P. A. C. No. 463

# PUBLIC ACCOUNTS COMMITTEE
## (1974-75)

(FIFTH LOK SABHA)

## HUNDRED AND SIXTY-SEVENTH REPORT

## FOREIGN PARTICIPATION OR COLLABORATION IN RESEARCH PROJECTS IN INDIA

**Ministry of Health and Family Planning**
**( Department of Health )**

LOK SABHA SECRETARIAT
NEW DELHI
*April, 1975/Vaisaka, 1897 (S)*

*Price Rs. 6·00*

## LIST OF AUTHORISED AGENTS FOR THE SALE OF LOK SABHA SECRETARIAT PUBLICATIONS

| Sl. No. | Name of Agent |
|---|---|
| | **ANDHRA PRADESH** |
| 1. | Andhra University General Cooperative Stores Ltd., Waltair (Visakhapatnam). |
| 2. | G. R. Lakshmipaty Chetty and Sons, General Merchants and News Agents, Newpet, Chandragiri, Chittoor District. |
| | **ASSAM** |
| 3. | Western Book Depot, Pan Bazar, Gauhati. |
| | **BIHAR** |
| 4 | Amar Kitab Ghar, Post Box 78, Diagonal Road, Jamshedpur. |
| 5 | M/s. Crown Book Depot, Upper Bazar, Ranchi. |
| | **GUJARAT** |
| 6. | Vijay Stores, Station Road, Anand. |
| 7. | The New Order Book Company, Ellis Bridge, Ahmedabad-6. |
| | **HARYANA** |
| 8. | M/s. Prabhu Book Service, Nai Subzi Mandi, Gurgaon. |
| | **MADHYA PRADESH** |
| 9. | Modern Book House, Shiv Vilas Palace, Indore City. |
| | **MAHARASHTRA** |
| 10. | M/s. Sunderdas Gianchand 601, Girgaum Road, New Princess Street, Bombay-2. |
| 11. | The International Book House, (Private) Limited, 6, Ash Lane, Mahatma Gandhi Road, Bombay-1 |
| 12. | The International Book Service, Deccan Gymkhana, Poona-4. |
| 13. | Charles Lambert & Company, 10, Mahatma Gandhi Road, Opposite Clock Tower, Fort, Bombay. |
| 14. | The Current Book House, Maruti Lane, Raghunath Dadaji Street, Bombay-1. |
| 15. | Deccan Book Stall, Fergusson College Road, Poona-4. |
| 16. | M.& J. Services, Publishers Representatives, Accounts & Law Book Sellers, Bahri Road, Bombay-15. |
| | **MYSORE** |
| 17. | People Book House, Opp. Jaganmohan Palace, Mysore. |
| | **RAJASTHAN** |
| 18. | Information Centre, Government of Rajasthan, Tripolia, Jaipur City. |
| 19. | M/s. Usha Book Depot, 585/A, Chitra Bazar, Tripolia, Jaipur. |
| | **UTTAR PRADESH** |
| 20. | Law Book Company, Sardar Patel Marg, Allahabad-1. |

CORRIGENDA TO 167TH REPORT OF THE PUBLIC ACCOUNTS COMMITTEE (1974-75) PRESENTED ON 30.4.1975.

---

| Page | Para | Line | For | Read |
|---|---|---|---|---|
| 192 | 7.1.25 | 3<br>6-7 | Sinopat<br>proceeding | Sonepat<br>preceding |
| 196 | | 11-14 may be read as follows: "been tried, especially since such a method was bring tried in the Sonepat experiments on aedes aegypti or work started on colonising anopheles stephansi and working on genetic strains." | | |
| 197 | 7.1.43 | 9 | were | was |
| 200 | 7.1.53 | 3 | new item | news item |
| 204 | 7.1.69 | 1 | ENHS | HNHS |
| 206 | 7.1.73 | 2 | project were explicit | project |
| 207 | | 5 | GOMU-like | GOMU-like |
| | 7.1.77 | 3 | National | Natural |
| 209 | 7.1.85 | 13 | Delete "and" | |
| | 7.1.86 | 7 | filds | fields |
| 211 | 7.1.91 | 5 | fearness | fearless |
| 212 | 7.1.93 | 9 | extant | extend |
| 246 | | 17 | bacteriological, and | bacteriological, herbicidal and |
| 248 | | 1 | Princi- | Principal |
| 256 | | 1-2 | Delete "The Committee.....action." | |
| | | 19 | Director | the Director |
| 257 | | 20 | action taken | action then taken |
| 260 | | 14 | Add: "The Committee would await a further report in this regard." | |
| 264 | | 12 | daemorrhagic | haemorrhagic |
| 265 | | 23 | in 1969 and 1968. | in 1968 and 1969. |
| 266 | | 16 | tried in | tried in the Sonepat experiments on aedes aegypti. |
| 269 | | 22 | were | was |
| 271 | | 11 | The report | The same report |
| 273 | | 25 | true pathogenic | true of pathogenic |

| Page | Para | Line | For | Read |
|---|---|---|---|---|
| 274 | | 18 | new item | news item |
| 278 | | 8 | 'islad inland' | 'isolated island' |
| | | 11 | reasons | reason |
| 283 | | 5 | arrived | arrive |
| 284 | | 7 | Delete: 'were explicit' | |
| | | 14-15 | This policy.. ...as is evident | This is evident |
| | | 20 | Add at the end: 'The Committee consider it rather strange that the Ministry of Defence had also not considered it necessary to obtain a copy of the ENHS-MRS study. Apparently the Ministry of Defence also came to know of the analysis of the blood samples in U.S. laboratories aborad only after the discussion in Parliament.' | |
| 285 | | 24 | GOMU | GCMU |
| 287-288 | | | Delete: 'In this context,... ...aerobiological research.' | |
| 289 | | 21 | GOMU | GCMU |
| 290 | | 8 | Bnussels | Brussels |
| | | 9 | studies and | studies |
| 292 | | 15 | At the very outset, the Committee must place | The Committee would like to place |
| 293 | | 14 | fearness | fearless |
| 294 | | 21 | extent | extend |

## GLOSSARY OF ABBREVIATIONS USED IN THE REPORT

| | |
|---|---|
| BARC | Bhabha Atomic Research Centre. |
| BNHS | Bombay Natural History Society. |
| BW | Biological Warfare. |
| CBW | Chemical and Biological Warfare. |
| CDC | Communicable Diseases Centre. |
| DOD | Department of Defence. |
| DRDO | Defence Research Development Organisation. |
| GCMU | Genetic Control of Mosquitoes Unit. |
| IARI | Indian Agricultural Research Institute. |
| ICMR | Indian Council of Medical Research |
| INMAS | Institute of Nuclear Medicine & Allied Sciences. |
| MAPS | Migratory Animal Pathological Survey of the United States Armed Forces Institute of Pathology United States Department of Defence. |
| NICD | National Institute of Communicable Diseases. |
| NMEP | National Malaria Eradication Progamme. |
| PL—480 | US Public Loan-480 |
| SIPRI | Stockholm International Peace Research Institute. |
| ULVS | Ultra Low Volume spray Technique. |
| USDA | United States Department of Agriculture. |
| USPHS | United States Public Health Scheme. |
| VRC | Virus Research Centre, Poona. |
| WHO | World Health Organisation. |

## CONTENTS



---

Not printed (One cyclostyled copy laid on the Table of the House and five copies placed in Parliament Library).

## PUBLIC ACCOUNTS COMMITTEE

### (1974-75)

### CHAIRMAN

Shri Jyotirmoy Bosu

### MEMBERS

2. Shri S. C. Besra
3. Shri C. D. Gautam
4. Shri Pampan Gowda
5. Shri Jagannathrao Joshi
6. Shrimati Parvathi Krishnan
7. Shri Y. S. Mahajan
8. Shri Bibhuti Mishra
9. Shri Paripoornanand Painuli
10. Shri Narain Chand Parashar
11. Shri H. M. Patel
12. Shri P. Antony Reddi
13. Shri Shibban Lal Saksena
14. Shri Biswanarayan Shastri
15. Shri Sunder Lal
16. Shrimati Pratibha Singh
17. Shri G. R. Patil
18. Shri V. B. Raju
19. Shri Mohammed Usman Arif
20. Shri T. N. Singh
21. Shri Sasankasekhar Sanyal
22. Shri A. K. A. Abdul Samad

### SECRETARIAT

Shri Avtar Singh Rikhy—*Additional Secretary.*

Shri B. K. Mukherjee—*Chief Legislative Committee Officer.*

Shri N. Sunder Rajan—*Senior Financial Committee Officer.*

## INTRODUCTION

I, the Chairman of the Public Accounts Committee, having been authorised by the Committee, do present on their behalf this Hundred and Sixty-Seventh Report on Foreign Participation or Collaboration in Research Projects in India.

2. A news-item released by the Press Trust of India was published in the press on 29th July, 1974 bringing out the serious concern in scientific quarters at some research projects being carried out in the country by or under the auspices of the World Health Organisation under conditions of total secrecy. The subject was discussed in Parliament on 30th July, 1974. During examination of paragraphs 32 and 33 of the Report of the Comptroller & Auditor General of India for the year 1972-73, Union Government (Civil) relating to the Ministry of Health and Family Planning (Department of Health), at their sittings held on 19th and 20th August, 1974 the Committee took up for consideration the working of these projects. The matter was further considered by the Committee at their sitting held on 14th January, 1975. The Committee examined the representatives of the Ministries of Health & Family Planning (Department of Health), Defence, Agriculture and Indian Council of Medical Research and National Institute of Communicable Diseases. The Committee also examined Dr. T. Ramachandra Rao, a former Director of Virus Research Centre who as an Officer on Special Duty in the Indian Council of Medical Research looked after the work relating to the Genetic Control of Mosquitoes Unit Project. At their sitting held on 5th March, 1975 the Committee examined the Editor-in-Chief, Press Trust of India (Shri C. Raghavan) and the Science Correspondent (Dr. K. S. Jayaraman). The Report was considered and finalised by the Committee at their sittings held on 25th and 26th April, 1975. The minutes of the sittings form part II of the Report.

3. A statement showing the summary of the main conclusions| recommendations of the Committee is appended to the Report. For facility of reference these have been printed in thick type in the body of the Report.

4. The Committee would like to express their thanks to the Editor-in-Chief and Science Correspondent of P.T.I. for revealing

matters of vital importance and giving valuable information to the Committee during evidence. The Committee would also like to thank the officers of the Ministries of Health & Family Planning (Department of Health), Defence and Agriculture for the cooperation extended by them in furnishing information desired by the Committee.

5. W.H.O. (World Health Organisation) is a United Nations Organisation. The U. N. Charter affirms its determination to "save succeeding generation from the scourge of warfare".

The Report covers some research programmes which have been taken up under the auspices of the World Health Organisation. The Report underlines the need for a most careful scrutiny of research programmes even though these may be sponsored by an Organisation of the United Nations to make sure that these would not unwittingly involve this country or expose our people to biological, chemical (herbicidal) hazards.

NEW DELHI;
*April* 28, 1975.
*Vaisakha* 8, 1897 (*Saka*).

JYOTIRMOY BOSU,
*Chairman,*
*Public Accounts Committee.*

## CHAPTER I

### I. Background

1.1.1. A number of medical and agricultural research projects and experiments have been launched in India and are being carried out in the country by or under the auspices of international and foreign organisations such as the World Health Organisation, United States Department of Agriculture, the Rockefeller Foundation, the Smithsonian Institute, Migratory Animal Pathological Survey (MAPS) of the US Armed Forces Institute of Pathology, United States Department of Defence, John Hopkins University, etc. For instance, a project for the genetic control of mosquitoes has been established in India in collaboration with the World Heauth Organisation. A collaboration for a study of bird migration had been entered into between the Bombay Natural History Society and the Migratory Animal Pathological Survey. Use of the Ultra Low Volume spray technique for urban malaria control is also being tried out with the assistance of the World Health Organisation. The Rockefeller Foundation has been associated with virus research with the Bombay Natural History Society and the Virus Research Centre in Poona and the Smithsonian Institute with bird migratory studies. The United States Department of Agriculture has been collaborating on a microbial pesticide project in the Pantnagar Agricultural University. The John Hopkins University had also been collaborating with Indian institutions on various research projects.

### 2. The P. T. I. Story

1.2.1. Dr. K. S. Jayaraman, Science Correspondent of the Press Trust of India, had brought out a very useful report in July 1974 on serious concern in sections of the scientific community in India at some research projects being carried out in the country by or under the auspices of the World Health Organisation under conditions of total secrecy. The report which appeared in 'Motherland' which has also done a very great service, of 29th July 1974 under the capital 'WHO works for US secret research in India?' is reproduced below:

> "Sections of the Scientific community in India are very much concerned at some research projects being carried out in this country by or under the auspices of the World

Health Organisation (WHO) under conditions of total secrecy, writes PTI Science Correspondent.

They are perplexed by the hush-hush atmosphere surrounding the experiements, the fact that all these projects are being financed by American Government agencies and that the US army appears to be a recipient of the research findings.

One easy explanation for the financing aspect, suggested by some, is that US agencies and particularly defence services, were able to utilise and spend rupee funds with the US embassy or authorities generated by PL-480 operations.

There may be explanations for other queries too, but attempts to get information on the experiments and answers to questions posed by critics have proved unavailing. None of the parties involved—WHO, Indian Council of Medical Research (ICMR) or the Union Health Ministry itself—is willing to answer the questions.

The WHO experiments are being conducted or have been completed at the Genetic Control of Mosquito Unit (GCMU) in New Delhi, Bombay Natural History Society (BNHS) and the Malaria Eradication Station in Jodhpur.

GCMU first came under public gaze two years ago when it was revealed that it was polluting village wells with chemicals suspected to be cancer-causing and prohibited in the United States.

Since then secrecy has become tighter on the entire project.

Dr. Rajendra Pal who runs the GCMU project from his WHO office in Geneva refused information on the plea that the unit's activities 'are sensitive to the Indian Press'.

Dr. Pal who was on a visit to India last May, said he had instructions from the WHO Director-General himself not to talk to the Press.

Dr. C. Gopalan, ICMR Director-General, asked the correspondent to be 'sympathetic' to the WHO-ICMR mosquito

---

WHO : World Health Organisation.

control project and explained that Press statement would 'embarass' the WHO.

Other senior Health Ministry Officials have been unavailable for comments or information on WHO research projects under their Ministry.

The WHO experiments which employ high technology and ultra new scientific concepts, appear to be plain investigations on mosquito control, bird migration and the like.

But the same experiments also provide data on the availability, behaviour and peculiarities of disease-carriers in India.

Some experts here believe that these data may be useful in a biological or germ warfare.

It appears that at least one of the WHO experiments (bird migration study with BNHS) was sponsored by the Migratory Animal Pathological Service (MAPS) of the United States which in simpler language is biological warfare research division of the United States army.

Some members of the scientific community ask whether the hush-hush atmosphere and the nature of data collected in various projects of doubtful relevance to India suggest that India is being used as a guinea pig or testing ground for chemicals or methods not permitted in sponsoring countries or even for some covert operations.

It may be pointed out that the U.S. Department of Defence ressional hearings that it spent $21.6 million over a seven-year project on weather warfare research in Vietnam before resort to this warfare in the actual operation during 1968-69.

It has also been reported that the U.S. used Latin American countries as guinea pigs for testing the effects of 'defoliants' before deploying them in Vietnam.

W.H.O. has not only blacked out news on its current research activities in India but also would not make available reports of earlier projects.

## US Project

For instance, request for a copy of the report of a WHO sponsored conference in Bombay in 1969 on the global Impacts of Applied Microbiology produced no result.

Apart from the WHO, the John Hopkins Medical Centre of the U.S. had set up some projects in Calcutta and Narangwal in the Punjab for several years. What studies were carried out in India by John Hopkins are not known because no Health official is willing to talk.

The WHO has been using BNHS for studies on how viruses are carried and introduced into India by migratory birds.

That this study was financed by MAPS of the U.S. Army is suggested by the fact that the WHO sent four copies of the secret report (WHO/PA/68.59) on 'dissemination of arboviruses through migratory birds' directly to Dr. Elliot H. Melure of MAPS far-eastern office in Bangkok.

It is not known why the report was sent to MAPS of the U.S. Army. But Shri N. Willard, public Information Officer of the WHO regional office here, said 'the report is not available with WHO'.

Questions about the involvement of the US military in this project was also raised in the Rajya Saba in the last session by Prof. Subramanian Swamy of the Jana Sangh who said that the US army had given BNHS a grant to study bird migration in north-eastern India.

The US Army Contract (DA|CRD|AFE|392|544|69|6 G137), according to Prof. Swamy, specified that 'two advance copies of the work' should be given to MAPS.

ICMR's virus research institute in Poona had until 1970 received substantial funds and 'experts' from Smithsonian Institution and Rockefeller Foundation of the US for bird migration studies (in collaboration with BNHS) and for the study of immune status of man and animals in NEFA.

---

MAPS : Migratory Animal Pathological Survey of the United States Armed Forces Institute of Pathology.

## Disease Virus

Although the WHO was refused to divulge its findings on migratory birds and viruses, a Russian virologist Dr. G. L. Netzky has confirmed the arrival of virus infested birds into India and has said that 'migrant birds can spread complex viruses throughout India'.

According to WHO's own journal (World Health, June 1963), the Kyasanoor forest disease virus that mysteriously appeared in Karnataka in 1958 could have come from migrant birds.

GCMU, set up in 1969, is entirely financed by the US Public Health Service which has so far pumped—through WHO—about Rs. 30 million in experiments that appear to have no relevance to malaria and filariasis, two major mosquitoborne diseases in India.

Instead, GCMU is collecting ecological, behavioural and dispersal data on aedes aegypti, a mosquito species that transmits yellow fever.

Dr. Rajendra Pal said that GCMU will launch a big experiment earlier next year in Sonepat (near Delhi) to control aedes aegypti by genetic method.

The WHO motive for this most expensive project is not known because there has not been a single case of yellow fever in India for ages.

Aedes aegypti also spread dengue fever but this is not as serious a health problem as malaria or filariasis.

## Yellow Fever

Dr. Gopalan refused to say why ICMR is backing the WHO study of 'aedes aegypti' when GCMU's priorities ought to be anopholef stephensi (malaria carrier) and culex fatigans (filaria carrier).

Malaria has come back to India and filariasis is endemic in an area occupied by one-fourth of India's population. Dengue has been sporadic but yellow fever is non-existent in India.

---

GCMU : Genetic Control of Mosquitoes Unit.

Dr. Rajendra Pal would not explain why all experiments of GCMU are carried out around the Indian Capital—which is not endemic for malaria or filariasis—instead of in real endemic areas in the country.

Until now GCMU had been collecting data on the ecology, behaviour and dispersal pattern of mosquitoes in South Delhi and in Faridabad, a sprawling industrial complex near the Capital.

Some experts fear these data can help some inimical persons who might want to employ mosquitoes for effective transmission of viruses and germs—known and unknown.

In this respect aedes aegypti could be extremely useful as germ carriers because its eggs can be dried, put on a piece of paper in an envelope and mailed to any part of the country where they can hatch. Eggs of other mosquito species can not be dried.

As part of experiments, GCMU has mapped in microscopic detail the entire area around Delhi, Faridabad and Sonepat. These maps contain the location of every well, pond, water mains, sewers, residential plots and the like.

In population density and layout, Sonepat resembles Old Delhi.

The Sonepat experiment expected to begin in February 1975 could also provide an answer to the riddle puzzling foreigners. Why is there no yellow fever in India when the carrier mosquitoes (aedes aegypti) are found in plenty? How is it that yellow fever virus does not get established in India despite its huge population of monkeys that are excellent reservoirs for the virus?

Yellow fever is believed to be absent in India because of the possible presence of another virus that may give 'cross protection' against the yellow fever virus. Experts ask if, genetic mosquito experiments would affect or remove this natural cross protection. If it does, yellow fever would strike India.

---

GCMU : Genetic Control of Mosquitoes Unit.

## Indians Know Not

Indian scientists working in GCMU privately say they do not know what is happening in the unit because all decisions are taken in closed meetings. The unit's present and the four previous project leaders have been U.S. government scientists.

Dr. A. D. Mani, former Director-General of Health Services and ex-Chief of WHO regional office here, recently said at the India Inter-national Centre that one need not worry about what experiment GCMU did because the money for the project came from the U.S. and not from the Indian Government.

The WHO, along with the Union Health Ministry, has also been carrying out some mosquito control experiments in Jodhpur using what it calls ultra low volume technique (ULV) for spraying insecticides.

In this technique, a small dose of insecticide is converted into millions of droplets and dispersed at a remarkable speed in an invisible form by special spray machines that can be mounted on a truck of aircraft.

Some experts say this technique is identical to the technique of dispersing disease causing germs. An official of the National Malaria Eradication Programme said the ULV experiment is supported by the U.S. Centre for disease control in Atlanta.

According to a WHO Press release, the ULV experiment was first tried in Thailand. It was then abandoned for unknown reasons and 18 months ago, the experiment was shifted to Jodhpur area (not far from the site of India's underground nuclear explosion).

It is not known if the WHO used aircraft, or why it chose this low priority area for this experiment, or why the project is now being wound up from Jodhpur and shifted to Bangalore.

---

ULV: Ultra Low Volume.

### 3. The National Herald Article

1.3.1. Earlier, a similarly useful article entitled 'Science or Neo-Imperialism' written by 'A Scientific Worker' had also appeared in the 'National Herald' of 11th February 1972. This article, which specifically referred to the WHO-ICMR project on genetic control of mosquitoes, is reproduced below:

"International cooperation in science is an attractive theme, provided the participants have common goals and comparable standards; otherwise, this becomes a donor-recipient relation, with very little choice for the recipient. Only rarely the donors are philanthrophic and have sufficient understanding of the problems of the recipients. The social objectives of the donor nations are to be different from those of the recipients, who would be eager to put to use the known knowledge and technology in their nation for social betterment be it health, industry or agriculture. The public of the recipient nation have to rely on their own scientific elite for the evaluation of the utility of such international efforts, but often this elite is so brain-washed that they are at ease only in the donor nation's social outlook and science programmes. Specially so in India, as public awareness is abysmally low on scientific matters.

**Specific Case**

An interesting collaboration in context is the unit for genetic control of mosquitoes, a cooperative venture of World Health Organisation and Indian Council of Medical Research, financed to a large extent from PL-480 funds. It is not known why the unit has been located in Delhi instead of the heavily mosquito infested areas of India with endemic malaria and filariasis. There are three methods of genetic control of insects, which this unit is to attempt. The first is the sterilisation of male insects by nuclear radiation and release in the field to mate with natural population. This method has been successfully employed to eradicate screw worm flies in the southern states of the U.S.A. Another method is the development of a mosquito strain incompatible with the local species

in the laboratory, near them in large numbers and release in the field to combat with the natural population. This has also been successfully utilised to eradicate a species of mosquito in Okpo Village near Rangoon, Burma, under the aegis of the WHO. The last method is use of chemicals to sterilise insects (instead of radiation) and release these sterile-males in the field. This method has not been very successful in limited field trials. The WHO/ICMR unit is supposed to give a limited trial to all the three methods and choose the most appropriate one for the local species and conditions. But a recent report of the unit on the work done in 1971 and planned for 1972 raises serious doubts, whether all the three approaches would get a fair trial. The primary requisite for the first method of radiation sterilisation is a nuclear irradiation source called Cobalt-60 gamma cell. The WHO/ICMR unit does not have this and is dependent on an old equipment at the IARI, for their work. Unless pre-conceived bias on the inappropriateness of radiation sterilisation method existed, this item would have been procured; specially so, when these could be fabricated by the BARC in India. Even if the items were to be imported, it would not have been difficult for this project with vast financial resources to commit Rs. 1.5 lakhs for this purpose. As to the second method of incompatible strain, the report of the unit states, 'Very little research on non-induced sterility with Culex fatigans has been done at this unit, most of the research was done in mainz, Germany'. In contrast, the third method of sterilisation by chemicals which has been unsuccessful elsewhere occupies a good part of the work.

**Recipient Guinea-Pig**

Field trials have been carried out in a village, Pochanpur near Delhi and are to be extended to Dhubiras and Bamanli in the current year on a wider scale by release from aeroplane, preceded by insecticide fogging of the area. The trend could not have been otherwise, because the past (first) and the present project coordinators are

BARC : Bhabha Atomic Research Centre.

both from the U.S. Department of Agriculture with a long experience and quite a few publications on chemosterilisation of insects. A recent monograph, joint edited by these two American entomologists states in the introduction: 'Although there has not been a smashing success in control or eradication of an insect species (with chemosterilants) on a large area basis such as with screw-worm, there is every justification for continuing and extending the research'. (Principles of Insect Chemosterilisation, Appleton-Century-Crofts, New York, 1968, p. 4). And this is exactly what the US Department of Agriculture scientists are doing in India, under the WHO aegis and ICMR support.

The chemicals which are used to sterilise the insects (Thiotepa in Delhi; Tepa Apholate etc.) are modifications of the mustards, the infamous war gas, with a similar biochemical action but with reduced toxicity for mammals. These chemicals produce mutations, cancer and foetal deformities in experimental animals; these facts are well known, [Hayes, W.J. Toxicology of Chemosterilants. Bulletin of W.H.O. 31. 721—736 (1964)]. The action is indiscriminate in that all species of insects exposed would be sterilised; so too higher organisms, depending on the dose. In 1964 and 1965, chemically sterilised Mexican fruit flies were released in the Mexico-US border near Tijuana, Mexico, with limited success. But in 1966-67, and subsequent years, radiation-sterilisation was used with equal results to avoid possible contamination of the environment.

This method has not been field tested anywhere else. With the present sesitivity towards environmental pollution in the U.S., it would be impossible to field test any of these chemically sterilised insects in the U.S. An additional factor to be reckoned with is the resistance of insects towards these chemicals, which will mean higher doses for sterilisation with consequent greater hazard to environment. A review article on 'Sterilisation and Insect Control' from Canadian Department of Agriculture [Annual Review of Entomology. 14, 81—102 (1969)] concludes by saying that 'Chemosterilants for sterilisation of native populations in the field should not be used on a large

scale until less hazardous chemicals are produced or safer techniques are developed'. Probably, the warning is not applicable in developing countries like India.

The U.S. Department of Agriculture should be exhilirated at the case with which they can field test on a large scale these chemicals, under varied conditions in India. Pochanpur Village, 35 km. south-west of Delhi with 1100 inhabitants, 500 animals is the first target. 50,000 mosquito pupae, dipped in the dangerous chemical for 3 hours and washed with water, were placed in all the wells of the small village. No one bothered how much residue of the dangerous chemical absorbed or sticking to the insects could directly pollute the drinking water. This was remarkable callousness coming from USDA scientists, who fix parts per million levels for far less dangerous insecticide residue sticking to fruits and vegetables sold in the U.S. market. Whenever these chemicals were used, the tests were done on refuse dumps or uninhabited islands in the U.S. but never in the water supply system of an American town. USDA employs chemists, toxicologists and ecologists to work with entomologists on such research schemes to evaluate important aspects like hazards, residue levels, species specificity etc. But in India, the work is carried out by a team of entomologists, as if it is an already accepted procedure for insect eradication. As these experiments are extended over larger areas of India over the coming years, the USDA experts can get back with the satisfaction of providing the U.S. drug industry, a big market for these chemicals over which they have an almost monopoly. It is a sad commentary on affairs that this goes with little public awareness and full acquiescense of the scientific bureaucracy."

### 4. Discussions in Parliament

1.4.1. The explosive PTI Report generated considerable interest and discussion in Parliament and was also the subject of a Calling Attention Motion in Parliament, on 30th July 1974, when the Minister of Health and Family Planning had characterised the press

reports as 'tendentious, unfair and misleading' There were, however, apprehensions in the minds of the Members of Parliament that the work carried out by the Genetic Control of Mosquitoes Unit Project may be connected with germ warfare experiments which would be detrimental to the interests of the country. The Minister had assured the House that the functioning of the Unit would be reviewed by the Government Body of the ICMR.

1.4.2. Since this was an urgent issue of public importance affecting both the health of the people and the security of the country, the Public Acconnts Committee (1974-75) decided to examine in detail the project and other related issues. The Committee examined representatives of the Ministry of Health and Family Planning, the Director General of Health Services, the Director General of the Indian Council of Medical Research and Dr. T. Ramachandran Rao, who had been an officer in charge of the Genetic Control of Mosquitoes Unit and had been associated with the study for a long time and had been requested to appear before the Committee, at the instance of the Derector General of the Indian Council of Medical Research. The Committee also examined Shri C. Raghavan, Editor-in-Chief, Press Trust of India and Dr. K. S. Jayaraman, Science Correspondent, Press Trust of India.*

1.4.3. The examination by the Committee of the official and other witnesses and the written information furnished in this regard is discussed in the succeeding sections of this Report.

---

USDA : United States Department of Agriculture.

*Both Mr. Raghavan and Dr. Jayaraman clarified that they were giving their personal views on the subject as the PTI, being a news agency, had no views as such on the subject

## CHAPTER II

## THE P.T.I. STORY

2.1.1. A note furnished to the Committee by Shri Raghavan, Editor-in-Chief, Press Trust of India, indicating the sequence of PTI investigations of the Genetic Control of Mosquitoes Unit is reproduced below:

"In April 1973, the PTI Science Correspondent (Mr. Jayaraman) first approached Dr. M. N. Wahi, ICMR Director-General for information on WHO-ICMR genetic control of Mosquito unit (GCMU). Dr. Wahi said GCMU had a set back after a Feb. 1972 National Herald Story (Feb. 1972), criticising use of some chemicals. Dr. Wahi said the PTI was welcome to see the unit and write about it and would have full facilities.

However, GCMU's acting project leader Dr. M. Yasino (now resigned) asked Jayaraman to restrict himself to generalities and said he would not be able to give details of the experiments being conducted in villages near Delhi.

The nature of information sought was basic to a popular science story on subject—density of present mosquito population, density of sterile males to be released, how sterility was going to be achieved (chemical, radiation or other means) and other such information.

At this point Jayaraman was merely disappointed; he could not get the detailed information that would have made story meaty. He wrote a general story on the theory behind the project, the enormous potential it had for mosquito control, etc. He also had visited the villages and met villagers and discussed with them their reactions.

The story appeared on April 16, 1973. It must be pointed out that while not giving any information and despite Dr. Wahi's permission to see the project and write about, Dr. Yasuno insisted on the PTI man showing the draft to

---

GCMU : Genetic Control of Mosquitoes Unit Project.

make sure it did not contain any figures or numbers that he said WHO might not want to be published.

The correspondent, however, began reading up on available literature in research journals and books on genetic control technique.

In December 1973 (eight months after the first story), Jayaraman met Dr. Jerry D Brooks of the US Public Health service, the fourth project leader. Recalling his earlier general story, Jayaraman asked for details about the experiment which had now ended, for a follow up story in view of its interest both for India and the world at large.

Dr. Brooks said he would give the material for the story after getting clearance from WHO head office in Geneva and said the clearance would come within a week.

One week became two months and Dr. Brooks was apologetic over the phone that no clearance had come. Dr. T. Ramachandra Rao, the ICMR expert on the project and a consultant, knew about efforts to get details. But the never took the matter up or helped Jayaraman to get the information sought.

In February 1974, German News the magazine published by the West German Embassy here reproduced an article by a WHO expert who had earlier worked at GCMU in Delhi. This was Prof. H. Laven, the father of the genetic control method (using chemical techniques). Dr. Laven's article said the experiment had been a total failure and had also warned against the chemicals being used a spotentially hazardous to health:

Jayaraman approached GCMU project leader, Dr. Brooks and asked him about the Laven article which PTI was going and Dr. Brooks was asked whether he had anything to say without waiting for clearance from Geneva. Jayaraman said PTI would want to have complete details of the experiment, both for a layman's story in PTI and for a semi-scientific article in popular science magazines in India and abroad.

---

GCMU : Genetic Control of Mosquitoes Unit Project.

Dr. Brooks promised to give details in two weeks, but in the meanwhile requested Jayaraman to publish his statement denying Prof. Laven's views.

PTI carried both Prof. Laven's article and Dr. Brooks denial.

Dr. Brooks agreed that Prof. Laven's article was very damaging to the GCMU project because of its conclusions and issues raised. He was thankful to PTI for having carried GCMU'S general denial.

Jayaraman told Dr. Brooks PTI had gone so on the understanding that Dr. Brooks would justify his statement on the basis of detailed experimental results to be made available to PTI in two weeks.

Two weeks later, Dr. Brooks said WHO at Geneva had not given clearance.

A month later, Dr. Brooks pleaded that his headquarters had tied his hands and that he was sincerely sorry he could not give the material he had promised to back up his claims against Dr. Laven.

Meanwhile, Jayaraman came across WHO's support to the bird migration studies at the Bombay Natural History Society.

Coincidentally at this time, Dr. Subramaniam Swamy (Jana Sangh MP) raised the BNHS contract with the US army in the Rajya Sabha.

After talking to Mr. Swamy and seeing the information he had, Jayaraman contacted WHO regional office in New Delhi for reports on the WHO-BNHS bird migration study.

Jayaraman also went through the publications of the BNHS in their journals issued during 1960-70. The reports contained information on the number and species of birds but did not say anything about their germ or virus carrying potential—the main purpose of the WHO study.

WHO's regional office said they had no complete report on the BNHS study nor was the report available in WHO's

---

GCMU : Genetic Control of Mosquitoes Unit.
BNHS : Bombay Natural History Society.

head office. However, some files on the project were available in New Delhi and the correspondent insisted on seeing those files.

It was in those files that Jayaraman found evidence, not only of the existence of the report, but of the fact that four copies of the report were sent to MAPS of the US Army. Jayaraman noted down details of this correspondence between the medical officer for virus studies of WHO and Dr. Mclure of MAPS in Bangkok.

The same files contained a report of Prof. Netzky, a Russian Virologist, who had confirmed the arrival of virus infected birds in India.

On the basis of this, Jayaraman wrote to Mr. N. Willard, Public Information Officer of WHO for a copy of the report. Mr. Willard replied the 'report is not available with WHO'.

It was at this point that the suspicion that the correspondent had earlier had about the GCMU project started to build up. For there was no reason for WHO to deny having published a report on a study that had ended four years ago.

On May 2, 1974, Jayaraman learnt that Dr. Rajendra Pal who is in charge of the GCMU at WHO arrived from Geneva for the usual biannual meeting. Jayaraman met Dr. Pal at 8 a.m. at the GCMU building and asked him for information about the project. Dr. Brooks introduced Jayaraman to Dr. Pal as the correspondent who had already visited the unit earlier and had written about the project.

Dr. Pal told Jayaraman he had orders from the Director-General of the WHO not to discuss the project with the Indian Press. Opening a folder as if to prove his point, Dr. Pal showed Jayaraman a confidential letter addressed to Mr. Willard of WHO regional office here which said the project is 'considered sensitive to the Indian Press'.

---

MAPS : Migratory Animal Pathological Survey of the United States Armed Forces Institute of Pathology.

WHO : World Health Organisation.

GCMU : Genetic Control of Mosquitoes Unit

Jayaraman left the room, telling Dr. Pal that under these conditions he could only write about what he knew and the WHO Director-General's injunction to keep GCMU out of the Indian Press.

At this point Dr. Pal invited the correspondent back again and agreed to an interview. The interview ended with the first question of Jayaraman namely the reason why GCMU was studying yellow fever mosquitoes instead of malarial mosquitoes.

Refusing to entertain any other question (or answer this one) Dr. Pal said Jayaraman should meet Dr. C. Gopalan, the new ICMR Director-General, adding that 'WHO is only a guest of India' and that the unit is 'under the control to ICMR'.

Jayaraman asked Dr. Pal to fix up the interview and also be present with Dr. Gopalan since Gopalan had just taken over and would not know anything of the technical points on which Jayaraman wanted answers.

Jayaraman walked across to Dr. Gopalan's room, where the first question or comment from Dr. Gopalan was about the yellow fever mosquito (suggesting that in the meanwhile Dr. Pal had talked on the phone to ICMR D.G.).

The interview with ICMR and others were fixed for 1645 hours that day. Present at the interview were Dr. Pal, Dr. Brooks, Dr. C. Gopalan, and Dr. MID Sharma, Director of the National Institute of Communicable Diseases.

The scientists had a ten minute discussion among themselves before Jayaraman was called in.

In the interview, Jayaraman was asked for his 'biodata' by Dr. Pal who indirectly sounded Jayaramn about a job offer at the WHO information office in Geneva.

Jayaraman was not allowed to ask a single question. Dr. Gopalan asked the correspondent to be sympathetic and he pointed out that he would not like to embarrass the WHO people. He said a special issue of a journal would come

out 'soon' that would answer all the question Jayaraman might have.

Jayaraman was not allowed to say anything more and Dr. Gopalan walked him out of the room.

Jayaraman slept on the story for one whole month. PTI Editor-in-Chief had been however kept informed at various stages. Editor-in-Chief made some inquiries to make sure it was not some kind of a Defence project, or something of which the intelligence may be aware of.

Editor-in-Chief also complained to Dr. Karan Singh of the general air of secrecy in Health Ministry about some of their research projects.

During this period PTI again persisted in asking WHO information officer—the only person, according to Dr. Pal, authorised to talk to the press—about the bird migration study, or the urban malaria programme in Jodhpur, where WHO had been studying the so called ULV* technique. But the WHO Information Officer had no answer to any of the queries and the concerned technical people would not talk.

To get information on the Jodhpur project Jayaraman called Dr. S. Pattanaik, Director of the National Malaria Eradication Programme. Dr. Pattanaik asked the correspondent to come through the Press Information Bureau of the Government of India.

Mr. Banumoorthi, DPIO at the PIB, did not give 'clearance' for reasons unknown. When Mr. Banumoorthi was reminded two days later, he pleaded inability.

Meanwhile, after Parliament adjourned towards end of May, Editor-in-Chief, Mr. C. Raghavan, called on Dr. Karan Singh and told him his view there was some hanky-panky in this whole business. He suggested Dr. Karan Singh should direct his Secretary to meet Jayaraman with the technical officials and discuss the questions raised by Jayaraman. Dr. Karan Singh promised to speak to Mr. C. S. Ramachandran.

---

*ULV technique : Ultra Low Volume Spray technique.

Even when this was brought to the notice of PIB and an appointment sought with Mr. C. S. Ramachandran or with other technical officials, there was no response.

Mr. Raghavan met Mr. Ramachandran at a social occasion, and told him about the difficulty that Jayarman was having to get some information checked out by Health officials. Mr. Raghawan also made it clear that this was not a routine story about the Bihar small-pox (as Mr. Ramachandran thought) but about their mosquito control unit on which PTI had some disquieting information. The Health Secretary agreed to meet the correspondent and said his PA should be contacted.

The PA, when contacted, fixed up a meeting for 1500 hours the next day. At 1430 hours the meeting was cancelled. The PA said the Secretary would not be able to meet the correspondent at all and suggested that the correspondent might try the Director-General of Health Services. (he D.G.H.S. had weeks earlier had already refused to meet or talk to the correspondent).

PTI then pulled together all available information and wrote a story."

2.1.2. Explaining the basis of the PTI Report, Shri Raghavan stated during evidence:

"The PTI report on the WHO's researches in India in collaboration with the ICMR was prompted by the concern of sections of scientific community that these projects had a direct bearing on BW programme. Dr. Karan Singh told the Parliament that data from these projects could be used, like nuclear energy for good or bad purposes but on the whole described the PTI report as 'tendentious false and misleading'.

The PTI report was not tendentious. It arose out of the natural curiosity of its science reporter whose beat was to cover and report on scientific developments in the country. From the time of initial contact with GCMU to the final publication of the story nearly 15 months were spent in gathering information, checking the material consulting reference books and journals in libraries, visiting villages where the project was in progress and of course, waiting for interviews, never granted, with health officials. The sequence

of investigations before the final release of the story will bear testimony to the fact that the story was not written overnight with any political or other motivation. The only motivation was to tell the public what some concerned people were saying namely that there was something unhealth about the project for genetic control of mosquitoes, the malaria eradication project at Jodhpur and the bird migration research at the Bombay Natural History Society because it was realised that each of these projects had a bearing on one or other aspects of BW.

Secondly, the PTI report was not false. Information gathered since the publication of the report confirms that the allegations raised in the Parliament on the basis of the report, are as true today as they were on July 30, 1974. For instance, the report expressed concern on the basis of documented evidence at the use of a dangerous chemical by GCMU in Delhi villages. I do not want to go into details over it but that shows that before they started field studies, during the course of the research they found that Thiotepa was dangerous and yet did field trials.

The second thing is that our report pointed out that the data collected by GCMU on the ecological and dispersal behaviour of Indian mosquitos are vital for BW. This, in fact, is the view of international experts on BW as well as the UN special committee on CBW.

Our report had also expressed special concern at GCMU's proposed experiment at Sonepat for collecting dispersal data on Aedes Aegypti or the yellow fever mosquitos because on analysis it was felt that these data are crucial for perfecting a system to employ yellow fever as a BW weapon. There is enough published evidence to prove that this concern was rational and basically correct.

The report alleged that the Ultra Low Volume hardware testing at Jodhpur, the microbial pesticide research at Pantnagar University and research on bird migration at BNHS all dealt with some aspect or the other of bilogical warfare. This was not an irresponsible statement as can be seen from published information.

Apart from published information there have been a number of developments since the Parliamentary debate on July 30, 1974 that confirm that our report was not false. For

instance, the International Journal 'Nature' wrote articles supporting our story and called for a probe by the Indian Parliament. It is dated 29th September, 1974. It is an international science magazine and has very distinguished science editors.

Health officials of our own Government have since formally and informally admitted the biological warfare implications of the GCMU and Jodhpur Research projects. The ICMR expert committee set up after the Parliamentary debate insisted on testing all GCMU released mosquitos for their potential to carry yellow fever and other viruses. It also called for an independent body to monitor GCMU activities. ICMR governing body asked for modifications in the ICMR-WHO agreement and called for transfer of technical and administrative power to the ICMR from WHO. The Sonepat experiment itself has now been abandoned. None of these would have happened, had the PTI report been false.

The PTI report was called misleading; it was not. In fact, Dr. Karan Singh was incorrect when he told the Parliament that GCMU started studying yellow fever mosquitos because malaria was practically wiped out in 1968 when proposals for GCMU were mooted. The Health Ministry's own annual report for 1968, however, revealed that malaria had actually increased. Dr. Karan Singh had also said that dengue fever is a major health problem and, therefore, GCMU was concentrating on the eradication of Aedes Aegypti which spread dengue fever in the country.

Dr. Karan Singh also said that foreign agencies collaborating with the Ministry had no military connections. But the facts based on well-documented information indicate that the opposite is perhaps true. Despite the sensitive nature of the projects in question, the Health Ministry's attitude to the projects had been, I am sorry to say, one of detachment rather than involvement, seriousness of purpose and commitment to people, whose very health and safety were threatened by the projects."

2.1.3. Dr. Jayaraman, Science Correspondent, Press Trust of India, stated in this connection:

"I am only a journalist. But I want to tell you from the little information that is available in this field, not only in this field, but also in other fields, about which I have written on the possibility of studying the ecology and the dispersal of mosquitos, that it is connected with biological warfare. The experiments being done in this regard are of three types: (1) Study of Aedes Aegypti and the development of yellow fever as a biological weapon; (2) Development of birds migration study and its relevance to CBW: (3) ULV technique being done at Jodhpur. There are very few people who know about it and the only way we can get the story is going through the literature or papers published by authorities like the Sipri Report which has been given to the Committee and other articles written by experts in professional journals. And there are occasional newspaper reports also."

2.1.4. The Committee asked who had written the story on the import of worm-infested hop plants from Australia. [This has been examined by the Committee in their 136th Report (Fifth Lok Sabha)]. Dr. Jayaraman replied that the report had been written by him.

2.1.5. In reply to a question whether any pressure had been brought upon the Press Trust of India by people in the GCMU Project or the Government of India to play down the report. Shri Raghavan stated:

"In fact Dr. Pal of WHO offered a WHO job to my colleague perhaps for not writing the story."

Dr. Jayaraman added:

"He hinted at that. He did not say anything directly. He said indirectly that a job would be offered to me in Geneva. He asked for my biodata . Then he said that I might be suitable for a job at the Information Department at Geneva."

Shri Raghavan also stated that there was no doubt in his mind that pressure was sought to be put upon them and certainly, after they wrote the story, to stop further investigations.

2.1.6. The Committee desired to know whether the concerned authorities were not willing to make available the relevant information relating to the project. Shri Raghavan stated:

"We have put it down in writing. We tried to talk to the people and they refused to talk to us. In this country, unfortunately, after 28 years of independence, after 28 years of my experience in the profession (nine years I have spent abroad) I can say the truth is that any person with a brown or black skin gets no where. But a white skin has an automatic 'entre'. They would not talk to us, but they have talked to foreign correspondents. I will give an example. Dr. Gopalan had refused to talk to my colleague or answer any questoin(s). Here I shall give you the article in 'Washington Post' which is on the same subject. If you read it you will find that it is on the same subject and they have talked to the foreign correspondents."

He added:

"I went and spoke to the Health Minister. As a matter of fact I must tell you that there is a barrier against the newsmen in the Health Ministry because they have got a dictum, if there is anything good that happens in the Ministry the Minister must announce it and take the credit and if anything bad happens, do not say anything. It may be all right with a political Ministry but why should scientists be prohibited from talking to newsmen? I told Dr. Karan Singh what I am after and further told him that something vicious was taking place. He said that he was coming back from Geneva, meanwhile I should meet the Health Secretary. We could not set up a meeting. I ran across the Secretary at a social occasion. I told him that my colleague wanted to speak to him. He said, 'Is it about small pox?' I said, 'No.' Appointment was fixed. When he went there, appointment was cancelled. The Secretary himself cancelled the appointment. No reasons were given. Mr. C. S. Ramachandran was the Secretary. So, it was at that stage that we would not get the information and even afterwards we could not get the information. I requested the Minister that somebody should sit with me to answer our queries. But this was not done. What is their answer even now to Max Theiler, Dr. Pandit and Sipri Report? If the data could be made available to the foreigners, why not to Indians?"

2.1.7. Explaining the reasons which prompted PTI to write the story, Shri Raghavan stated:

"I thought over it for a couple of weeks when my colleague brought this story to me. At that stage I decided to write it. In a news agency we normally do not go out to make charges. I talked to certain people who felt that they were helpless in this matter. Then we decided that we would publish it and hoped it would come into the open. As a matter of fact when we published it, others started taking interest. We could not mount campaign against it. That is not in a News Agency tradition. But we did not publish anything further since you were all going into it."

2.1.8. The Committee desired to know the source of the information which led to the story. The witness stated:

"All that I can say is from the time we started investigation, in the 15 months until we wrote the report. We tried at every stage consciously to make sure that the information that we get is cross checked with somebody so that we were not victims of any employees who were disgruntled or against any authority and that this was not considered as a story by disgruntled employees. It is very encouraging that nobody brought it to us.

When we saw something about it I sent my colleague on my own to enquire as to what happened about the project on gentic control. I told him here is something new. Our first story was in praise of this project. We started from the other angle, not in condemnation of the project. Six months later we asked as to what happened to the Project? We found the project had not succeeded. No one was willing to tell us why it had not succeeded. That made us suspicious. When we looked to the WHO's file on bird Migration & Vector Study we found the report being sent to Bangkok. It was in those files that we found evidence not only of the existence of the report but of the fact that four copies of the report were sent to MAPS of the U.S. Army. But WHO's regional office said that they had no such report. The succession of events made us feel that something fishy was going on. I went to the Intelligence people, I asked the military intelilligence, Civil Security Apparatus people and asked them if they knew anything about it be-

cause I did not want to get myself involved in those things. All of them said that they did not know anything about it. It was then that we began to feel that there is something wrong and it requires our attention."

2.1.9. The Committee asked what gave rise to their suspcion about the project. Dr. Jayaraman stated during evidence:

"My suspcision arose when I found that the people who were doing this work were not sincere. This experiment began around Delhi villages. In my first contact, I was told, 'Do not worry about details, write about the theory, how the mosquitos can be controlled with this new method'. I did that just to educate the people about genetic control of mosquitos. Being a journalist, I followed it up. The experiment in Delhi villages was completed and I wanted to find out what they had done. I found that they spent long time in collecting data. You have to collect data, when you do experiment. But my question is, whether the experiment was done to the extent that is necessary to demonstrate the feasibility part of it. What I found out was that the time they took for collection of data was about two years or so. They did almost the same experiment in about ten villages. One was, of course, a major one. They came to the conclusion that the method seemed to work well, but it had been spoiled by mosquitos coming from outside. This shocked me.

I am a physicist. When I take up a problem, I anticipate the problems before I spend money. Here I have already evidence. As far back as 1938, somebody had said that the Delhi mosquitos (colex petigans) would travel so far. This migration of mosquitos is well known. This migration problem, they say, they found out after spending three years and enormous money. They employed a lot of people and did large scale experiments just to find out that mosquitos travel 12 kilometres. This was already known. This is one thing which showed that they are not really after the control programme. They are collecting information about ecology, behaviour and dispersal of mosquitos. Why were they emphasising on these aspects The question was to find out the feasibility. You do an experiment; if it is successful, you try to do it again until you get a confirmation. The fact that migration spoiled

the experiment does not mean that the feasibility study is over. They have to eliminate the migration and then see whether the theory works or not. They did not do that.

They were working in certain villages. If they were really interested, they should have gone to another set of villages, but they did not. They went to Faridabad, an industrial town and to Palwal. They did not release any mosquitos there, but simply collected data again. This went on for one year.

At that time, I happened to know about the bird migration studies at the BNHS. At that time Dr. Subramaniam Swamy, MP raised in Parliament the question of bird migration studies and its connection with the US Army. I wanted to verify Dr. Swamy's statement and went to WHO. I suspected the WHO collaboration with MAPS. I learnt that this study had got something to do with biological warfare and bird migration.

It has been published in one of the journals that in 1965, US tried this in Brazil about bird migration. They said it was for biological reasons. It was exposed by the American Press. It was terminated there and taken up here. I thought, they have got a link.

Then I came across another project called Ultra Low Volume Spray Project at Jodhpur. This is to make insecticides invisible. The machinery that you need to make it invisible and send it in droplet forms is the same that is used for biological warfare purposes. I wanted to know, why they had gone to Jodhpur. I found out that malaria problem in Jodhpur is not significant at all. It has got a low priority and this information can be obtained from the Institute of Communicable Diseases. Somebody told me that it was earlier in Bangkok and then at Jodhpur. I found out that this is again related to agrobiology research on BW agents temperature, weather pattern, topography—all these are linked. All this information cannot be obtained otherwise. There was another pesticide research project connected with agriculture. Now, this pesticide DDT is a chemical that has been certified as dangerous because it pollutes water and other thing. So now the new concept is that you select a virus, use it and put it in

the field on the standing crops. This virus does not attack the plant, supposedly, but it goes and kills the pest which attacks the plant. The pest develops a disease just as a man develops a disease and then the pest dies and the plant is saved. This is a new approach, just like the genetic control of mosquito, but here the production or manufacture is done by culture—*viz.*, the virus is kept in culture. In this case it is kept in the form of capsules. The virus is put inside the capsules so that it can live for a long time. This is exactly what is done in biological warfare because, when you throw them out, they are exposed to sunlight and rain and so they die. Research in biological warfare has shown that they are better put in capsules because the capsule protects the virus. The techniques of development of pesticides in the Agricultural Universities in Gujarat, Pantnagar and Andhra are very similar to those of making BW agents; the techniques for making them are similar and the techniques for their dispersal are similar. This is precisely what is going on in Jodhpur. But when I went and asked the man concerned with the project, he refused to talk to me."

The Committee intervened and asked who this officer was and Dr. Jayaraman stated that it was Dr. Patnaik. The witness continued:

"He asked me what I wanted and I told him specifically that I wanted to be informed about the ULVS project. He then said he would let me know. He asked me to call half an hour later and, when I called, he said he could not talk to me unless I came through the Press Information Bureau. I called on the Press Information Bureau and asked for Mr. Bhanumurthy and he told me he would let me know later. For two days he did not call me. On the third day he called me and said that he could not help me. Apparently, he had talked to the Director General of Health Services and permission was not granted by him. I am not sure whether he consulted the DGHS, but I think he asked the DGHS and he did not give a clearance—because the DGHS was not ready to speak to me when I wanted to tell him something about this project."

2.1.10. In reply to another question whether Dr. Jayaraman had any occasion to discuss the project with the Project Leaders, the witness stated:

---

ULVS - Ultra Low Volume Spray.

"Initially, I had a talk with the project leader. He was Dr. Yasino, acting leader and he was Japanese. He told me that I could write a general article. But I could not ask any question. I did write an article. Then later on I tried to meet Dr. Brooks who had taken over from the acting Japanese leader, Dr. Yasino. He told me that he had to get clearance from WHO. Well, I waited for about one week, but the clearance did not come. Then I waited for two months, still the clearance did not come. Then there was some occasion to see him about some article written by the German WHO expert, which came in the German News published by the German Embassy. The German expert had been previously one of the consultants to GCMU. He said that they (GCMU) were using some dangerous chemicals like Thiotepa. He also gave the information that their research had failed Then I took these two things to the American project leader and told him that you did not tell me anything. Then I told him that I wanted to know more about it. Then he said that he would give me a statement. So, we published his statement which was a denial, along with the original German story. Then I told him that I had carried your statement and I wanted you to justify it. He said that he would again write to WHO and that I would get the information. But they never gave me any information. Then I did meet Dr. Rajendra Pal who was No. 2 man in the WHO in the department that dealt with vector biological control. I asked him to tell me about this. At that time, he told me that they had instructions that they should not talk to the Press. Then he told me that this matter about mosquito control was considered sensitive to the Indian Press apparently because of the bad publicity received through the article in the National Herald. Then I told him that I was going to write an article.

2.1.11. Evidence tendered by Shri Raghavan and Dr. Jayaraman on individual aspects of the different projects has been considered by the Committee in the relevant sections of this Report.

## CHAPTER—III

## GENETIC CONTROL OF MOSQUITOES UNIT (GCMU) PROJECT

### 1. Background Information

3.1.1. In India, as in many other tropical countries of the world, mosquitoes are agents of transmission of some deadly and widespread human diseases. Predominant among them are (i) malaria, which is transmitted by several species of Anopheles mosquitoes, (ii) filariasis, transmitted by the Culicine mosquitoes, chiefly Culex fatigans and Mansonia uniformis, (iii) dengue and chikungunya viruses, transmitted by the Aedes aegypti species of mosquitoes. Yellow fever, the foremost among the mosquito-transmitted virus diseases is restricted in its prevalence to certain areas of African and American continents and does not occur in India. Another mosquitoes-borne virus disease, Japanese encephalitis, occurs in India.

### Genetic Control of Mosquitoes

3.1.2. An extract from a note on the World Health Organisation—Indian Council of Medical Research sponsored project on the Genetic control of mosquitoes placed on the Table of Lok Sabha, in reply to Starred Question No. 148 answered on 21st November 1974, which explains the circumstances leading to the establishment of a research unit on the genetic control of mosquitoes, is reproduced below:

> "Malaria had been brought under control. But there are now disturbing evidences of its resurgence. Filariasis is a disease which is yet to be controlled and prevented. Dengue, which is not fatal, is endemic in large parts of the country and occurs in sporadic epidemics in some of the large cities of India. However, in recent years, a sinister form known as 'dengue haemorrhagic fever' has been prevalent in several south-east asian countries. There have been widespread epidemics of chikungunya virus disease in Madras, Calcutta, Nagpur, Sagar and quite recently in Barsi in Maharashtra. Both dengue and chikungunya are transmitted by Aedes aegypti. Japanese encephalities

(transmitted by Gulex tritaeniorhyncus) is now known to be widely prevalent in India in the eastern and southern parts of the country in endemic form and recently there was an epidemic including fatalities in a small area in West Bengal.

Conventional anti-mosquito measures have proved effective against many of the mosquito-borne diseases, particularly in urban areas. The widespread use of insecticides, in rural areas also had been effective, but there is growing evidence that lately mosquitoes are becoming increasingly resistant to some of the commonly used, otherwise harmless, insecticides.

The control of insect vectors by conventional methods, particularly by use of chemicals, is costly, cumbersome and repetitive. It has two serious disadvantages. Firstly, sooner or later, insects become resistent to the chemicals and make them ineffective and secondly, some of the really useful insecticides are those which are likely to accumulate in nature and contaminate the environment. Some chemicals are even toxic to non-target insects and also to several lower and higher animals. It is, therefore, of distinct national interest to find additional measures insect control which will do away with extensive use of chemicals. Emphasis is being given all over the world to several new approaches towards the use of non-chemical control measures which include the revival of better sanitary practices through drainage and water management, biological control including the use of larvicidal fish parasites and predators, applications of genetic concepts etc.

In view of the importance of the subject Government of India appointed a task force of eminent scientists from Public Health, Agriculture and allied fields in 1972 to review current modality of control of insect pests. The Task Force in its report to the Ministry of Health, *inter alia* with the Genetic Control of mosquitoes.

Control, even complete suppression, of insect populations of certain species by using genetic techniques has been shown to be sound in theory as well as in practice and its utility

has been demonstrated by the eradication of screw-worm-fly in the United States and against certain species of fruit-fly in the Mediterranean region. Preliminary trials carried out against Culex fatigans, the mosquite vector of filariasis, in a village near Rangoon (Burma) have also shown the feasibility of control under certain favourable conditions. It was against this background that the Research Unit on Genetic Control of Mosquitoes, New Delhi, was established during 1969-70.

This Unit came into existence on the basis of an agreement between the World Health Organisation and the Government of India. Rupee funds were provided to the Unit by the World Health Organisation. The World Health Organisation also made funds available from its own regular budget for the salaries of Project leaders, professional staff in the Unit, Consultants and certain supplies and equipment. A subsidiary agreement was entered into between the World Health Organisation and the Indian Council of Medical Research in which the necessary working arrangements for the execution of the project and for the recruitment of the local staff were made.

The objective of the Unit is to test the feasibility of applying genetic techniques for the control of mosquito populations, including extensive laboratory and field experiments. Three species of mosquitoes which are of relevance to India's public health needs were selected, namely; Culex fatigans, Aedes aegypti and Anopheles stephensi.

The Unit was planned initially for a period of six years with the proviso that the agreement may be extended, after review, for a further period of time mutually agreed on."

"Genetic control means the reduction or elimination of mosquitoes that can transmit disease and their replacement by another strain that cannot by use of genetic techniques. The major methods are:

A. *Sterile male technique* i.e., release into the natural environment of large numbers (carefully calculated) of laboratory bread male mosquitoes sterilised either by radiation or chemicals (Chemosterilization).

B. *Cytoplasmic incompatibility i.e.*, release of a strain of mosquito which is incompatible with the local strain.

C. *Genetic strain i.e.*, release of a strain of mosquito, which is produced in the laboratory, with abnormal chromosomes (translecations).

In all the methods the released male compete with the normal local males to mate with the local females and thereby sterilise them. As a result, the latter lay only eggs which do not hatch. Gradually the mosquito population dwindles because of the sterility of the females."

2. *Administration of the Project.*

3.2.1. An agreement dated 16th June 1969 entered into between the World Health Organisation and the Government of India for a collaborative research project on the genetic control of mosquitoes, furnished to the Committee by the Department of Health, is reproduced in Appendix I. According to this agreement, the research projects will be conducted under the technical and administrative responsibility of the World Health Organisation in collaboration with the Government of India through a Research Unit to be established by the World Health Organisation in India on the genetic control of mosquitoes. The agreement provides for the appointment of a Project Leader by the World Health Organisation who would undertake the technical and operational direction of the project in accordance with the research protocols referred to in the agreement and in consultation with a national counterpart to be nominated by the Government of India. The administration of the project, according to the agreement was, however, to vest in the WHO Project Leader who shall control finance, discipline and other administrative matters related to the project.

3.2.2. The Committee asked whether any Indian Project Leader had been appointed for the GCMU Project. The Director General, Indian Council of Medical Research informed the Committee during evidence that Dr. T. Ramachandra Rao an outstanding entemologist was the Officer Incharge of the Programme in the ICMR.

3.2.3. Subsequently, the Department of Health informed the Committee in a written note that Dr. T. Ramachandra Rao had not been appointed as the Indian Counterpart Project Administrator but as an Officer on special Duty in the ICMR on 25th August 1970 and that in that capacity he was looking after all the technical

work relating to the GCMU Project under PL 480 schemes. A copy of the order setting out his terms of appointment as Officer on Special Duty, furnished to the Committee by the Department of Health, is reproduced in Appendix II. The Department also stated that the expenditure on Dr. Rao's salary and allowances was met from the budget of the WHO Genetic Control Project sanctioned for the staff at the Headquarters office. The Department of Health, also informed the Committee in the note that the Director General of the Indian Council of Medical Research had been appointed as the National Counterpart of the WHO Project Leader for the GCMU Project in India.

3.2.4. The Committee were also informed by the Department of Health in a written note that no other officer had been appointed by the ICMR as Officer on Special Duty vice Dr. Rao.

3.2.5. When the Committee enquired as to what office Dr. Rao was holding at present, Dr. Ramachandra Rao replied that he was leading a retired life. The Department of Health also informed the Committee in a demo official letter that Dr. Ramachandra Rao, who had appeared before the Committee to tender evidence, had come to Delhi in connection with a four-day meeting of the Consultative Committee appointed by the Government of India to consider the revised strategies in the malaria programme and that during this period he would be entitled to travel and daily allowance which would be paid by the World Health Organisation.

3.2.6. The Committee asked whether Dr. Ramachandra Rao had also been employed as a WHO Consultant and the witness replied in the affirmative. The Department of Health also informed the Committee that Dr. Ramachandra Rao had been appointed as a paid consultant of WHO from 24th September 1973 to 31st December 1973 and again from 23rd January 1974 to 2nd May 1974.

3.2.7. The Committee desired to know the details of the salary and allowances and other perquisites that Dr. Ramachandra Rao was entitled to as a WHO consultant, and whether these were subjected to Indian taxes. The Department of Health, in a written note furnished to the Committee, stated as follows:

> "Dr. T. Ramachandra Rao was paid a salary of $1200 per month and per diem of $20 for the first 60 days and at a reduced rate (approximately Rs. 107/- per day subsequently). During his tenure as short-term consultant with the WHO, he was not in receipt of any perquisite

or allowances other than the salary and per diem mentioned above. No Income-tax was paid by Dr. Rao though he has shown the income from that source in the Annual Income-tax Return."

3.2.8. The employment record of Dr. Ramachandra Rao, furnished by the Department of Health at the instance of the Committee, was as follows:

1932-36.—University of Mysore-Research Assistantship and Demonstratorship.

1936-42.—Entemologist in charge of Pattukkotai Field Station of Malaria Investigations of South India (Rockefeller Foundation).

1942-51.—Entemologist, Malaria Organisation, Bombay State.

1952-53.—Assistant Director of Public Health (Malaria), Bombay State.

1953-55.—Medical Entemologist, Virus Research Centre, Poona, under the Rockefeller Foundation.

1955-58.—Assistant Director of Public Health (Malaria), Bombay State.

1958-61.—Deputy Director of Public Health (Malaria and Filaria), Bombay State and later Maharashtra State.

May 1961.—Director, Virus Research Centre, Poona.
to
May 1970

3.2.9. In reply to a question by the Committee as to who was Dr. Ramachandra Rao's predecessor in the Virus Research Centre, Poona, Dr. Ramachandra Rao stated that it was one Dr. Anderson from the Rockefeller Foundation. In reply to another question as to when he had retired from the Research Centre, the witness stated that he had initially been employed on a contract for five years under the sponsorship of ICMR and had subsequently been given the extensions of two years each and that in all he had served for nine years.

3.2.10. Since it had been stated that the four-day meeting of the Consultative Committee appointed by the Government of India

to consider revised strategies had been financed by the World Health Organisation, the Committee desired to know the reasons for WHO incurring expenditure on this meeting, especially since it was a consultative committee of the Government of India. The Department of Health stated in a written note furnished to the Committee:

> "The World Health Organisation has funds, earmarked for meeting the expenditure on conferences, expert committees meating etc. As in the Consultative Committee's meeting not only the experts from the country, but also the experts from the World Health Organisation, SEARO and World Health Organisation (Headquarters), Geneva, participated, the World Health Organisation agreed to provide funds to meet the expenditure on the meeting of the Consultative Committee from its earmarker funds. It is a normal practice for the World Health Organisation to provide funds for such NMEP meetings/conference etc. Besides as the Government of India are making substantial contributions to World Health Organisation, they are also entitled to receive assistance in the shape of financial grants for meeting expenditure on such scientific conferences/ seminars and other expert committees' meetings."

3.2.11. The Committee enquired whether any other former health officials from India had been appointed as consultants by the World Health Organisation. Dr. Rao stated during evidence:

> "From among people who have retired, there is only one person—Dr. Raghavan. Among those who are still working, there is one Dr. Krishnamurthy from the NICD. From the ICMR there are Shri Rajagopalan. Shri K.R.P. Singh, Miss Reuben and Shri Panicker.

To another question whether there was anybody from the State Government, the Health Secretary replied in the negative.

3.2.12. Subsequently, the Department of Health informed the Commmittee in written note that only Dr. T. Ramachandra Rao, Retired Director, Virus Research Centre, Poona and Dr. N.G.S. Raghavan, Retired Director of the National Institute of Communicable Disease, Delhi, had been appointed by the World Health Organsation as consultants to the GCMU.

**3.2.13. A list of Project Leaders of the GCMU Project appointed by the World Health Organisation furnished by the Department of Health, at the instance of the Committee, is reproduced below:**

| Name | Period | Nationality |
|---|---|---|
| Dr. C. N. Smith | January 1970 to October 1970 | U.S. |
| Dr. R. S. Patterson | October 1970 to February 1971 | U.S. |
| Dr. G. G. La Brecque | February 1971 to August 1972 | U.S. |
| Dr. R. Pal | August 1972 to November 1972 | Indian |
| Dr. M. Yasuno | November 1972 to April 1973 | Japan |
| Dr. K. W. Macdonald | April 1973 to July 1973 | U.K. |
| Dr. G. D. Brooks | July 1973 onwards | U.S. |

3.2.14. The Committee desired to know whether the Japanese ecologist Dr. Yasuno and the other Project Leaders had left the Project before the completion of their terms. Dr. Ramachandra Rao stated during evidence that he was not aware why they had left and that it was entirely a contract between the World Health Organisation and the person concerned.

3.2.15. In a written note furnished to the Committee the Department of Health stated in this regard as follows:

"The information required in furnished below:

(1) **Dr. C. N. Smith.**—At the time of his recruitment to the Project he was over 60 years of age and hence was appointed as a Consultant Project Leader for a period of one year only. He served his full term in the Project.

(2) **Dr. R. S. Patterson.**—Pending the appointment of Dr. G. G. La Brecque as Project Leader in February 1971, Dr. Patterson who was an entomologist in the unit acted as a Project Leader from October 1970 to February 1971. He was not appointed as Project Leader on a regular basis.

(3) **Dr. G. G. La Brecque.**—He was appointed on a regular-basis in February 1971; he had to resign a few months

before the termination of his contract which was for a period of two years because of his family circumstances; his family and children had to return to the United States.

(4) **Dr. R. Pal**
(5) **Dr. M. Yasuno**
(6) **K. W. Macdonald.**

All these officers acted as Project Leaders pending the arrival of Dr. G. D. Brooks who was appointed on a regular basis as the Project Leader from July, 1973. The interim arrangements were made so that the work of the Unit was not affected. The appointment of these officers was purely as an interim arrangement.

(7) **Dr. G. D. Brooks.**—He was appointed on a regular basis from July, 1973 and is still continuing as the project leader.

In view of the complexity of the investigations being carried out in the Unit embracing different disciplines, the services of specialists in particular fields for appointment as project leaders had to be obtained and this process takes about six months or more from the start of negotiations to the final appointment, including obtaining clearance from the Government concerned. Since the project could not be left without a project leader pending appointment of a regular leader temporary arrangements had to be made in the interest of the smooth functioning of the project."

3.2.16. In reply to a question whether it was correct that Dr. Smith, Dr. Patterson and Dr. La Brecque had left the Project because they had been asked by Dr. Pal to do things which were not scientifically correct, Dr. Ramachandra Rao stated during evidence that he was not aware of that.

3.2.17. In reply to another question whether Dr. Rajendra Pal had been an employee of the Government of India before joining the World Health Organisation, the Director General, Health Ser-

vices stated during evidence that Dr. Pal was in Government service as Deputy Director, National Malaria Eradication Programme, in charge of the Entomology Division.

3.2.18. The Committee desired to know whether there would not have been some consultations with the Government of India prior to Dr. Pal joining the World Health Organisation. The Director General, Health Services stated during evidence:

> "There is a method of recruitment and I don't think departure is made in that. There is the well-established method of recruitment. WHO's regional office looks around in regard to scientists who work in various fields, depending upon the requirements, what they want to do, etc. In the regional office they have a panel of names of scientists in various fields whom they could harness for consultancy, short-term and long-term or expertise for furthering their objectives and so on. Some times even Government of India supplies these panels. In the field of Epidemiology he had experience, WHO was interested in control of mosquito invector."

3.2.19. The Committee asked who had recommended Dr. Pal for the WHO assignment and the mode of his selection and how long he had been associated with the WHO. The Department of Health informed the Committee in a written note that the Director General, World Health Organisation had asked for the services of Dr. Rajendra Pal and the Government of India had given their consent and that how he had been selected by the WHO was not known to the Government of India. Dr. Pal was stated to be working with the WHO since 9th April, 1962.

3.2.20. In reply to another question whether there had been, at any time, any enquiry against Dr. Pal, the Department of Health stated in the written reply that no record was available to indicate whether there had been any enquiry at any time.

3.2.21. The Department of Health also informed the Committee that Dr. Pal had been sent on deputation to the World Health Organisation with the approval of the Government of India which had been communicated in Ministry of Health letter No. F. 4-19/62-Instt., dated the 27th March, 1962.

3.2.22. The details of the various posts held by Dr. Rajendra Pal prior to his deputation to the World Health Organisation, furnish-

ed by the Department of Health, at the instance of the Committee, were as follows:

| | |
|---|---|
| 1941 | Part-time Demonstrator in Zoology, Punjab University. |
| 1942—1944 | Malaria Assistant, Defence Department. |
| 1944—1946 | Malaria Assistant, ICMR and Assistant Entomologist, Malaria Institute of India. |
| 1946—1948 | On Rockfeller Foundation Fellowship for higher studies. |
| 1948-49 | On National Institute of Health, US Public Health Service Fellowship for higher studies. |
| 1949—1958 | Assistant Director, Malaria Institute of India. |
| October 18, 1958 to April 9, 1962 | Deputy Director, National Malaria Eradication Programme. |

3.2.23. When asked whether Dr. Pal had started his career as a Class III Government Servant, the Director General Health Services replied during evidence:

> "As Assistant Entomologist in NICD or something like that. This is Gazetted Class II post. Recruitment is through UPSC. He was allowed to apply. He must have been selected by the UPSC. He must have been selected in this manner. Normally there is no automatic promotion from Class III to Class I posts."

The Director, National Institute of Communicable Diseases, added:

> "He started as civilian in the Defence Services, as inspector or something like that. He was then only B.Sc. or M.Sc. Afterwards he did his Ph. D. Then he spent several years in U.K. and USA. He had his Ph. D. from Punjab. He also had Ph. D. from London University."

3.2.24 The Committee were also informed by the Editor-in-Chief, Press Trust of India, during evidence tendered by him before the Committee, that Dr. Rajendra Pal had retained his lien in the National Institute of Communicable Diseases, New Delhi, even after working for ten years at the World Health Organisation and that after the question was raised in Parliament in July, 1974,

he tendered his resignation which had been accepted from October 1974. The Public Accounts Committee took up this project for examination on 19th August, 1974.

3.2.25. The Committee enquired from the Ministry whether Dr. Pal had resigned from Government Service after accepting the WHO assignment and if not, whether his lien had been maintained in Government of India. The Committee also desired to know whether the retention of lien for such a long period since 1962 was permissible under the rules. No reply had been received in this regard from the Department of Health till the finalisation of this Report.

3.2.26. A list of 37 WHO short-term consultants and temporary advisers who had visited the GCMU Project since its inception, showing their nationality, qualifications and experience, furnished by the Department of Health, at the instance of the Committee, is contained in Appendix III. It will be seen, therefore, that 21 of these were US nationals.

3.2.27. The Committee desired to know whether it was not a fact that most of the Indian scientists working in the GCMU Project under the present Project Leader, Dr. Brooks, were more experienced than him. Dr. Ramachandra Rao stated during evidence that there was no doubt that the Indian scientists working in the Unit were some of the highest qualified and experienced people. He also accepted in reply to another question, that most of the techniques and instruments in the GCMU had been developed by Indian scientists.

3.2.28. In view of this reply, the Committee asked why the white experts were required. Dr. Ramachandra Rao replied:

> "There are two aspects. One is the administrative aspect about which I do not wish to comment, because quite a lot depends upon the mutual relationship between governments and the WHO. Secondly, till 1970, there were 3 Indian scientists working under me, who had experience in one kind of mosquito research or the other. But they did not have experience in genetic method. Over the last 4 years, they have developed this experience; there are occasions in many organisations, where we bring in foreign experts and the Indians take over gradually."

3.2.29. Commenting on the appointment of foreign consultants for the Project, Shri Raghavan, Editor-in-Chief, Press Trust of India stated during evidence:

> "We have entomologists as good as anywhere in the world. Some are doctors and have published papers. But they bring in an American, who gets a Ph. D. after coming here and appoint him as head of the Unit. Why should you get an American when you have a qualified man here?
>
> In this case, under the agreement that they had, WHO was to consult the US Government because it was giving PL 480 funds before they appointed a consultant though the consultant was paid from the regular WHO budget. Our consent was never required for appointing any consultant in our country."

3.2.30. Since Dr. Rao had stated that the Indian scientists in the GCMU had had no genetic experience, and finding from the information earlier furnished by the Department of Health that Dr. Brooks, the current Project Leader had obtained his Doctorate in Philosophy only in 1973, the year he had been appointed in the Project, the Committee confirmation on this point from the Department of Health. The Committee also enquired whether it was a fact that Dr. Brooks had worked as a malaria expert in Iraq in the late 50s and the circumstances under which he had to quit Iraq. The Department of Health replied, in a written note furnished to the Committee:

> "The WHO representative in India was addressed in the matter. The Regional Office of the World Health Organisation has replied, stating that since the full records of the persons employed by the WHO Headquarters are kept in Geneva, the Headquarters have been asked to furnish the necessary information. No further information has been received from the Headquarters. They have been reminded in the matter.
>
> However, the details of the bio-data in respect of Dr. Brooks,

as made available to this Ministry by the WHO in May 1973 are furnished below:

| | |
|---|---|
| NAME | Brooks, Gerald Dean |
| DATE OF BIRTH | 7th May, 1926 |
| NATIONALITY | U.S. |
| LANGUAGES | English |
| QUALIFICATIONS | 1948—52 Fresno State College, BA Biology. |
| | 1953—55 University of Utah M.Sc. Medical Entomology. |
| | 1955—66 Tulane University—MPH, Public Health Epidemiology. |
| | 1971—N. Carolina University for Dr. PH. (laboratory, practice). |
| EXPERIENCE | 1955—57 Entomologist, mosquito and Fly Abatement, Conord, Calif. |
| | 1957—62 Malaria Specialist, Malaria Eradication. US. Agency for International Development, Washington, |
| | 1962—71 Assistant Chief, Biology Section, Centre for Disease Control US Public Health Service, Atalanta, GA. |

3.2.31. The PTI news report had pointed out that Indian scientists working in the GCMU were saying privately that they did not know what was happening in the unit because all decisions were taken in closed meetings. The Committee asked how many meetings were held in a year in GCMU. Dr. Ramachandra Rao replied in evidence:

> "Staff meetings are held practically every week; but, under the agreement between the WHO and the Government of India, the Technical Review and Planning Group has to meet twice a year. The participants are the DG of ICMR, the head of the National Institute of Communicable Diseases, representatives of the WHO and a representative of the U.S. Public Health Service."

In reply to another question whether he was sure that it was a representative from the US Public Health Service, the witness replied:

"All the members of the Technical Review and Planning Group are there, besides a representative from the US Public Health Service. It is something like a meeting of an executive board which meets in camera."

When the Committee expressed surprise that officials of the US Public Health Service should have been allowed to attend the meetings, the Health Secretary stated that he had found from the earlier papers on the subject that this was a historical development.

3.2.32. Explaining the background for this arrangement, the Department of Health stated in a written note furnished to the Committee:

"In accordance with the Agreement entered into between the Government of India and the WHO on the 16th June 1969, the technical implementation of the programme of the project, review of progress and periodic assessment of the programme will be performed in accordance with the protocols established by a meeting of Investigators comprising of representatives from the Indian Council of Medical Research (ICMR), National Institute of Communicable Diseases (NICD), United States Public Health Services (USPHS) and WHO. All meetings are to be convened by WHO.

No other representative from USA Organisations attended the meetings of the Technical Planning and Review Group."

3.2.33. The Committee asked whether one part of the six-monthly meetings were closed to the Indian scientists working in the GCMU and whether it was a fact that the minutes of these meetings were not circulated to the scientists. Dr. Rao agreed that one part of the meeting was a closed meeting of the Board of Directors consisting of the Director General, ICMR, Director, National Institute of Communicable Diseases and the Head of the WHO Vector Biology Section. He added that a Mr. J. W. Wright was the representative of the WHO on the Board of Directors and sometimes Dr. Rajendra Pal, one of the senior scientists used to attend, in Mr. Wright's absence. He further stated that when the Director General, ICMR, was not present he used to attend the meetings.

3.2.34. Clarifying, further to his admission, Dr. Rao added that this was only in the nature of an Executive Board meeting and that

simultaneously, an open meeting of about twenty to twenty-five scientists consisting of all the members was also held.

3.2.35. As regards the reasons for not circulating the minutes of these meetings to the Indian scientists, Dr. Rao stated in evidence that this was almost like a resolution of the Executive Committee, which was circulated to the Director General, ICMR and to the Members. Both the Director General, ICMR and the Director General, Health Services confirmed that they got the minutes of these meetings.

3.2.36. At the instance of the Committee, the 'Department of Health furnished copies of the proceedings of the 7th meeting held from 26th April to 22nd May 1973, the 8th meeting held between 13th and 21st November 1973 and the 9th meeting held between 23rd and 29th April 1974. The Committee found from the proceedings that these meetings were conducted in two parts and that the following attended Part I of the meetings:

*7th Meeting:*

1. Dr. T. R. Rao, Officer on Special Duty, ICMR, New Delhi.
2. Dr. D. A. Elieson, USPHS, CDC, Savannah, Georgia, USA.
3. Dr. M.I.D. Sharma, Director NICD, New Delhi.
4. Dr. M. Yasuno, Assistant Project Leader, Project IR-0529.
5. Dr. W.W. Macdonald, Consultant Project Leader, Project IR-0529 (only on 2 May)
6. Dr. R. Pal, Vector Biology and Control, WHO, Geneva.

This meeting was convened to review the progress made by the Unit and to consider major administrative and technical policy questions.

*8th Meeing:*

1. Dr. P. N. Wahi, Director General, ICMR, New Delhi.
2. Dr. R. Scholtens, USPHS, CDC, Atlanta, USA.
3. Dr. M.I.D. Sharma, Director, NICD, New Delhi.
4. Dr. G. D. Brooks, Project Leader, IR-0529.
5. Dr. R. Pal, Vector Biology and Control, WHO, Geneva
6. Mr. J. W. Wright, Chief, Vector Biology and Control Geneva (13th November only).

This meeting was convened to review the progress made by the unit, to consider a number of technical and administrative policy questions and to approve in broad terms the programme proposed for 1974-75.

*9th Meeing*:

1. Dr. C. Gopalan, Director General, ICMR, New Delhi.
2. Dr. R. Scholtens, USPHS, CDC, Atlanta, USA.
3. Dr. M. I. D. Sharma, Director, NICD, New Delhi.
4. Dr. G. D. Brooks, Project Leader, IR-0529.
5. Dr. R. Pal, Vector Biology Control, WHO, Geneva.

This meeting was also convened to review the progress made by the unit, to consider technical and administrative policy questions and to consider in broad outline the programme of work for the rest of 1974 and 1975. The minutes of these meetings had been separately submitted to the Directors General, ICMR and New Delhi.

3.2.37. In the second part of the meetings, technical aspects of the programme were discussed.

3.2.38. Subsequently, at the instance of the Committee, the Department of Health furnished copies of all the technical review meetings held since the inception of GCMU. The Committee found therefrom that some WHO consultants had also participated in the second part of the meetings held in 1970 and the staff of the Project participated in this part from 1971.

3.2.39. In reply to a question how the scientists who carried out the experiments were kept informed, Dr. Rao stated during evidence:

> "There are half-yearly meetings when five to six days are spent in reviewing each and every aspect. They themselves present the data they have collected and it is discussed. Not only the staff Indian scientists, but the WHO scientists and a number of invited scientists are also present at these open meetings."

3.2.40. The Committee requested Dr. Rao to offer his comments on the following statement which was read out during evidence:

> "Till 1972, Indian experts were kept out of the meetings which were attended by U.S. experts, Dr. Pal, Director General

of ICMR and Director of the National Institute of Communicable Diseases. The latter two are Indians but do not work on the project and as such cannot contribute to the discussions. Only in the beginning of 1973 the meeting was split in two parts. Part A continues to be closed and Part B is open to Indian scientists. But important decisions and strategies are decided in Part A whose minutes are secret and not circulated to the Indian scientists."

Dr. Rao stated:

"First and foremost, there is no secrecy about it. It is confidential only to that extent that any resolution of an Executive Committee is confidential.

Regarding the other statement, the year 1973 is inaccurate. In the beginning, when the Unit was established in 1970 (I will have to check up on this) all of them were participating in the larger Technical Group Cell. Each of them was participating, so long as he had something to suggest or discuss, to challenge or to get challenged. As early as 1972 or even earlier (I am again subject to correction) all the senior scientists have been participating. I do not know how this statement has been made."

3.2.41. The Committee desired to know the reasons for treating the closed meetings of the Board of Directors as secret. The Department of Health, in a written reply furnished to the Committee, stated as follows:

"The Agreement between the Government of India and the World Health Organisation for the Collaborative Research Project on the Genetic Control of Mosquitoes does not provide for a Board of Directors for the Project. In accordance with that Agreement the broad lines of policy upon which the work of the project will be based will be agreed upon between the representatives of the Government of India and WHO, and the technical implementation of the programme of the project, review of the progress and periodic assessment of the programme will be performed in accordance with the protocols established by a meeting of investigators comprising of the representatives from the Indian Council of Medical Research, National Institute of Communicable Diseases, United States Public Health Service and WHO. The proceedings of

these meetings are not secret. They are, however, treated confidential in the manner as proceedings of any other meetings of the committees of the scientific research institions."

3.2.42. During evidence, Dr. Rao had mentioned that Dr. Krishnamurthy from the National Institute of Communicable Diseases, Dr. Rajagopalan and Dr. K. R. P. Singh from the Indian Council of Medical Research were among those who were working in the GCMU Project. Replying to questions on their backgrounds before joining the Unit, Dr. Rao stated that Dr. Rajagopalan had been a young scientist working in the ICMR while Dr. Rao was also serving in 1970 and that after some years he had been promoted as Senior Research Officer (Selection Grade) and had been appointed as Senior Scientists in the Genetic Scheme in the ICMR, along with two other officers.

3.2.43. As regards Dr. Krishnamurthy, Dr. Rao informed the Committee that he was an Assistant Director in the National Malaria Eradication Programme who was at present a Geneticist in the Genetic Unit.

3.2.44. Dr. K. P. R. Singh, according to Dr. Rao, was a Senior scientist at the Unit. In reply to another question by the Committee as to whether Dr. Singh had also worked in Tanzania, Dr. Rao replied that if he remembered rightly, Dr. Singh had gone to Tanzania for two months. When asked whether he was aware that Dr. Singh had been recruited by Dr. Pal, the witness stated that he would not say that Dr. Singh was recruited by Dr. Pal but would say that he was recruited by WHO.

3.2.45. The Committee also enquired about two other scientists, Dr. U. P. Sharma and Dr. N. P. Gupta. Dr. Rao informed the Committee that Dr. Sharma was a young scientist who had been working as a Pool Officer in the Virus Research Institute and that he had been appointed as a Senior Scientist. Dr. Gupta, according to the witness, was a Professor of Microbiology in the Vallabhbhai Patel Chest Institute. He had been appointed to the post of Director, Virus Research Centre and sometime in 1971, he became the Director of the Institute.

3.2.46. The Committee desired to know whether the GCMU Project had been reviewed by any expert committee. The Department of Health stated in a written note that the reports of work done on the ICMR|WHO|GCMU were reviewed by the Council's Expert

Committee on Human Genetics, Immunology and Allergy in 1971, 1972 and 1973. Extracts of minutes of the meetings furnished to the Committee by the Department of Health are reproduced below:

"EXTRACT FROM THE MINUTES OF THE MEETING OF THE EXPERT COMMITTEE ON HUMAN GENETICS, IMMUNOLOGY AND ALLERGY HELD IN NEW DELHI ON 1ST OCTOBER, 1971.

X X X X

TO CONSIDER THE REPORT OF WORK DONE ON THE WHO ICMR COLLABORATION PROJECT, FEASIBILITY STUDIES ON GENETIC CONTROL OF MOSQUITOES IN INDIA AT NEW DELHI.

REMARKS

The Committee noted the report with appreciation. The members were interested to know if a human ecologist is involved.

X X X X

EXTRACT FROM THE MINUTES OF THE MEETING OF THE EXPERT COMMITTEE ON HUMAN GENETICS, IMUMUNOLOGY AND ALLERGY HELD IN NEW DELHI ON 11TH OCTOBER, 1972.

X X X X

TO CONSIDER THE REPORT OF WORK DONE ON THE WHO/ ICMR COLLABORATIVE PROJECT: FEASIBILITY STUDY ON GENETIC CONTROL OF MOSQUITOES IN INDIA AT NEW DELHI.

REMARKS

The Committee noted the progress of work done.

X X X X

EXTRACT FROM THE MINUTES OF THE MEETING OF THE EXPERT GROUP ON HUMAN GENETICS IMMUNOLOGY AND ALLERGY HELD IN NEW DELHI ON 3RD OCTOBER, 1973.

X X X X

TO CONSIDER THE REPORT OF WORK DONE ON THE WHO/ ICMR COLLABORATIVE PROJECT, FEASIBILITY STUDIES ON GENETIC CONTROL OF MOSQUITOES IN INDIA AT NEW DELHI.

X X X X

REMARKS

The Group noted the progress of work done.

** ** ** **

3.2.47. Pursuant to the Call Attention Motions in the Lok Sabha and Rajya Sabha on the 30th July, 1974, the Governing Body of the Indian Council of Medical Research met on 16th September, 1974 and decided that the general nature and pattern of agreement with the World Health Organisation relating to the technical and administrative control of the GCMU Project should be reviewed by a committee consisting of the Secretary, Ministry of Health & Family Planning, the Financial Adviser, Ministry of Health, the Director General, Health Services, the Director General and Dr. S. L. Agarwal. An extract from the proceedings of the Special 40th meeting of the Governing Body held in this regard, furnished by the Department of Health, is reproduced below:

> "To consider matters arising out of the debate in both Houses of Parliament relating to the reported serious concern of the scientific community over the research projects being carried out by or under the auspices of the W.H.O.

The members of the Governing Body discussed in detail the various aspects of the genetic control project. The discussions centred round the following aspects:—

(1) The Agreement entered into by the Government of India with the W.H.O.

(2) Technical and administrative control of the project by the I.C.M.R.

(3) Scope, relevance and importance of this project from the scientific point of view; and

(4) The budgetary control by the Governing Body.

After detailed discussions it was decided that:

(i) the general nature and pattern of agreement with the WHO regarding technical and administrative control of the project, should be reviewed by a committee consisting of the Secretary, Ministry of Health and Family Planning,

Financial Adviser, Director-General of Health Services and Director-General, ICMR and Dr. S. L. Agarwal.

(ii) a scientific review of the project keeping in mind the safety factors regarding contamination, the side effects of genetic strains etc. should be made by the Expert Groups on Virus and Arthropod Borne Diseases and on Human Genetics, under the chairmanship of the Director-General, I.C.M.R., B.A.R.C. and I.N.M.A.S. should be asked to nominate a representative each to attend this meeting.

(iii) the meetings of the above groups may be held in the course of the next 3 or 4 weeks and they be asked to submit a report to the Governing Body towards the end of October."

3.2.48. The Sub-Committee set up by the Governing Body of the ICMR to review the technical and administrative control of the GCMU met on the 15th October, 1974. Relevant extracts from the minutes of this meeting furnished to the Committee by the Department of Health are reproduced below:

"Secretary explained that at the 40th meeting of the Governing Body of the ICMR held on the 11th September, 1974, it was decided, among other things, that the general nature and pattern of Agreement with the WHO regarding the technical and administrative control of the Genetic Control Project should be reviewed by a Committee consisting of Secretary Financial Adviser, DGHS, DG, ICMR and Dr. S. L. Agarwal and that this meeting had been convened in pursuance of this decision. The Agreement entered into between the Government of India and the WHO had already been circulated to the Members.

Secretary stated, at the outset, that while reviewing the various provisions of the Agreement, it should be examined whether, in accordance with the existing provisions, the effective functioning of the national counterpart in respect of the various aspects of the projects could be ensured and normal checks could be exercised by him. As in accordance with the existing Agreement, the project would terminate some time in June, 1975, the question of amending the provisions of the Agreement could be taken up

with the WHO at the time when proposals for the extension of the project came up for consideration. However, it is desirable to start an exercise now so as to ensure that necessary safeguards are provided in the revised Agreement, if it is decided to extend the life of the project beyond June, 1975.

After discussion it was agreed that efforts should be made to provide the following in the Agreement:

(i) the DG. ICMR should be made over all incharge of the Unit and the Unit functions under his administrative control and guidance;

(ii) the project leader should be appointed with the specific approval of the Government of India; and

(iii) the provisions of the agreement should be made more specific to remove any ambiguities.

The Group felt that even the existing agreement provides sufficient authority to the DG, ICMR to exercise overall control on the project and that the DG, ICMR should suitably write to the project leader requesting him to forward to the ICMR fortnightly or monthly report about the work done in the Unit and also to ensure that all communications in the nature of reports in regard to the research activities in the Unit are cleared by the project leader with the DG, ICMR before general circulation or transmission to other agencies.

It was also agreed that a copy of the Agreement between the WHO and the Government of the USA might be obtained and studied carefully."

3.2.49. A joint meeting of the Expert Committee on Virus and Arthropod Borne Diseases and Geneticists from the Expert Committee on Human Genetic, Immunology and Allergy was convened on 16th October, 1974. The Report of the Group, stated to represent the unanimous views of all the members present is reproduced below:

"The Group consisting of

(1) ICMR Committee on Virus & Arthropod Borne Diseases,

(2) Geneticists from the ICMR Expert Committee on Human Genetic, Immunology & Allergy,

(3) Other leading experts in the field of Virology and Genetics, and

(4) Representatives of Bhabha Atomic Research Centre, Institute of Nuclear Medicine & Allied Sciences and the National Committee on Science & Technology,

met at a special meeting convened by the Director-General, Indian Council of Medical Research, in order to review the current research programmes of Genetic Control of Mosquitoes Unit, New Delhi (GCMU).

The following members were present:

1. Dr. C. Gopalan, Director General, Indian Council of Medical Research (Chairman), New Delhi-110016.
2. Dr. A. Balasubramanian, Director, Pasteur Institute, Coonoor-3.
3. Dr. Sharat Chandra, Cytogeneticist, Indian Institute of Science, Bangalore-20.
4. Dr. K. H. Dave, Assistant Director, Haffkine Institute, Parel, Bombay.
5. Dr. N. P. Gupta, Director, Virus Research Centre, 20-A, Wellesley Road, Poona-1.
6. Dr. S. Kumar, Head of the Division of Bacteriology & Virology, Indian Veterinary Research Institute, Mukteswar (U.P.)
7. Col. S. K. Majumdar, Director, Institute of Nuclear Medicine and Allied Sciences, New Delhi.
8. Dr. G. S. Mutalik, Joint Director, Directorate of Medical Education and Research, Government of Maharashtra, Bombay-1.
9. Dr. C. G. Pandit, 450, Sindi Cooperative Housing Society, Ganeshkind Road, Poona-7.
10. Dr. C. K. Jayaram Paniker, Professor of Microbiology, Medical College, Calicut-8 (Kerala).
11. Prof. M. K. K. Pillay, Department of Zoology, Delhi University, Delhi.

12. Dr. N. G. S. Raghavan, Emeritus Medical Scientist, Department of Microbiology, All India Institute of Medical Sciences, New Delhi.

13. Dr. G. Rahallkar, Bhabha Atomic Research Centre, Trombay, Bombay.

14. Dr. T. R. Rao, No. 5, Eight Road, Malleswaram, Bangalore.

15. Dr. G. Sadasivan, Addl. Professor Anatomy, Gandhi Medical College, Hyderabad-1.

16. Dr. L. D. Sanghvi, Head, Epidemiology Division & Dean, Cencer Research Institute, Tata Memorial Centre, Parel, Bombay-12.

17. Dr. J. K. Sarkar, Professor of Virology, School of Tropical Medicine, Calcutta.

18. Dr. M.I.D. Sharma, Director, National Institute of Communicable Diseases, Delhi.

19. Dr. K. R. P. Singh, Senior Scientist, WHO/ICMR Research Project on Genetic Control of Mosquitoes in India, 2 & 3 Ring Road, New Delhi.

20. Dr. C. K. Varashney, Department of Botany, University of Delhi, Delhi.

21. Dr. N. Veeraraghavan, A-1/3, Flat 3, GOCH Colony, 3rd Main Road, Basant Nagar, Madras-90.

Dr. T. Jocob John and Dr. A. K. Khosla could not attend the meeting.

The Director-General, Indian Council of Medical Research in opening the discussions gave a brief account of the genesis of the Unit. The Group had before them the general report of the work done by the Unit, compiled as special articles, published in the Indian Journal of Communicable Diseases. The Director-General in his opening remarks pointed out that there should be a free and frank discussion on all aspects of the work done in the Unit and that members should feel free to offer suggestions with regard to the work already done and proposed.

In the discussions that followed, almost all the members who were present in the meeting made interesting and valuable comments. At

the end of the discussion, it was decided to appoint the following committee:

1. Dr. C. G. Pandit—*Chairman.*
2. Dr. Sharat Chandra.
3. Dr. C. K. Jayaram Paniker.

to prepare a report embodying views expressed at the meeting. This draft report was again discussed. The group generally approved the draft but suggested that a few changes be incorporated in the final report. The revised report given below presents the unanimous views of all members present.

*Achievements of the Unit so far*:

The Group was of the view that the Unit had made some very important contributions in the field which have received general recognition. The following aspects deserve special mention:

The Unit is recognised as the largest single enquiry into the genetic control of insects in the world and since its inception in 1969 and has accomplished a great deal.

It has standardized methods for the mass rearing of Culex fatigans and Aedes aegypti mosquitoes and their sterilisation. Techniques for handling very large numbers of mosquitoes have been perfected. The Unit has developed the D3 strain which is cytoplasmically incompatible with C. fatigans mosquitoes in the Delhi areas as well as the integrated strain IS-3IB with 100 cytoplasmic incompatibility with respect to the Delhi population and 65 to 70 per cent sterility of matings within the strain.

The Unit has established a double translocation heterozygete in A. aegypti the progeny of which inherit either T1 or T3 translocation and is therefore 50 per cent sterile.

Based on computer simulation studies indicating that release of males with the distorted double translocation heterzygete system would be more effective for population suppression than release of the same number of chemosterilized males or double translocation males without distortion. The Unit has developed an A. aegypti strain with Indian genetic background giving 61 per cent sterility and 6:1 sex ratio in favour of males.

The Unit has made extensive studies on mosquito ecology with special reference to C. fatigans in the Delhi area. They made the important observation that these mosquitoes breed extensively in irrigation wells, a hitherto unrecognised behaviour, and that there is massive infiltration of adult mosquitoes into villages from considerable distance contributing as much as 85 per cent to the numbers present.

Laboratory investigations on these mosquitoes have been carried out on their mating ability, competitiveness, length of life, fertility of the pregeny etc.

Field studies have shown that measurable degree of sterility could be induced in the natural Culex mosquito population by radiation sterilized males, chemosterilized males, and by males of both the genetic strains D3 and IS-31B. It has been found that immigration of already inseminated females into the target area has been the most important factor which prevented the attainment of very high egg-raft sterility and that barrier zones up to 3 km., though made free of culex breeding were found ineffective in preventing immigration. In this context it was possible to recapture released mosquitoes at distance upto 11.2 km.

The field studies with A. aegypti, which are of a preliminary nature, have shown that a strain with a 'silver marker' and another with chromosomal translocation could become incorporated into the local population and to produce recognisable offsprings.

The 'Special issue of the Journal of Communicable Diseases on Genetic Control of Mosquitoes' has given an indication of the enormous quantity and excellent quality of work done and the valuable data collected during a brief period of about 4 years. The Unit deserves to be congratulated on its excellent performance.

While it is well-known that the experience gained on any one species of the mosquito may not be readily applicable with regard to other species of public health importance, the experience which has been gained in building up these techniques in certain conditions with reference to the two species of mosquitoes which have been experimented upon, namely the A. aegypti and Culex fatigans deserves special mention and would certainly prove valuable. A question was raised during the discussion to ascertain the reasons for taking up research on these two species. The group was in-

formed that it was done because of the basic knowledge that was readily available with regard to the A. aegypti and the facility with which the Culex fatigans could be reared in the laboratory for genetic manipulation and eventual release.

The Group noted that work on anopheles stephenci has also been initiated in accordance with the recommendations at the last Project Committee Meeting.

*Proposed programme of field studies*:

The Group noted that Laboratory studies with Aedes Aegypti have now reached a stage when releases of mosquitoes for field studies will have to be taken up. At this stage it was necessary to consider safeguards and precautions to be observed before such releases are undertaken.

The Group noted that at present three techniques viz. (1) Irradiation, (2) Chemosterilisation and (3) Genetic manipulation were employed. The possibility, however, remote that the third approach viz. genetic manipulation may result in strains of mosquitoes with increased competence to transmit other diseases should be taken into account. The Group pointed out therefore that before releasing genetically manipulated mosquitoes, it would be essential to have data on some important aspects in order to ensure that such mosquitoes have not developed increased competence for transmission of other diseases. The Group noted that while the Unit had in fact already incorporated some safety measures in this regard and had arranged for testing genetically manipulated strains with respect to their competence to transmit dengue and chikungunya viruses, it was essential that this safety measure should now be expanded to cover other important viruses as well. The Group realised, in this connection, that it will not be realistic or feasible to include all conceivable viruses for this purpose. However, viruses which are considered by the Expert Committee on Virus and Arthropod Borne Diseases to be of major importance and relevance and capable of posing public health hazards, have to be included, for such screening. The Group pointed out that in fact such safety measures in experimental approach have been stressed by the WHO.

In this connection, special stress was made by the Group of the desirability of testing transmission potential of manipulated A. aegpyti strains with respect to transmisson of yellow fever. The

Group, while emphasising the importance of screening genetically manipulated strains of mosquitoes for susceptibility to yellow fever virus, noted that this work cannot be undertaken in India because of the legal restrictions which have been in existence for many years. However, wherever such tests are done, the Group felt that it would be highly desirable to associate Indian workers with such studies in order that they may also gain experience in this particular field.

During the discussions, one important consideration emerged, namely, that it was not intended to undertake control measures immediately, especially with regard to the control of filariasis in the country. It was also stressed that the control of filariasis will have to be based on an 'integrated approach', in which genetic control could conceivably be one aspect.

The question of 'replacement' of mosquito population by non-susceptible strains was discussed. The Group was of the view that while this might control the disease, such a replacement would still leave the problem of mosquito menace unsolved.

In the face of widespread development by mosquitoes of resistance to insecticides, the Group recognised the desirability of keeping open the possibility of injecting susceptible genes into the mosquito population so that they could again be controlled through insecticides. But utmost caution and more extensive data were considered necessary before such population replacements were undertaken.

*Independent Monitoring Body:*

The Group was of the view that a separate 'Monitoring Body' be specially created with a wider membership drawn from those not actually engaged in the project in order to monitor the effect and impact of future releases of genetically manipulated mosquitoes. The staff of the Genetic Control Unit will naturally have to be associated with such a monitoring programme. Indeed the Monitoring Body and the concerned staff of the Genetic Control Unit will have to work in close cooperation at all stages of the release operation. This recommendation is generally in accordance with the practice which is generally accepted; for example, in drug research, the scientists who develope a drug are not involved in trials regarding its efficacy. This is always entrusted to an independent body which ensures desired objectivity of results. A similar approach is recom-

mended in this case also. The Group recommended that this proposal should receive very careful consideration in any plan for the future.

The Group did not consider the possible future lines of development for this project. The Group felt that this would be the legitimate responsibility of the Project Committee of the Unit."

3.2.50. The Governing Body of the Indian Council of Medical Research met on 2nd November 1974 and approved the recommendations of the Expert Group. Extracts from the minutes of the meeting are reproduced below:

"The Chairman explained that as a result of a News Item which appeared in the newspapers on the 29th July 1974 about the activities of WHO|ICMR Research Unit on Genetic Control of Mosquitoes there was a call attention motion in the Lok Sabha and the Rajya Sabha on the 30th July 1974. He had given an assurance on the floor of the House that the functioning of the Unit would be reviewed by the Governing Body of the ICMR. Accordingly the Governing Body met on the 11th September 1974 and it was decided by them that a scientific review of the Project should be made by the Expert Groups on Virus and Arthropod Borne Diseases and on Human Genetics and the general nature and pattern of agreement with the WHO should be reviewed by a Committee of administrative experts. The 21 group members of scientists met on the 16th October 1974 and had submitted a report. The Committee of administrative experts met on the 15th October 1974 and they had also submitted a report. Both these reports are for consideration of the members of the Governing Body.

Shri Ranen Sen desired to know how many of the scientists of the expert group were working with the ICMR. The Director-General clarified that only Dr. K.R.P. Singh was working in the unit but he attended the meeting of the group in his capacity as a member of both the Expert groups on Virus & Arthopod Borne Diseases and on Human Genetics Immunology & Allergy. The Director-General also explained that apart from Dr. K. R. P. Singh, Dr. N. P. Gupta, Director, Virus Research Centre, Poona and Dr. N. G. S. Raghavan, Emeritus Scientists were also with the ICMR.

**Shri Sen** stated that the entire discussion in the Parliament arose as there was apprehension in the minds of the Members of Parliament that the work carried out by the Unit on Genetic Control of Mosquitoes may be connected with germ warfare experiments which would be detrimental to the welfare of the country. He desired that a report in layman language should be placed on the table of the House. The Minister assured him that he had already taken steps in that direction.

Dr. Rajat Kumar Chakrabarti stated that steps should be taken to develop alternative pesticides. Dr. Mahipatray Mehta also mentioned that malaria was rampant in Kutch in pre-independence days and in those days gamaxene was used as a pesticide. If mosquitoes are now immune to pesticides currently in use then alternative pesticides should be developed.

The Director-General, ICMR clarified that Genetic Control is one of the many techniques being developed to control the population of mosquitoes and research in other methods of control, such as production of vaccine against malaria, development of larvaecidal fish and plants, alternative pesticides etc. had already been undertaken by ICMR.

The Chairman stated that the expert Group had reviewed the work done by the Genetic Control unit so far and was of the opinion that the unit had 'accomplished a great deal' since its inception in 1969. The work carried out by this Unit was of high scientific standard and had resulted in important contributions with respect to both genetic and ecological aspects. The Group noted that the Unit had already incorporated safety measures to be undertaken before field releases of mosquitoes. The Group suggested testing of the vectors with new strains for their potential to transmit yellow fever. The Group also recommended the setting up of an independent monitoring body under the ICMR to monitor the impact of future releases of genetically manipulated mosquitoes. This monitoring body should function in coordination with the Genetic Control Project.

The Chairman also stated that the Committee of administrative experts should meet again to suggest procedural modifica-

tions in the agreement between Government of India and the WHO envisaging closer direction and guidance of the project by the ICMR.

After a general discussion, the Governing Body approved of the recommendations contained in the report of the Expert group of scientists and the suggestions made by the Chairman. The Governing Body was of the view that the project was important from the point of view of developing alternative and additional strategies for containment of mosquito borne diseases and should be continued with such modifications as approved by the Governing Body.

Shri Ranen Sen, M.P., however, reserved his views in this regard."

3.2.51. Relevant extracts from the comments of the Director, National Institute of Communicable Diseases in 1968 on the WHO proposal for genetic control of mosquitoes in India are reproduced below:

"The need for such studies of newer approaches or techniques, has been accentuated by the development of resistance by culicine mosquitoes, thereby stalling or threatening to do so attempts at control of filaria and haemorrhagic fever transmitted by C. fatigans and Aedes aegypti respectively. The experiences in such studies even globally (Genetic manipulation of mosquitoes) so far has been negligible or very little. The numerous lacunae in the understanding and studies in vector biology and behaviour, genetics of mosquitoes, of technical and technological know-how of bio-engineering, radioactive biology etc. and above all the prohibitive finances needed for such studies have stood in the way of any country embarking on the same and studies even by the WHO have been very restricted. These facts have been amply brought out in the project now under consideration. However, with regard to C. fatigans, the small scale study in this direction by WHO, Geneva, in an isolated village OKPA near Rangoon, Burma have stimulated further activities in this field and hence this document. It is, however, to be noted that even the small scale studies in the isolated small village of OKPA are not, it is learnt continuing. For these reasons the need for such a study has to be accepted.

However, the scanty knowledge, the numerous lacunae and difficult problems are so manifest that they have been summarised succinctly in the cautiously worded statement in the document under consideration which runs as follows: Although limited results to date are promising and the concept seems sound in theory, success or failure cannot be predicted at this stage. There are many problems to be resolved. Some of these are sequential, each step depending upon the reults achieved in the previous step. Should the experiment on operational feasibility of genetic control be a success, the project would have achieved a major break-through in public health. Even if the operational experiment is a failure, the understanding of biology and behaviours of insect populations would be greatly advanced, opening up new vistas to applied biologists. This implies *inter alia* a constant concurrent evaluation of the programme, decision making on the spot and follow-up thereafter i.e. the authority for the responsibility must vest in a local organisation.

It would be pertinent to note that a small village experience of OKPA (1000 persons) is to be expanded to a larger area."

3.2.52. The Committee asked whether the World Health Organisation were also collaborating with the National Malaria Eradication Programme and the National Filaria Control Programme. The Director General, Health Services stated during evidence:

"Collaboration is there as for any other scientific programme. There is no speciality about it. We have National Malaria meetings and in these meetings several experts take part, national as well as from WHO. They take part in such meetings."

He added:

"We are having national programmes and we utilise them with regard to consultation, with regard to specialised technology and methodology. But apart from that, there is no other help that we get from them and they are entirely our programmes. So, WHO has nothing to do with them."

3.2.53 When the Committee pointed out that the WHO or US agencies did not apparently wish to have much coordination or collaboration with wholly Indianised institution, the Director General, Health Services stated:

> "With regard to WHO I can answer the question and not with regard to other agencies. We have nothing to do with other agencies. We do invite WHO for expert opinion and they collaborate with us and we collaborate with them, but other agencies certainly we do not."

3.2.54. The Committee asked whether the Deputy Director General, World Health Organisation had visited the Health Ministry recently and, if so, what the reasons for his visit were. The Health Secretary stated during evidence:

> "Actually, he was here in connection with the Board of Control of the GCMU Units and it is their usual practice to call on the officers. He also met me and we discussed about the transfer of the project and he said that they would have no objection to the complete transfer of the project to the ICMR."

3.2.55. On the question of monitoring by ICMR, Shri Raghavan, Editor-in-Chief, Press Trust of India, stated during evidence:

> "The people who work in the laboratory should have nothing to do with the monitoring units. When I produce a drug, the testing authority should be somebody else; in this way, there are three or four authorities which perform their respective functions before that drug can be used for public use. Does it not apply in the field of Microbiology?"

3.2.56. About the administrative control resting with Indians, the witness stated that Indian control would not mean an Indian sitting in the WHO and controlling the Project.

3.2.57. Explaining the role of the Indian counterpart, he stated:

> "Till now the counterpart had nothing to do. After all it is only now they have brought a gentleman who is supposed to be monitoring. I am told he is a fairly sincere person. Dr. Veera Raghavan is his name. They said that they

have published all this information in this journal. This does not even contain one orginal research paper. They are all review articles."

3.2.58. The Committee asked what was the role played by Dr. Brooks. Shri Raghavan stated:

"He is the Project Administrator. And the Project is actually being run from Geneva by the WHO Vector Biology Division. And I do not even know whether Dr. Brooks understands it. I am not even prepared to accept whether Dr. Brooks knows everything of it."

3. **Involvement of the United States of America**

3.3.1. According to the agreement entered into between the Government of India and the World Health Organisation, effective initially for six years, the World Health Organisation is to provide, subject to the availability of funds, a Project Leader and two professional staff as well as additional staff and short-term consultants as required, payment for contractual services, premises, equipment and supplies and operating expenses.

3.3.2. The Committee asked whether the GCMU Project was financed from PL-480 funds and the Director General, Indian Council of Medical Research replied in the affirmative.

3.3.3. The Committee requested the Department of Health to furnish a copy of the agreement, if any, entered into between the World Health Organisation and the US authorities in regard to the GCMU Project. A copy of the agreement for carrying out feasibility studies on the genetic control of mosquitoes in India entered into between the World Health Organisation and the United States of America, as represented by the National Communicable Diseases Centre, Bureau of Disease Prevention and Environmental Control, Public Health Service, Department of Health, Education and Welfare, Atlanta, Georgia, USA, was furnished to the Committee by the Department of Health. The effective period of this agreement was six years commencing 1st January 1969 which would mean that the agreement would have expired on 31st December 1974, although it was continuing and even the Health Secretary was not in the know of it as to who were financing it.

3.3.4. Confirming that the agreement between the United States Government and the World Health Organisation for the provision of PL-480 funds was supposed to have expired, the Health Secretary also informed the Committee that the agreement between the Government of India and the WHO would expire sometime in June 1975 and so far no proposals had been received regarding the renewal of the agreement.

3.3.5. Since the agreement between the US authorities and the WHO had expired on 31st December, 1974 and that between the WHO and the Government of India was due to expire only on the 30th June 1975, the Committee desired to know how the GCMU Project would be financed by the WHO from 1st January to 30th June 1975 and whether the agreement between WHO and the US authorities was being extended for this purpose. The Health Secretary stated during evidence:

> "We were a party to an agreement between Government of India and the WHO and that agreement is due to expire in June. The agreement between WHO and the PL-480 authorities has expired. I do not know whether any request has been received by the WHO from PL-480 authorities for extending this programme. So far as we are concerned, we had at once taken up with the WHO and they had agreed that the technical and administrative control would be transferred to the ICMR and the ICMR authorities are now engaged in locating the Indian scientists to man the entire project."

He added further:

> "This is a tripartite agreement, in the sense there is a separate agreement between WHO authorities and the PL-480 authorities which has expired in December. We are not a party with PL-480 authorities. But there is an agreement between WHO and the Indian authorities which is to expire in June. So far, we have not received any request from the WHO to extend the project but the thinking is there. If the project is administratively and technically transferred completely to the control of the ICMR, then we might extend it."

The Committee wondered how the Ministry knew that 'the thinking is there' if no request had been received from the WHO.

3.3.6. In a written reply furnished to the Committee subsequently, the Department of Health stated:

> "The WHO was addressed in the matter.... The WHO, Geneva, has sent the following telex message:
>
> 'Agreement was signed with USA on 3 July, 1969 in accordance with annex A ref 2 with the following modification stop Prime agreement was signed for an additional period of three years resulting in minor changes to technical part of the text stop Second page 23 at 3.3 to make periodic report to the NCDC on fiscal expenditure and scientific progress as called for in section 5 stop Tertio page 28 section 7 reworded those residual values of equipment and unconsumed supplies and material remaining at the completion of or termination of the project will be made over to the agency continuing or interested with this or allied work stop Copy actual agreement with changes noted being pouched.
>
> It may please be seen from the above that even though it was originally intended that the period of agreement would be from the 1st of January 1969 to 31st December 1974, the agreement was actually signed by the WHO with the United States Government only on the 3rd of July 1969 for a period of three years in the first instance and subsequently extended for another three years by another agreement valid upto 30th June, 1975. This correspond to the date of expiry of the agreement between the WHO and the Government of India in regard to this Project. Thus the finances for the Project would be available from PL-480 funds upto the 30th June 1975. The fact that the WHO had actually signed two agreements with the U.S. Government was not known to the Government of India. Further clarifications in this regard are being sought from the WHO and when received would be supplied....
>
> It is understood that the United States Government have agreed to provide funds to the WHO for continuance of the Project for another period of three years, with effect from the 1st July 1975. The position regarding further exten-

sion of the agreement is also being ascertained from the WHO."

3.3.7. According to the agreement furnished initially by the Department of Health, the effective period of the agreement was only till 31st December 1974. The telex message received from WHO, however, revealed that the agreement between WHO and the US authorities had been signed only on 3rd July 1969 and that the Prime agreement had been signed for an additional period of three years resulting in minor modifications to the technical part of the text. The Committee, therefore, desired to know whether the modified agreement referred to by the WHO in their telex message was in modication of the agreement which was already effective from 1st January 1969. The Department of Health, in a written reply furnished to the Committee, confirmed that this was so.

3.3.8. The Committee enquired whether the Ministry was aware of the existence of the original as well as the modified agreements between WHO and the US authorities. The Department stated in a written note furnished to the Committee:

> "The Ministry was aware of the existence of the original agreement only between the WHO and the US authorities. The modified agreement was not forwarded to the Government of India by the WHO. Only in reply to this Ministry's letter No. V. 25011|11|74—RISM, dated the 14th January 1975, it was mentioned by the WHO that there were two agreements one for the first three years and the other for the next three years."*

3.3.9. Since it appeared from the telex that the modifications made in the original agreement had not been communicated by WHO to the Government of India till February 1975, the Committee desired to know the reasons therefor. The Department of Health informed the Committee in a written reply:

> "The World Health Organisation who was addressed in the matter to clarify the position have drawn attention to their two letters dated the 23rd December 1968 and 13th May 1969 addressed to the Director General of Health Services and to the Minister for Health and Family Plan-

---

A letter written in this connection by the Chairman, Public Account Committee, to the Prime Minister of India is reproduced in Appendix.

ning respectively. In the first letter, it was stated that they have been informed by the United States Public Health Services that funds have been reserved to support the first three years of work but that these can be held only until the end of April 1969. They, therefore, urged the Government of India to finalise the agreement and World Health Organisation quickly. In the second letter, dated the 3rd May, 1969, the degree of urgency in finalising the agreement between the WHO and the Government of India was stressed by the WHO. But in either of these two letters, the modified agreement between the WHO and United States Government was not mentioned."

3.3.10. The Committee desired to know the present position of the status of the Project after 30th June 1975. The Department of Health stated in a written note:

"The World Health Organisation has informed this Ministry that the United States Government have agreed to extend the financial support to the Project from 1st July 1975 to the 30th June 1978. The present agreement between the WHO and the Government of India ends in June 1975. No further extension of the agreement between the WHO and the Government of India has been made. During informal consultations, the WHO representatives have assured that they will have no objection to transfer the administrative and technical control of the project to the ICMR if it is renewed."

3.3.11. Copies of correspondence exchanged in this regard between the Government of India and the World Health Organisation furnished by the Department of Health, at the instance of the Committee, are contained in Appendix IV. Copies of all the agreements entered into between the World Health Organisation and the US authorities in respect of genetic control of mosquitoes in India were also furnished by the Department of Health, at the instance of the Committee. The salient features of these agreements, four in all, are discussed below:

3.3.12. The first agreement initially executed between the World Health Organisation and the US authorities was to commence from 1st January 1969 and extend for a period of six years. The National Communicable Diseases Centre of the United States Public Health Service was to make payment in local currencies an amount not ex-

ceeding US dollars 19,36,150 (Rs. 1,45,21,000) for the performance of this project by the collaborating institution. Sections II to V of the agreement contained exhaustive details of the objectives and description of the work to be performed, decription of the work plan year-wise, selection of site, details of studies on ecology and behaviour, studies on biological parameters, details of the responsibilities of the National Communicable Diseases Centre and the Collaborating Institution, World Health Organisation, period of performance, details of compensation and budget plan, method of payment, etc.

3.3.13. Sections VI and VIII of the agreement which deal respectively with Records and Reports and Publications and Patents are reproduced below:

"**SECTION VI.**

**RECORDS AND REPORTS.**

All reports and other communications will be transmitted by the Collaborating Institution in the English language, unless otherwise provided for.

**Records**

The Collaborating Institution agrees to keep adequate records for documentation of progress made and status of this project as well as for preparation of reports on the scientific aspects of this programme; and further agrees to keep records of obligations and expenditures, together with receipts, vouchers, correspondence and memoranda associated with funds received and expended in carrying out the project provided for in this Agreement.

**Reports**

The Collaborating Institution agrees to submit to the NCDC reports as specified below. However, none of these arrangements for reports shall preclude full informal exchange of correspondence or other communication between the Principal Investigator and the Project Officer at NCDC.

Two months in advance of each payment period and in no case less than semi-annually, the following fiscal and progress reports on the work provided for under this Project Agreement will be submitted:

(i) A brief, but descriptive, narrative progress report of the scientific aspects of the project clearly indicating significant factors with respect to the progress of the work.

(ii) A fiscal report on forms to be furnished by the NCDC which will show the actual amounts of money obligated by the Collaborating Institution on behalf of this Agreement.

(iii) A statement of the estimated financial requirements for the following period, indicating any overages or shortages from the prior period, together with explanation of significant changes in financial requirements for specific purposes. Authorisation of payment for the succeeding period will then be based on an evaluation of this information.

At the conclusion of this Agreement, a final report in a form suitable for publication, including all pertinent technical data, summarising the work done, the results accomplished and the conclusions drawn therefrom.

Such interim reports or information on the status or progress of the project as may be necessary in connection with special events of problems arising during the course of the work, either on the initiative of the NCDC or the Collaborating Institution.

*Access to Facilities, Records and Accounts*

The parties to this Agreement or their accredited representatives will have access at any reasonable time to that part of the project facilities or offices utilised in connection with the project described in this Agreement for the purpose of observing the status and progress of this project and all data, information, records, reports and accounts relating to this project shall be available to these representatives and shall be maintained available for examination for a minimum period of two years beyond the completion of the project or termination of the Agreement except that this provision shall not be exercised so as to violate confidentially of statistical reports as may be established by law, or

policy, nor to require retention of bulky statistical returns beyond the usual storage periods. Officers or employees of the Collaborating Institution, or other personnel assigned to or engaged in the conduct of this project, shall be available for consultation with the Project Officer or his representative at any reasonable time."

*"SECTION VIII.*

*PUBLICATIONS AND PATENTS*

Publication of findings shall be at the discretion of the Collaborating Institution unless otherwise provided for subject to the limitations relating to patents set forth below. Acknowledgement of the NCDC assistance in the conduct of the work covered in the publication should be noted in an appropriate manner.

Any patentable invention or improvement resulting from work carried out under this Agreement, insofar as the United States of America is concerned, shall be assigned to the United States Government as represented by the Secretary of the Department of Health, Education and Welfare. Rights to the patentable results in countries other than the United States of America shall be in accordance with the policy of the Collaborating Institution, provided that an irrevocable and royalty free licence to practice such invention throughout the world be issued to the United States Government and that, as stated above, the results or findings be available without restriction to the general public.

With respect to patentable results and in accordance with the foregoing paragraph, the Collaborating Institution agrees to cooperate in the preparation and prosecution of any United States patent application, to execute all papers requisite to such prosecution, and to secure the cooperation of any of its employees in the preparation and prosecution of such papers."

Section VII of the agreement was in respect of equipment supplies and materials. Sections IX to XI contained provisions in respect of

research assistance, the Principal Investigator and the Project Officer and termination of the agreement.

3.3.14. The second agreement signed on 3rd July, 1969 amended the effective period of the agreement to commence from 1st April, 1969 and to extend for a period of three years. The total funds to be provided during the period of this agreement was also modified as US dollars 7,81,907 (Rs. 59,42,500). Other details of the initial agreement had been retained in this agreement also.

3.3.15. The third agreement signed on 3rd June, 1971 further modified the period of the proposed project from 3rd July, 1969 to 30th June, 1975, to coincide with the expiry of the agreement between the World Health Organisation and the Government of India. The funds provided under the agreement dated 3rd July, 1969 were also enhanced to Rs. 1,45,88,500.

3.3.16. The fourth agreement signed on 20th June, 1974 amended the effective period of the agreement to be operative from 3rd July, 1969 to 30th June, 1978. The total funds to be provided during the period of agreement had also been enhanced to Rs. 1,67,56,179. This agreement also contained proposals of work plans from 1975 to 1978.

3.3.17. The provisions regarding the Principal Investigator and the Project Officer read as follows:

"SECTION X

PRINCIPAL INVESTIGATOR AND PROJECT OFFICER

The Principal Investigator designated in this Agreement will be in active direction of the Project and responsible for its administration on the part of the Collaborating Institution. Changes or substitutions of Principal Investigators will be made only with written approval from the NCDC. The NCDC Project Officer designated in this Agreement shall be responsible for the administration of this Agreement on the part of the BDPEC."

3.3.18. The Committee drew the attention of the Ministry of Health to Section VIII of the agreement relating to publications and patents and desired to know whether the Government of India had asked for

reports which, however, had been denied to them The Director General, ICMR, replied during evidence:

> "We have full access to the outcome of the work in the field of medical or agricultural research; in fact, we have these reports. What is being referred to is patenting of any invention. That is in a different category."

He also added that this clause, as far as he was aware, was also being revised. Clarifying the position further, the Director General, Health Services stated:

> "The report may give the details of how a particular virus has been isolated but if a vaccine has been made out of a virus, it will be a type of invention or contribution. Use of that vaccine or manufacturing rights of that vaccine may be governed by the clause."

3.3.19. The Committee enquired whether any invention, patented medicine or vaccine had been developed as a result of this research. The Director General, Health Services stated that there had been no patent on the health side and that nothing had been done so far on the health front.

3.3.20. Commenting on the patent rights of the project resting with the United States of America, Shri Raghavan, Editor-in-Chief, Press Trust of India stated during evidence tendered before the Committee:

> "It (this patent ownership) is fundamentally opposed to the WHO's own charter. It is clearly stipulated that there could be no patent rights and material because they wanted that WHO knowledge should be for the general benefit of the humanity."

3.3.21. A note furnished by Shri Raghavan, Editor-in-Chief, Press Trust of India, to the Committee explaining the link between the United States Public Health Service and the US Biological Warfare Research Centre at Fort Detrick is reproduced below:

> "Several other agencies collaborating with the Indian projects in question have all some link with the BW Research Centre at Ft. Detrick according to published information. For instance, it is stated that Ft. Detrick and the USPHS—the prime collaborator with ICMR in the GCMU project—cooperated in a study of experimental epidemiology of coccidioidomycossis, an infectious fungal disease (Science,

January 13, 1967). According to the same report the USPHS in 1960 received more than 380,000 dollars in funds transferred from the Army General Corps which according to the Sipri report, has the responsibility for coordinating the CBW programme of the Navy, Army and the Air Force. The science report says that the annual transfer of funds from the chemical corps to the USPHS measured only a fraction of the real cooperation between the two agencies. Apart from the transfer of funds it is stated that there is active liaison between the two agencies, communication at several levels and efforts to avoid duplication. The London conference on CBW in 1968 revealed that the USPHS maintains a close liaison with Ft. Detrick and receives a few hundred thousand dollars for its efforts."

### 4. Selection of Site

3.4.1. Extracts from a note laid on the Table of the Lok Sabha on 21st November, 1974, in reply to Starred Question No. 148 are reproduced below:

"During the first four years, work has been concentrated chiefly on Culex fatigans. The area chosen has included a number of villages in the Delhi area.

* * * * *

Twelve large village scale experiments have been done in 1971, 1972 and 1973. The results showed that a high degree of sterility can be injected into the local mosquito population (which was regarded as adequate to suppress populations) but for the massive infiltration of mosquitoes found to occur in the Delhi villages.

* * * * *

Therefore, it has been decided that the field experiments should now be done in urban situations, preferably in endemic areas, where the patterns of mosquito distribution and dispersal would be different from those in rural areas. Preliminary studies have also been taken up at Faridabad."

3.4.2. The Committee desired to know why Delhi was chosen for the experiment. Dr. Ramachandra Rao stated during evidence:

"My personal opinion is: it was long before I took over and I am not in a position to say what was the official reason at all because I came into the picture after Delhi had already been chosen."

The Director General, Health Services, stated in this connection:

"I think Dr. Rao knows that in the various meetings in the ICMR this point was discussed. Perhaps he was aware why Delhi was technically chosen."

3.4.3. When asked whether the site selection had been done in consultation with local agencies, the Director, National Institute of Communicable Diseases replied:

"Selection of Delhi is dependent on the feasibility whether genetic control of mosquitoes would be feasible or not. ICMR and other agencies are here. The National Institute of Communicable Diseases is also located here. Also availability of experts from elsewhere is possible. This would have been the various reasons why this was selected."

3.4.4. When the WHO proposal on the Genetic Control of Culicine mosquitoes had been referred to the Virus Research Centre, Poona in 1968 for comments, Dr. Ramachandra Rao who was then the Director of the Centre, had felt that the studies on aedes aegypti should be carried out in South India. The relevant comments in his letter dated 20th July, 1968 are reproduced below:

"While the studies on Culex fatigans can be carried out at Delhi with the NICD as the main participant I feel that the studies on Aedes aegypti should be carried out in South India with the VRC as the main participant. The entomology staff of the VRC are fully conversant with the problems connected with Aedes aegypti and can contribute significantly to the study when it is organised."

3.4.5. Since Dr. Rao had earlier suggested that the experiments on aedes aegypti should be carried out in South India, the Committee desired to know the reasons for reversing his earlier stand. In a written reply, the Department of Health stated:

"Dr. T. R. Rao, who was consulted has replied as follows:

'There was no occasion to reverse my stand. In my letter of April 20, 1968, merely a suggestion had been made hoping that the Virus Research Centre also may be participating in the work in which case, I felt, the work on Aedes aegypti should be done in South India. Delhi was chosen for work on Culex directly under the Unit and the Unit started looking for suitable place for work on Aedes also within a reasonable distance for effective management and supervision'."

3.4.6. The WHO proposal had also been referred to the National Institute of Communicable Diseases for comments. In his comments, the Director, Natitnal Institute of Communicable Diseases had, *inter alia*, observed as follows in respect of selection of site:

"*Site selection for C. fatigans and Aedes aegypti.*—The Delhi area has been chosen for the C. fatigans studies and for Aedes aegypti, the team seems to consider this area as not suitable. They seem to think an area in the east coast of South India would be more suitable.

The criteria for the selection of the Delhi area are not known. From the criteria set out...., however, it is stated with regard to site selection for Aedes aegypti.

'Villages must be linked by a network of all weather roads'.

'Proximity to a metropolitan area for housing, supply and air transportation'. Presumably these criteria also weighed for C. fatigans studies to be located near about Delhi. The point to note would be that the neighbourhood of Delhi is a non-endemic area for filariasis. It is suggested that the vectoral states of C. fatigans in the selected areas to W. bancrofti should be predetermined before final selection.

With regard to site selection it would be preferable to consult local institutions like the NICD, VRC etc. as they have rich local experience and abundant data in these contexts."

3.4.7. As regards the selection of Sonepat for the experiment, Shri Raghavan, Editor-in-Chief, Press Trust of India stated during evidence:

"As a matter of fact, it is a very interesting thing. I cannot produce it, but it is in their documentation. We came to

know that in the first preliminary meeting that the WHO had with the Health Ministry for the setting up of this project. They said that they may require the consent of the Haryana Government. Why? Why Haryana even before a survey on mosquitoes to decide a site?"

3.4.8. According to conclusion No. 6 of the minutes of the meeting held on 6th November 1968, on the genetic control of culicine mosquitoes, it had been decided that besides the Government of India and WHO, the Government of Haryana or any other State Government concerned would be a partner in the project. In view of the fact that this meeting had been held a year before the GCMU Project took final shape, the Committee desired to know how Haryana had been mentioned by name even before site selection and whether Sonepat had been premarked by the United States of America and the World Health Organisation even before the Indian Council of Medical Research entered the scene. The Department of Health stated in a written note furnished to the Committee:

"The State of Haryana or other State Governments were mentioned in conclusion No. 6 of the minutes of the meeting held on 6-11-1968 because there was correspondence with the Government of Haryana from July 1968 onwards in regard to this Project. In the report of the Director General of the World Health Organisation, forwarded to the Government of India in June 1968, it was mentioned that the scientists visited the area around Delhi to survey mosquito populations and suitable test sites. Several villages and townships to the South of Delhi appeared satisfactory for the proposed studies on Culex fatigans. In view of this, the entire report was forwarded to the Secretary to the Government of Haryana, Health Department of Chandigarh on the 6th July, 1968 for their comments. It was, therefore, stated that the Government of Haryana or any other State Government in which the experiments would be conducted, would be a partner in the Project."

3.4.9. The Committee asked whether it was a fact that Dr. Mc. Cray had made a report on the selection of site for the experiments. Dr. Ramachandra Rao stated during evidence that he had not seen that report and had only read about it in the papers. He added that he did not know anything beyond that.

3.4.10. At the instance of the Committee, the Department of Health furnished a copy of the results of a survey for aedes aegypti conducted in Madras and surrounding twons and villages by Dr. Elmo M. Mc Cray, Jr. The purpose of this survey was (a) to determine the presence or absence of addes aegypti in Madras and surrounding towns and villages, (b) to determine if possible the relative abundance of aedes aegypti in the positive localities, (c) to physically examine and tentatively select those towns and villages that would be suitable for field tests and (d) to record observations of those environmental factors that may have direct bearing upon the execution and success of such tests.

3.4.11. The conclusions and recommendations of Dr. Mc Cray were as follows:

"CONCLUSIONS.

Madras city and the surrounding towns and villages do have an A. aegypti population during the month of March, which is one of the two or three months out of the entire year having the lowest mosquito populations.

There are an ample number of towns and villages within a 35—40 mile radius that would be suitable for further evaluation and possible use for field experiments.

These towns and villages are readily accessable by good all-weather roads.

The city of Madras has ample facilities for housing staff and temporary personnel, and is readily accessable by air, sea and land. It has available all of the business and supply companies that may be needed to fabricate equipment or provide specialised services."

"RECOMMENDATIONS.

Since this survey was conducted during the dry season, and at that time when A. aegypti populations were at their lowest levels, a more intensive study should be made at a later date, preferably during August, September or October. I would suggest that this later study be made in greater depth and attempts be made to establish con-

tinuing surveillance in each of the towns and villages which potentially may be used for experimental purposes.

Blueprint maps of almost all of the towns are available from the Talus Commissioner and these should be purchased and readily available for use.

The latest censure is currently being conducted and all data on population and number of houses present in each town is supposed to be in the administrative offices this week. An effort should be made to obtain this information through official channels now, for it will not appear in published form until 1971 or 1972.

Arrangements should be made with local glassware suppliers or manufacturers to obtain or produce ample number of containers suitable for ovitraps and these should be glossy black on the outside surface. These, with an ample supply of oviposition strips should be on hand and available for instant use.

The primary sites tentatively selected should be thoroughly evaluated with a satisfactory ovitrap grid-pattern to determine the extent of A. aegypti distribution within the towns or villages.

A lesser number of ovitrap monitors should be maintained in each of the potential villages or towns to obtain season patterns prior to the initiation of any experimental tests.

Valid data should be obtained on the extent of any current anti-mosquito programmes being conducted in the towns and villages being considered, for signs of such activity were observed during the survey.

### 5. Hazards of Chemosterlisation

3.5.1. One of the techniques of genetic control of mosquitoes is the release into the natural environment of large numbers (carefully calculated) of laboratory-bred made mosquitoes sterilised either by radiation or chemicals. Sterilisation by chemicals is known as chemosterilisation. For sterilising mosquitoes in the GCMU, a chemical called thiotepa had been used. A note on the use of

thiotepa as chemosterilant furnished to the Committee by the Editor-in-Chief, Press Trust of India is reproduced below:

"GCMU was using a chemical called thiotepa for sterilising mosquitoes before releasing them in fields. The only manufacturer of this chemical is Du Pont Corporation in the US. The chemical is a modification of the World War I mustard gas, with a similar biochemical action but with reduced toxicity for mammals. It has been reported that thiotepa produces mutations, cancer and foetal deformations in experimental animals. In 1969 the Canadian agricultural department had concluded that 'chemosterilants for sterilisation of native populations in the field should not be used on a large scale until less hazardous chemicals are produced or safer techniques developed.' In 1972 two GCMU scientists had themselves reported that 'there is a possibility however remote of contaminating the environment with the chemical as it is present both externally and internally on the insects being released. In future this could become a problem should more persistant chemicals be used'. Another WHO consultant to GCMU Prof. H. Laven, Director of Genetics at Gutenberg University in Germany had labelled thiotepa as 'potentially dangerous'.

Sterility can be introduced in male mosquitoes by chemicals like thiotepa or through gamma radiation. In fact it is the latter technique that has been preferred by defence scientists at the Institute of Nuclear Medicines and Allied Sciences in New Delhi who have also conducted mosquito control experiments. The defence scientists have specifically ruled out the use of thiotepa after a careful scrutiny because of its hazard potential.

Despite all these evidences against thiotepa, GCMU continued to dip mosquito pupae in the dangerous chemical and place them in wells in Delhi villages. The dangers of this method were first exposed by the National Herald in 1972. Subsequently WHO set up an expert committee in Geneva which cleared the use of thiotepa but suggested the release of adult mosquitoes instead of pupae. The argument was that the chemical gets metabolized during the time when pupae change into adults and therefore the release of adults would not contaminate the environment.

This however was not correct: it has been found out in an experiment by GCMU that spiders became sterile after eating the sterlized adults indicating that contamination does occur even when adults are released. On the expert committee that decided to continue the use of thiotepa India was represented by Dr. T. Ramachandra Rao. However, it must be noted that Dr. Rao at that time was an employee of WHO at GCMU (and even a little earlier was OSD at ICMR looking after GCMU and paid out of WHO's payments to ICMR from PL-480 for the work of the GCMU) which had vested interest in the continuance of the project."

3.5.2. The Committee desired to know whether it was correct that Professor H. Laven, the German WHO expert had warned that the chemical thiotepa used in the GCMU experiments was 'potentially dangerous'. Dr. Ramachandra Rao stated during evidence:

"In the German Embassy bulletin, an article appeared early this year. In that article, it was stated that heredity was better than chemicals, because one of the methods of sterilisation of mosquitoes is the use of chemicals. Dr. Laven is an outstanding scientist who has been working on the mosquitoes incompatible with the local mosquitoes. I would say that for the last 15 years, he has not been very favourable to the use of sterilisation technique. He has been one of those scientists who have been pressing for the use of genetic strains which are incompatible with local mosquitoes. As far as 15-31-B strains are concerned, these have been used by this unit and they have produced very good results; but equally good results, from the analysis made at that unit, have been obtained from the use of chemicals. But in the German article, it appeared that all other techniques were not right and only the heredity technique was proper. Then there was a statement in that article that the use of this chemical could be harmful to a man."

3.5.3. In reply to another question whether Dr. Paterson and Dr. Sharma in their paper had said that thiotepa could contaminate the environment. Dr. Rao replied that he was not aware of that. He added:

"In general, the properties of this chemical are very well-known. It is for this particular reason that it is being

used to sterilise mosquitoes. This subject has been taken up for intensive study. In one of the meetings, I, myself, raised this question and on that basis, the WHO Expert Committee, which met in Geneva in November 1972, applied their mind to this. I am subject to correction. They made a statement that they could not recommend the use of this chemical in the field; but in the manner in which it is being used at the genetic control unit of misquitoes at Delhi, it is absolutely safe for human beings."

3.5.4. When asked whether it was a fact that Dr. Paterson had himself used this chemical only on an experimental basis on an uninhabited island of Florida and that it had never been used on the mainland of the United States, the witness replied that this was used as a very preliminary experiment. Explaining the use of this chemical, he added:

> This chemical has been used extensively as an experiment in many countries. Research on this aspect has been going on in many laboratories. So far no government or organisation has permitted that this should be used openly in nature, except for experimental purposes such as for sterilisation of mosquitoes. In the United States itself, it is being used for experimental purposes."

3.5.5. The Committee desired to know whether the chemical produced 100 per cent sterility in males, the sterility produced by it in females was anywhere from nil to 20 per cent. In a written reply, the Ministry of Health have stated:

> "The figure for females is incorrect. The effective sterility is 52 per cent. However, the exact level of female sterility is of minor practical importance because 99.8 per cent of the mosquitoes released are males."

3.5.6. The Committee asked whether it was true that spiders caught from experimental villages in Delhi were later found to be sterile. The Director, National Institute of Communicable Diseases replied that this was not so, according to his knowledge. Subsequently, in a written note furnished to the Committee, the Department of Health stated:

> "No spiders or any other species were collected by the Indian Council of Medical Research for investigation, viz. testing of sterility, from Delhi area, where thiotepa was used to sterilise mosquitoes."

3.5.7. According to sub-para (3) of paragraph 6.4 of the report of the Research Unit on the Genetic Control of Mosquitoes (Minutes of Technical Planning and Review Group—23rd to 29th April, 1974), published data showed that spiders fed on thiotepa-treated mosquitoes have reduced fertility.

3.5.8. The Committee desired to know why the use of thiotepa was continued in Delhi villages and later in Sonepat, if thiotepa caused sterility in spiders and what was the residue of thiotepa in each aedes aegypti released. The Department of Health stated in a written note furnished to the Committee

> "With the sterilisation technique used in the Unit it has been shown by gas liquid chromatography that the residue on each treated male mosquito at the time of release is one quarter of a millionth of a milliongram. Further, there is a very rapid decomposition of the compound. It will thus be seen that the chemosterilant is present in a negligible quantity and cannot be considered as a hazard.
>
> Studies in Canada showing an effect on spiders is not comparable because a different sterilisation technique was used which left 15 times as much residue of the chemosterilant in the mosquitoes. Further, spiders were fed exclusively with these mosquitoes."

3.5.9. In reply to another question as to who had given clearance for the use of thiotepa and whether the Drug Controller had been consulted, the Department stated in a written note that the need for a clearance was not deemed necessary as the public health hazard involved was considered to be negligible or non-existent.

3.5.10. The Committee also enquired how many aedes aegypti would be released daily in Sonepat and for how long The Department of Health replied in a written note:

> "It was planned to release initially 35,000 mosquitoes per day and to adjust the numbers subsequently depending on the changes in the natural population.
>
> In the light of the cage tests carried out, it was expected that population suppression would have been achieved in about three months."

3.5.11. In reply to a question whether the use of thiotepa was freely allowed in the United States of America, Shri Raghavan,

**Editor-in-Chief, Press Trust of India, stated during evidence before the Committee:**

> "To the best of our knowledge, in the US they have prohibited the use of Thiotepa in field experiments. The Canadian Government have also prohibited its use."

3.5.12. When asked to name any other country where the use of thiotepa had been prohibited or banned, Dr. Jayaraman, Science Correspondent, Press Trust of India replied:

> "We do not know exactly but in France, they did it by using Thiotepa but that was only during the experimental stage. No one is prepared to test it on a large scale. This is what I have gathered during my literature research. The United States did use Thiotepa but it was in an island."

3.5.13. The Committee desired to know whether it would not be desirable to sterilise mosquitoes by using the radiation technique instead of the hazardous thiotepa. Dr. Ramachandra Rao stated during evidence:

> "This is a point of view on which lot of discussion is going on. Radiation sterilisation is one of the techniques. Chemo-sterilisation is another technique. The pros and cons are many and if you permit me to go into this in a little detail, I will do so. The sterilisation techniques by radiation require a Cobalt 60 source at every place. If we want to tailor this programme to suit rural areas in this country and to suit the large urban population—I am not having in mind cities like Bombay, Madras and Calcutta but a large number of small cities in which the disease occurs—the practicability of employing and having Cobalt 60 source in such places is remote. Then it has to be not only effective but also safe. I am emphasising the word 'safe' again and I am one of those who has been emphasising on this and every moment we are looking into this in great detail, that it has to be effective and safe. The chemical has got many advantages because this kind of sterilisation of mosquitoes can be done at any number of places. All that is needed is, beakers and test tubes and the pupae are there, which is just before the adult stage."

3.5.14. Explaining the actual work that had been done by the GCMU in this regard, enquired into by the Committee, Dr. Rao stated:

> "One of the objectives of this unit is to test the various methods. Radiation sterilisation has already been tested by this unit very extensively both in the laboratory and in the field. Chemo-sterilisation has also been tested both in the field and in the laboratory. Genetic strains have also been tested. The time has come when a review has to be made about the merits and demerits of each case and to decide, what should be adopted on a countrywide basis."

3.5.15. The Committee desired to know which agency would carry out the review and decide which of the methods should be adopted. Dr. Rao stated:

> "If this becomes operational, naturally it will be the Ministry of Health who will carry out this."

3.5.16. Since the radiation techniques for sterilisation were considered to be cent per cent successful and would not require any foreign know-how, the Committee asked why the GCMU and the World Health Organisation had been against trying out these techniques. Dr. Rao replied:

> "When the WHO and the Government of India established this Unit and entered into an agreement in 1969, the question of which radiation source should be used, which kind of sterilisation should be used had not been decided. Therefore, when the Unit was established, as I understand it, they were expected to test out all the methods to find out pros and cons of each method. According to the agreement between WHO and ICMR, the project leader and the project officers were not only for this purpose, they were for all aspects. Therefore, I am unable to give the answers."

3.5.17. The Committee asked whether the Bhabha Atomic Centre and the Institute of Nuclear Medicine had conducted any experiments in the field. The Health Secretary stated during evidence:

> "This was brought to my notice only when the questionnaire was sent to me day before yesterday. I have called for

the information and have also requested the ICMR to address the units and give us the results of the latest experiment. I understand that it is only a newspaper report that they are working on this."

3.5.18. Subsequently, in a written communication, the Department of Health informed the Committee that the Bhabha Atomic Research Centre had informed that no work was being done at Bhabha Atomic Research Centre on control of mosquitoes by genetic manipulation and bird migration.

3.5.19 In another written note, the Department furnished a copy of a note received from the Ministry of Defence on the AFMRC Project No. 499/72 on field trials for the control of culex fatigans mosquito through release of radiation induced sterile males of the species in Delhi cantonment area. The note from the Ministry of Defence in this regard is reproduced below:

| | |
|---|---|
| "Sanction of the Project | August, 1972 |
| Work started | March, 1973 |
| P.D.C. | 1975 |
| Allocation of Money | Rs. 100,000 |

This project arose in consequence to the laboratory studies 'Radiation Induced Dominant Lethality in Control of Culex Fatigans at INMAS' (Published in the International Journal of Radiation Biology in 1970).

The laboratory studies established that the method of radiation sterilisation of males is a promising and feasible one for the control of this species of the mosquitoes. In particular the following points were established:

(a) A simple method was developed for separating the males from the females.

(b) The optimum sterilising dose as well as the optimal stage of the mosquito at which the sterilisation is to be effected were established. It was shown that irradiating them at the pupal stage to a dose of 8000 reproduced adult males whose life span and mating competitiveness were equal to the normals. The mating of these sterile males led to normal production of egg rafts; however, at least 98.8 per cent of these egg rafts did not hatch.

These factors indicated that the method is feasible for a field trial.

It was, therefore, decided to undertake a limited field trials to evaluate the success of this method.

The work is concerned with release of radiation sterilised males of the mosquitoes Culex fatigans only (not yellow fever mosquito) in the field. The males do not bite. The few females that may be involved in the release are fully sterilised by the radiation dose given and do not lay eggs. Hence radiation sterilisation is considered the best method among the genetic control methods such as (i) cytoplasmic incompatibility; (ii) chemosterilisation, and (iii) use of translocated chromosome strains.

The field area has been well surveyed, breeding sites located and resting sites of the adult marked. Regular catches of the species in the village has been in progress since March 1973 and the seasonal fluctuation noted.

Techniques have been developed during the period for (i) mass production of the mosquitoes; (ii) separation of males; (iii) sterilisation; (iv) transport and (v) release at site.

A total of about 5 lakhs of sterile males have been released at the site over a period of 3 months. Over 60 per cent sterility in egg rafts (collected and examined) is now being obtained. The result is promising. The intention is to get about 90 per cent females inseminated by the sterile males before they go into winter hibernation. At present the production of sterile males has reached over 20,000 a day. If the target reaches 90 per cent sterility in females by mid-winter we are likely to be left with the progeny of only 10 per cent fertile males. This population will be overwhelmed with the release of 30 to 40 thousand sterile males a day in spring, which is within the reach of the present rearing capacity. Surveillance will have to be maintained afterwards for any incipient fertility to be dealt with.

A careful scrutiny was made about the relative merits and demerits of other genetic control methods such as (i)

chemosterilisation, (ii) use of cytoplasmic incompatible strains and (iii) translocated chromosome strains.

(i) **Chemosterilisation.**—This involves use of hazardous chemicals like thiotepa which is cytotoxic and the danger of polluting the environment. It does not also give complete sterilisation to the females, thus leaving such females released in the field to produce mutant progenies which could also be dangerous.

(ii) **Use of cytoplasmic incompatible strains:** This involves introduction of alien strains of the species into the country giving rise to the danger of opening avenues of new diseases into the country with potential uncertainty and sedious.

(iii) **Use of translocated chromosome strains:** This involves development of a new strain and unknown possibilities of susceptibility of this strain to new virus diseases.

It was thus felt that radiation sterilisation offered a better method without the possibility of introducing concomitant disadvantages inherent in other methods.

### 6. Release of Incompatible Strains and Infiltration

3.6.1. Referring to the release of incompatible strains, the Committee asked whether it was correct that the task force report itself had warned of the danger of a new colony of mosquitoes being established instead of the local mosquitoes being eradicated and, if so, how a foreign strain had been released in Delhi villages. Dr. Ramachandra Rao stated during evidence:

> "So far as the first part of the question is concerned, it is a strain which has been made with of Delhi genetic composition. The susceptibility of any mosquito depends not on the cytoplasmic incompatibility, but on the genetic composition of the mosquitoes. The mosquitoes strains which are used in Delhi are $D^a$ with Delhi genome. so far as the second part of the question is concerned, the possible consequence is that there is always a danger of replacement of strains of mosquitoes. It may be that the new strains are more dangerous than what we have already got. The ICMR has already established two investigations. The work is going on the susceptibility of these various strains which are proposed to be used in the field. They are being

tested for susceptibility to filaria infection. So far as other mosquitoes are concerned, the Virus Research Centre, Poona, has been given a grant to study susceptibility to virus infections."

3.6.2. The Committee asked whether it was correct that such a threat would not exist if only 100 per cent male mosquitoes were released as otherwise the mating of the foreign males and females released in the environment would result in a new breed of mosquitoes whose eradication would be more difficult than eradicating the existing local mosquitoes. The witness repiled:

"The first part of the question is correct. There is no replacement. It is only the female which produces the eggs. A very careful separate study is being made. But in the best of circumstances, there will be a small number of females which enter into the environment. In this case, one of the scientists of the unit has received a National Invention Promotion Award for inventing a devise for separation of sexes. In any case, in experiment with sterilised males, the females have also been sterilised and therefore cannot reproduce. Now, the males as well as the females have been sterilised. The chances of the sterilised females reproducing are far less."

3.6.3. When the Committtee pointed out that this was only a matter of opinion, the witness stated:

"In scientific progress, they are always opinions. Those who progress in science do many things with ideas and concepts in mind, but when they test them they may not turn out to be as useful and proper as they expected it to be. Scientific reasoning shows that the statistical chances of a very small number of females entering and replacing the others—most of these are not sterile—are very very remote. I certainly concede your point of view. This point has to be kept in mind and in the other cases, it is our own mosquitoes, as I told you, which have got into the environment. There is some kind of feeling in regard to this, if I may be permitted to say so. There are many aspects of this in which there is a lot of difference of opinion even among scientists. The strains which are proposed to be released are not those who have come from abroad. They are those which are engineered by the unit

which have the genome, as we call it, of the Indian mosquitoes or Delhi mosquitoes, or whatever it is. In my personal view, the possibility of the danger, which is visualised, is negligible and I do not know what other word I can use except to say 'negligible'. This point has certainly to be kept in mind, and I am sure, the administrators who will later on look into the programme, if it is expanded, will look into all aspect very very carefully."

3.6.4. On this question, Shri Raghavan, Editor-in-Chief, Press Trust of India, stated during evidence:

"Under this project, they were going to release per day (it is there in the protocol which they have signed) five hundred thousand mosquitoes after a process of sterilisation. Now, according to their own published literature, they release the mosquitoes after they emerge from pupae, which will give both male and female mosquitoes. Even under the best of conditions by separation at the egg stage, it may give you 99.8 per cent males. So, for every 200 mosquitoes released, there will be one female mosquito and Tiopera chemo-sterilisation sterilises only the male and not the female....So, only 99·8 per cent are males and the females are not sterilised. Originally they used to put Tiopepa on mosquito breeding rafts in the wells but when the National Herald wrote about it saying that they were spoiling the wells, they hit upon the idea of treating the pupae and allowing the mosquito to come out and then releasing them. They released them within 36 hours of their coming out. When we asked them 'How did you do it? After all, will they not contain female mosquitoes also which may mate with male mosquitoes?' They said that it will not happen, as the non-sterile females would have mated with males before release. Actually mosquitoes mate only 48 hours after they came out of the pupae stage by when they are already released. The female mosquitoes they release can mate with other male mosquitoes of the same strain in the local population or, if the sterilisation is not complete, with their own male mosquitoes. In any event they would have released more female A.A. mosquitoes in Sonepat than the native population. As a matter of fact, in another experiment at Delhi, this is exactly what happened—though they gave different reasons for the failure. In Delhi, they played

around with Culex Fatigans and, from their own documentation I can show that what they have said was not correct. Their experiment with the Culex Fatigans did not eradicate the mosquito population. I am a Physics Graduate. As a scientist, if I come to the conclusion that a particular thing did not come out right for X, Y or Z reason, I will go back and conduct an experiment eliminating the factors X, Y or Z and see whether it succeeds and then only I can conclude that the experiment failed originally because of a particular reason. When the experiment failed in the Delhi villages, these people came to the conclusion that mosquitoes from outside invaded these areas and the 3.5 km. zone, that they had set up was not sufficient; it required 11 km. zone. They did not try the experiment again and find out that their theory was right. They went ahead and printed that theory! They did not prove the reasons for this failure and that it was because of this 3.5 km. zone. As a matter of fact, the paper that I have given to you, Entomologists study, the foot note clearly suggests that the experiment failed for other reasons, not because of invasion. How did they come to the conclusion that the mosquitoes that came from village 'A' to village 'B' could not be stopped and cause the failure of the experiment. Without any scientific proof they came to this conclusion, abandoned the experiment and decided to go to Sonepat for their Aedes aegypti work."

3.6.5. The views of an entomologist, who wishes to remain anonymous, on the application of genetic control techniques, furnished to the Committtee by Shri Raghavan are reproduced below:

**"Application of Genetic Control techniques.**

It is not an alternative to insecticidal control of vectors. The method will be used as an adjunct to other methods *e.g.* to eliminate the few insects that remain after insecticidal application'. Therefore, population suppression by conventional methods is necessary. Its applicability is limited as it can work only against an isolated mosquito population. Davidson says 'compulsorily it should be a literal island outside the flight range of the insect to be controlled'. He further states: 'passing from small pilot project to large scale application is largely wandering into the realms of unknown at this stage in the development of

genetic control methods. We only have the experience of screw-worms to go on and this involved an insect normally occurring in small numbers and apparently with a low capacity to increase. To many people the extension of such techniques to the control of insects with a known high rate of increase is inconceivable especially where such insects are spatially continuous over large areas Scholtens (1974) adds: 'We now know that field trials which test the effect of genetic factors on natural populations can be conducted only in isolated ecological localities if they are to provide data on the effect of releases on population densities. And we know that the value of genetic control of mosquitoes is large but still only potential'.

**Techniques and previous experiments**

There are many techniques which are commonly grouped under 'genetic methods', and the most important is the sterile male technique. Male mosquitoes are sterilised either by irradiation or by chemosterilants. Irradiation technique is not currently advocated because of the lack of a source at all places where such genetic control techniques may be used. Chemosterilisation is more popular technique. Chemosterilants can have a variety of toxic effects. 'It is their mutagenic effect that they are active at their lowest dosages. Mutagenic effects are difficult to evaluate both scientifically and ethically and according to MacDonald's review it calls for caution in the use of chemosterilants' (Curtis, 1974).

Since these two techniques involve mass release of mosquitoes, automation and mechanisation in the production of mosquitos and sex separation is involved. Depending on the quality of mosquitoes reared, the percentage of females going into the releases varies. Even in the most ideal and controlled conditions, 0.6 to 1.0 per cent females are released. (More than 350,000 males were released per day in one of the experiments in South Delhi which means anywhere between 2100 to 3500 females are released in the population).

Laven's cytoplasmic incompatibility is another technique which does not involve irradiation or chemosterilisation. This is also used as a sterile male technique in that only males are to be released. But in large scale releases a high percentage of females going into the wild population is inevitable. The drawbacks of this technique is, that there are many crossing types in the wild population. Subba Rao et al (1974) says: 'Polymorphism of cytoplasmic crossing type exists in the local population in Delhi and Faridabad area. This shows that the integrated or genetic strains at present in use in Delhi is not an ideal choice for use and other foreign strains will now have to be tested'. There are diverging opinions about what really causes incompatibility. Yen and Barr (1974) say that maternally inherited entities which professor Laven had previously shown to be determinants of cytoplasmic incompatibility can be identified with specific types of symbiotic rickettsiae. Thus cytoplasmic incompatibility joins the list of cases of cytoplasmic inheritance which are attributed to trans obarially transmitted micro-organisms. Let us now take the examples of some experiments where success has been claimed:

"Sea Horse Key is a small island off the coast of Florida where chemosterilised releases were made (Patterson et al 1970). The daily production was about 1300 males per day in the island. They released sterile males at a ratio of 2:1. Though sterility was induced into the natural population no eradication was achieved.

Prof. Laven (1957) released males of a 'cytoplasmic incompatible strain' in a small village Okpo near Rangoon in Burma. He released 2000 males per day and later increased the rate to 5000 and claimed a release ratio of 1.2:1. The releases were conducted for 80 days and in all 275,000 males were released. He claimed eradication on the basis of finding all the 65 egg crafts he collected 'failing to hatch'. Laird (1967) however rebutted this claim as he found the rafts he collected still hatched and the equatic stages were present in the environment.

In the Delhi unit many small releases gave inconclusive results. The two major experiments are (1) release of chemosterilised males in Dhulsirus village with a barrier

zone 3.5 km. radius and (2) release of males of genetic strain (cytoplasmic incompatible—D3) in Gommenhera village, also with a 3.5 km. wide barrier zone around it. In these two cases the results were different. In the former, no population suppression was achieved and the sterility reduced increase to 85 per cent only when the wild population decreased due to seasonal climatic conditions. In other words, the system does not work against the reproductive potential of culex fatigans. The daily releases ranged from 250,000 to 350,000 males per day and very high release ratios (about 300:1) were obtained. In the later case, at Gommenhera also, some eggrafts collected did not hatch but the population control was not achieved. In both the experimental village and in the control village, the rate of decline in the population was same indicating that decline is due to the seasonal changes in the mosquitoes population (which declines as the winter approaches). More than 100,000 males per day were released.

Though the unit has been in existence since 1970, the most significant contribution has been the study on the ecology of mosquitoes. The results have shown that genetic control techniques have with the available know-now at present no chance of success against a species like culex fatigans. A full-fledged genetics section charged with the task of finding a genetic strain and staffed with four Indian and one foreign geneticists have not succeeded in producing a strain ready to go into release. This is not because of lack of trying nor is it a reflection on the ability of scientists—Indian or Foreign. But it is simply due to the fact that our know-how is so limited in the field of mosquito genetics that it will take another five to six years before a safe and efficient genetic strain is produced and ready for use in the field. Such a strain must have bi-directional and complete incompatibility and with a translocation giving a high female sterility which is stable. We have no hope of obtaining such a strain."

3.6.6. An extract from an article by Dr. H. Laven, Director of the Institute of Genetics, Johannes Gulenberg University, Mainz, which appeared in the 'German News' bulletin dated 1st February 1974, is reproduced below:

"For several years the WHO-ICMR Research Unit on Genetic Control of Mosquitoes has tried to control mosquitoes with

the so-called sterile male technique. Males of the common mosquito species Culex fatigans, in the southern parts of India a very important sector of filariasis, were totally sterilised by a treatment of the pupae with a chemical. It breaks and destroys the chromosomes and the males are therefore sterile. When such males are released into a wild mosquito population and if they copulate with normal females, no offspring will be produced.

But in spite of tremendous numbers of sterile males released in an isolated village inhabited by a rather small wild mosquito population, the effect was disappointing. From February 15 to April 21 last year, a total of 13.5 million sterilised males were liberated in Thulsiras village, south west of Delhi. Only about 91 per cent of the eggs laid by wild females in the tenth week of the experiment were sterile. The population was not affected by this small loss: on the contrary it increased tenfold. Also, the continuous release of about 300,000 males per day up to the end of the July had no impact at all on the wild mosquitoes."

3.6.7. The Committee asked whether the Task Force had warned that the genetically manipulated mosquitoes essentially carried a disease. Dr. Ramachandra Rao stated during evidence:

"I do not know what this statement means because no mosquito essentially carries a disease. A mosquito has to feed on an infected person, live for certain period of time and then infect another person. No mosquitoes intrinsically, I would not say essentially, are capable of carrying disease. The question whether they carry disease or not depends upon the presence or absence of virus in the locality. A freshly hatched mosquito is not at all capable of carrying any disease."

3.6.8. In reply to another question whether Dr. Laven had warned the GCMU against the movement of a particular strain of genetically manipulated mosquitoes, Dr. Rao stated during evidence that he would have to check this up. Subsequently, in a written note, the Department of Health stated that the Ministry was not aware of any warning of Dr. Laven to the GCMU against the movement of the genetically manipulated mosquitoes.

3.6.9. The Committee desired to know the scientific basis for the GCMU experiments in South Delhi in view of the fact that infiltration was a problem with mosquitoes and the US experiments had also shown that infiltration from adjacent areas would make any control programme by the genetic method meaningless. Dr. Rao stated during evidence:

> "If the genetic control has to be applicable in India, it has to be done in the continental and peninsular India and not in isolated islands. If we develop a technique specifically for an island, it has no practical importance. Tomorrow, I will recommend to the Government 'please close this'. Our main aim, as scientists, is to utilise this technique and use it for the benefit of our rural people, of the million of our people, and not a few people, isolated people, who live in small islands and to do that, we have to engineer them, we have to study the strains, we have to study the biological characteristics of the mosquitoes, the physiographical characteristics of the localities etc. I can say this from my experience of mosquitoes during the last 40 years that the degree of infiltration which is found in villages in South Delhi is of an order, which has not been noticed anywhere. I have myself worked in South India in many places, in rural areas. As a matter of fact, from the wide experience of the National Institute of Communicable Diseases, it is found that the presence of culex fatigans breeding heavily in the wells of rural Delhi was something which was not expected. But, even the dispersal depends upon the environment. If there is only one source for blood meal surrounded by 500 acres of rice field, all the mosquitoes will come there. If this 500 acres of rice field is dispersed in other places, the dispersal patterns of the mosquitoes vary. Because the dispersal patterns vary, we have tried this experiment in different places. In the Technical Planning Review Committee—the D.G., ICMR chairs these meetings regularly—it has been decided that the urban localities should be explored and a team, I believe, has been going round and studying the possible urban sites for such analysis where the dispersal patterns will be very different."

3.6.10. The Committee asked whether it was true that the screw-worm experiment on the US mainland had been successful only after

setting up a 1500 mile long and 400 mile wide barrier zone and what would be the cost of setting up such a barrier zone. Dr. Rao replied:

> "Screw worm is very different from the mosquito. The conditions required for these two are totally different. Screw worm flies long distances. It is a longer lived insect. It does not travel 100 miles at a time."

3.6.11. When asked whether a barrier zone was necessary for mosquitoes, the witness stated:

> "In my view, a barrier zone is not necessary. If genetic control envisages the establishment of an effective barrier zone within 3 kms., we cannot think of it because its cost will be high. It was needed only for the purpose of experiment to keep away mosquitoes and to see how the genetic control affects their population. If at all we need it, we would be able to use it as a public health measure."

## 7. **Control of Aedes Aegypti**

3.7.1. Initial experiments in the GCMU had been largely devoted to the culex fatigans species since considerable data were already available on the genetic control of these mosquitoes. The project has also, however, been extremely preoccupied with yellow fever mosquitoes, aedes aegypti.

3.7.2. Extracts from notes on aedes aegypti and yellow fever submitted to the Committee by Shri Raghavan are reproduced below:

> "*Gcmu's Major Plan for the Control of Aedes Aegypti may let yellow fever strike India.*
>
> GCMU had originally planned to do this month a maior genetic experiment in Sonepat to eradicate yellow fever transmitting mosquitoes (Aedes Aegypti). Till the beginning of February the Health Ministry and ICMR had been keenly intent on GCMU carrying out the experiment. But somehow the experiment was abandoned two weeks ago, apparently a belated effect of last years PTI report. The planned experiment was unscientific and there is enough published evidence to show that eradication of Aedes Aegypti may open the door for yellow fever.
>
> There is plenty of aedes aegypti in India but they have been spreading dengue fever, a mild flu-like illness. It is also

known to be a vector of yellow fever virus but so far no yellow fever had occurred in India or in South Asian countries. This has not happened because people who once get dengue, become immune to yellow fever. In other words the Aedes Aegypti perform a beneficial role by spreading the relatively harmless dengue and thereby protecting Indians against fatal yellow fever which had recently wiped out many thousands of people in Ethiopia. In this context the GCMU rationale for the aedes control experiment in Sonepat and Health Ministry's priority (in the face of malaria) to the experiment which its potential for possible harm to the security and the health of the country is not understandable.

Evidence exists to show that exposure to dengue fever affords protection against yellow fever. Those who have given such evidence are C. G. Pandit, the First Director of ICMR and an vellow fever authority often consulted by WHO from 1940s and Dr. Max Theiler of Rockefeller Foundation who received Nobel prize for his very work on yellow fever.

In his Gharpore oration (published in the Journal of Indian Medical Research—October 1971) at the Haffkine Institute Dr. Pandit said 'Today because of the danger of dengue fever epidemics we are advocating eradication of Aedes Aegypti mosquito from our midst. If we succeed would we then lose the umbrella of protection against yellow fever which we have today? It might be argued that in that case the danger of introduction of yellow fever would also recede. It is however necessary to remember that we also have Aedes albopictus and Aedes vittatus which are prevalent all over the country and can transmit the infection. We have had no occasion also to examine the susceptibility of other species of mosquitoes for yellow fever infection'.

In other words Dr. Pandit had warned that eradication of aedes aegypti would not eradicate the vector of yellow fever but only the beneficial dengue fever. Once this natural protection is lost the other species of mosquitoes like aedes albopictus and aedes vittatus would take up the role of spreading the yellow fever virus.

Dr. Pandit further said, 'Previous exposure to dengue fever virus, affords a varying degree of protection against Japanese B encephalitis, Murray Valley Encephalitis, St. Louis encephalitis and probably against West Nile Virus infections'. Therefore, Health Ministry 'plan' for eradicating dengue would intensify the health problem with the establishment of all these diseases mentioned by Dr. Pandit.

A similar warning against the control of aedes aegypti was issued by Dr. T. Ramachandra Rao, ex-director of the Virus Research Centre (VRC) at Poona and ex-GCMU consultant. In his Dr. Narayana Rao oration at the ICMR a few weeks ago Dr. Rao asked the Health Ministry to exercise caution in the eradication of dengue fever from India. He said that not only Aedes Aegypti but also culex fatigans (filarial mosquitoes) play a beneficial role, the latter giving protection against West Nile fever.

But the most authoritative and important evidence on cross protection has come from Dr. Max Theiler after exhaustive study at the Carribeans and Trinidad. There is experimental evidence to show that dengue fever offers protection against yellow fever and these experiments were carried out in the Rockefeller Foundation Laboratory at New York itself. The results of the tests, according to Dr. Theiler 'showed that dengue one and dengue two immune sera gave a clear protection against yellow fever'. Dr. Theiller's book (Arthropod brone viruses in vertebrates—1973) further says 'The conclusion is inevitable that all group B infections (dengue belongs to group B) in man lead to the development to a greater or lesser extent of antibodies capable of neutralising yellow fever'. Dr. Theiler further says: 'It has been shown conclusively that dengue immune sera have the capacity of neutralising yellow fever virus. It has been shown that all human sera containing group B antibodies from West Africa, Tanzania, Malawi, Sudan, Egypt, India, Malya and Hongkong are all capable of neutralising yellow fever virus. It seems a general law that any group B infection in man leads to the development of antibodies capable of neutralising yellow fever virus'. In the jargon of virology, group B infection includes dengue fever. It

**is important to note that Dr. Theiler's statement that any group B infection can give protection against yellow fever.**

Dr. Theiler's book describes real events in Africa that confirm his laboratory findings. For instance, in Ethiopia in 1960—62, a major yellow fever epidemic appeared. Dr. Theiler says of this epidemic 'While we have no information on the group B immunity status of the population in Nuba mountains of Ethiopia, our studies have given us considerable information concerning the prevalence of group B infections in the various provinces of Ethiopia. Here it is clear that an epidemic of yellow fever with a high mortality occurred only in those regions where the incidence of group B antibodies was low. In Ilubador region with a high group B antibody rate the epidemic failed to develop'.

Theiler added 'A remarkable feature of yellow fever epidemic was that in spite of the large number of Aedes Aegypti in Port-of Spain and other towns no urban epidemics occurred. No large epidemic of yellow fever occurred in Port-of-Spain due to the fact that dengue was endemic in the city and that a large percentage of the population was dengue immune. Because of the immunological overlap between dengue and yellow fever it is postulated that a population immune to dengue is relatively insusceptible to yellow fever'.

Throughout two chapters in his book, Dr. Theiler had made it clear that dengue gives protection against yellow fever. He says: 'The high incidence of such (group B) antibodies in the indigenous population in West Africa may thus be the reason for the comparative scarcity of fatal cases of yellow fever in the region'.

The conclusion seems to be clear. The indigenous population of India have antibodies of dengue which belongs to group B infection. It is the prevalence of these antibodies that had fortunately prevented yellow fever from forming a focus in India, despite the innumerable opportunities—through jet planes, arab dhows and smugglers boats—for bringing the dangerous virus from yellow fever endemic areas in the world. Therefore, the Health

Ministry should not even entertain the thought of any control programme against Aedes Aegypti unless the Ministry's scientists can disprove—scientifically—Dr. Theiler and Dr. Pandit."

3.7.3. During evidence tendered by the official witnesses, the Committee desired to know the justification for experimenting on yellow fever mosquitoes when the disease was non-existent in India. Dr. Ramachandra Rao stated:

"The three species of mosquitoes which were selected for study are the most common mosquitoes in India which bite many millions. Secondly, the virus which causes yellow fever in the western world does not occur here. As far as we are concerned, there are the chikungunya and dengue fever viruses. Aedes aegypti causes chikungunya. In the year 1964-65, several million people in Tamil Nadu suffered from chikungunya fever in the course of 3 months. Is the prevention of this illness not justified scientifically? The dengue fever is a breakbonefever under which a man likes to die but does not die. The disease itself is not fatal but in cities where there are factories and armies of human beings it can create a lot of morbidity which can justify this project on economic, apart from humanitarian considerations."

3.7.4. To another question whether yellow fever mosquitoes could also cause dengue, Dr. Rao replied in the affirmative. He added:

"Studies and hypotheses are going on, in this field of study for the last 50 years; but nobody has come out with a satisfactory answer. I have myself worked in Africa. I have my own hypotheses. The other question was about Anopheles stephensi. In Anopheles, the first idea was to test the genetic strains. The programme envisaged for Anopheles stephensi, one of the malaria-carrying viruses, is in the final stage of preparation."

3.7.5. When the Committee pointed out to the witness that the evidence that yellow fever mosquitoes also carried chikungunya and dengue viruses had been established only recently and that the incidence of dengue was insignificant compared to malaria and filaria, Dr. Rao stated that though chikungunya did not appear in a particular city year after year, it had been occurring frequently in

different years as in Visakhapatnam, Madras and Calcutta. He added:

> "This fever was not known before 1963; but there are some serological evidences. When we studied the sera of elderly people above the age of 50, antibodies were found which indicate that it had occurred; but for some reasons which we have not understood, they had not developed a further. The fever occurs in explosive outbreaks and disappears."

3.7.6. In reply to another question whether it was not a fact that chikungunya had not occurred very much during the last twelve years, the witness stated:

> "I would say that it does occur in India, and in Barsi in Maharashtra during 1973 there was an explosive outbreak. Before that, during 1963, 1964 and 1966 it had occurred in a number of places."

3.7.7. A summary of recorded outbreaks of dengue in the country furnished to the Committee by the Department of Health is tabulated below:

| Year | Place | Dengue virus type | Haemorrhagic manifestations |
|---|---|---|---|
| 1966 | Jabalpur | 3 | .. |
| 1967 | Delhi | 2 | None |
| 1967 | Asansol | — | Sporadic |
| 1968 | Vellore | 1, 2, 3, 4 | .. |
| 1968 | Kanpur | 4 | Small percentage |
| 1969 | Kanpur | 2 & 4 | Occasional |
| 1969 | Aimer | 1 & 3 | Several cases |
| 1970 | Delhi | 1 & 3 | .. |
| 1970 | Gwalior | 3 | .. |
| 1971 | Jaipur | 1 & 2 | .. |

3.7.8. The Committee desired to know the basis on which it had been decided to undertake research on Aedes aegypti mosquito from the point of view of its vector qualities as a transmitter of dengue

and desired to furnished with copies of the minutes of meetings, if any, held in this connection. The Department of Health informed the Committee, in a written note as follows:

> "Decision to carry out work on Aedes aegypti along with other species of mosquitoes was taken at the meeting held in Health Secretary's room on 6th November, 1968. The fact that Aedes aegypti is a transmitter of Haemorrhagic fever was brought out in the comments of Director, NICD when this project was referred to him. The then Director, NICD also attended the meeting on 6th November, 1968. It is, therefore, to be assumed that the members of the Group that met on 6th November, 1968, were aware of the fact that Aedes aegypti is a vector of Dengue."

Copies of the minutes of the meeting held on 6th November, 1968 and the comments of the Director, National Institute of Communicable Diseases, furnished to the Committee by the Department of Health are contained in Appendix V.

3.7.9. The Committee desired to know whether any prior consultations had been held with the Virus Research Centre, Poona on the advisability of eliminating dengue and the dengue carrying Aedes Aegypti mosquitoes. The Department of Health confirmed in a written note furnished to the Committee that the proposal on the genetic control of culicine mosquitoes had been referred to the Director, Virus Research Centre, Poona. The comments of Dr. Ramachandra Rao, the then Director, furnished by the Department were as follows.

> "I have carefully gone through the Memorandum and consider that the project, if successfully executed, will become a landmark in the history of vector control.
>
> It is presumed that the ICMR will be fully in the picture in all stages of the programme, particularly in the technical scrutiny and execution of the project. The outline now prepared is more or less in general terms but I am sure that before the work is implemented a more detailed programme will be prepared. There are also several theoretical questions which need further elucidation. As stated in the body of the Memorandum no one can guarantee the success of such schemes of genetic control as

attempts at such control under field conditions have been very few.

While the studies on Culex fatigans can be carried out at Delhi with the NICD as the main participant. I feel that the studies on Aedes aegypti should be carried out in South India with the VRC as the main participant. The entomology staff of the VRC are fully conversant with the problems connected with Aedes aegypti and can contribute significantly to the study when it is organised.

I am making no comments regarding the organisational set up as I hope that a suitable one can be prepared by mutual discussion at a later date.

I shall be glad to offer my assistance in the project at all stages because of my long personal association with studies on mosquito control and behaviour."

3.7.10. The Committee asked whether it was correct that yellow fever mosquitoes were extremely susceptible to DDT and, if so, why it was not necessary to develop a genetic method to deal with Aedes aegypti. Dr. Ramachandra Rao stated during evidence:

"The Anopheles stephensi which were susceptible to it, have now become immune, posing a serious threat to our malaria! programme. The main philosophy underlying these experiments which are being done under the auspices of ICMR is to develop new technology to overcome the use of persistent and harmful insecticides which have the predilection or property of contaminating the environment. If we do develop genetic techniques, they cannot be applied in every place; but there would be vast areas in India where they would be of use. If we can develop our technology and can use it in our country, why should we wait for some others to develop it and then copy it? This is my attitude as a scientific worker on the subject for the last 10 years. The fact that Aedes aegypti is susceptible or not to DDT is not the main reason. Aedes aegypti has got certain habits which anopheles has not got. It goes with man; it does not occur in rural areas or forests, but in urban environment and in contact with men. It does not bite other animals. Aedes aegypti does not normally fly more than 25 kms. If we had a mosquito of that kind, how can we control it? We have to study

the dynamics of the mosquito population; what will be their method of migration etc. I would justify such a study on the basis of biological interest, if on nothing else."

3.7.11. In reply to another question whether it was not a scientific fact that the genetic technique developed for Aedes aegypti could not be used for culex fatigans or for anopheles, the witness stated:

"The general principles can be applied; but the specific details of work in connection with the particular species cannot be applied. There are 3 types of mosquitoes on which we are working, of which this is one."

3.7.12. The Committee enquired whether the results obtained in one particular place could be equally applied to other places in the country, in view of the ecological and climatic differences. Dr. Rao stated:

"It is absolutely true that the findings of a study on how a mosquito behaves in one locality cannot be used for areas just 15 miles away. Everything depends upon the environment and the particular mosquito. It is for the scientists to study as to how the behaviour changes due to environment and understand patterns of this behaviour, to draw laws of behaviour and utilise the knowledge, wherever necessary. It is not like the laws of physical sciences. The physical laws will be purely theoretical, whereas we have to test it (laws of behaviour) in different places. Sonepat has been selected probably because it has an isolated population, close to Delhi."

3.7.13. The Committee desired to know whether it was a fact that Dr. Pandit had warned against the programme for eliminating dengue and the Aedes aegypti mosquito from India and requested that the minutes of the meetings, if any, held at the ICMR prior to the publication of the PTI report, to consider Dr. Pandit's warning. In a written note furnished to the Committee in this regard, the Department of Health stated:

"Dr. C. G. Pandit delivered the first Charpure Memorial Oration at the Haffkine Institute, Bombay, on 29th May 1971 on 'India and the Yellow Fever Problem'. This oration has been published in the Indian Journal of Medical Research (Volume 59, pages 1523—1547), 1971. In this

oration Dr. Pandit discussed various facets of yellow fever problem and speculated as to why yellow fever had not entered India. He had further speculated the possibilities as to what would happen if Aedes aegypti was controlled. He had raised questions such as:

(i) If we succeed in control of eradication of Aedes aegypti would we then lose the umbrella against the yellow fever;

(ii) In the event of eradication of Aedes aegypti, can Culex fatigans assume the role of transmitter of infection;

(iii) Would control of Dengue fever pave the way for other viral agents such as Japanese N. Encephalities;

The evidence that Culex fatigans can assume the role of transmitter is based on very preliminary evidence.

If Culex fatigans were to assume the role of transmitters of infections for yellow fever, these should have occurred much earlier as the density of this species and Aedes aegypti is non-existent there.

The Japanese B. Encephalities is already prevalent in different parts of the country, irrespective of whether dengue fever is prevalent or not.

No meeting was held to discuss this subject and therefore there are no minutes. It may, however, be pointed out that all these thoughts were raised in a lecture and this need not be construed as a warning against the programme.

It may be mentioned that Dr. C. G. Pandit was a member of the General meeting of the Expert Committee on Virus and Arthropod Borne Diseases and Geneticists which met on 16th October, 1974 and recommended the continuation of the Project."

3.7.14. Considering the fact that Dr. Pandit was the foremost authority on yellow fever in India, the Committee desired to know whether any other experts had been consulted before overruling his view and launching the experiments with Aedes aegypti. The Department of Health stated in a written note:

"The thoughts raised by Dr. C. G. Pandit in his lecture are not to be construed as a warning against the programme. As such other experts were not considered.

**It may be mentioned that the entire programme of the Genetic Control of Mosquitoes Unit was reviewed by the Joint meeting of the Expert Committee on Virus and Arthropod Borne Diseases and Geneticists on 16th October, 1974. Dr. C. G. Pandit, who also attended the meeting, headed the drafting committee appointed to prepare a report."**

3.7.15. Commenting on the views of Dr. Pandit against the eradication of Aedes aegypti, the Director General, Health Services stated during evidence:

"I presided over this oration. Dr. Pandit is a very well known and renowned scientist and we consider his views with great deal of respect. He has got as one of his qualities of throwing in in the meeting and in the oration provocative challenges and ideas to stimulate scientists to thing on those lines. I had long discussion with Dr. Pandit on these subjects. It is with a view to stimulate scientific interest in this field. The reasons why yellow fever has not been able to take a foothold in India are really very interesting and intriguing. There is a great deal of air traffic between African Countries and India. There is every possibility, with these large jumbo jets that fly to and fro that certain number of mosquitoes in spite of precautions can find their way from one Continent to another. As a preventive health measures we quarantine people not immunised against yellow fever; we also take steps to disinsectize the aircraft with aerosals. But I may say that I will be the last person to state that these public health measures of quarantine and immunisation etc. will keep the virus of yellow fever out of the country. We have been speculating about various reasons why yellow fever has not come to India in spite of quick transport and larger traffic. In India there are certain other viral infections like the Japanese B Encephalitis and Dengue fever which have got some relationship with yellow fever disease or virus. This is one of the hypothesis. Dr. Pandit anticipated and said: Look here, gentlemen, if you are going to eliminate these diseases from this country, if you eliminate the vector responsible for spreading these diseases, are you not making the population susceptible to yellow fever? It is a natural immunising process which is going on as it also happens in the case of poliomylitis which we discussed last time when natural sub-

clinical infection takes place in the community, which prevents subsequent virulent spread of the disease. Therefore, he goes to the scientific world and says: 'If you take any public health measures, please also take into account this factor that in the process of eliminating a certain disease, you might user in another new type of disease'. It is a very interesting possibility which should be kept in mind. We have debated this at length, but the question of control of Aedes aegypti completely by these methods and techniques only arises when, by traditional and conventional methods, we have diminished the population of these mosquitoes to a very low level by insecticides, by environmental hygiene, by proper water management and control and that there is no fresh water collections on house tops and things like that. These are the traditional known methods for the control of mosquitoes. After their population has been reduced a great deal, then for the residual number, some new facets and ideas like genetic control, male sterile release technique etc may be tried, but we are not anywhere near that stage yet. The mosquitoes are very large in numbers and we have to adopt the traditional and conventional methods for a long time. This has to be in conjunction with the traditional methods rather than as a replacement of the normal methods and techniques of control of mosquitoes. So, these ideas of Dr. Pandit were interesting and provocative. We are aware of this. From time to time we have been discussing this possibility the same will also be kept in mind. Science is always growing and we cannot rule out any possibility and this possibility is very much in our mind."

3.7.16. The Committee pointed out that despite the provocative views expressed by Dr. Pandit, the Government had construed these as casual utterances and had not consulted other experts. The witness stated:

"This subject has been discussed at length between various virologists, immunologists and public health workers and, as I said, I have myself discussed it with Dr. Pandit a number of times and I must say that it has been discussed in the ICMR. And I would say in all humility that in science one should keep a very open mind and this possibility I for one would not completely rule out, though it

seems to be rather remote and very farfetched, but everything should be kept in mind and this possibility also should be kept in mind."

3.7.17. The Committee desired to know whether any minutes of these discussions were available. The witness stated:

"A good few of them will not have minutes. They were discussions. When he comes here, we get together over a cup of tea or in the evenings. But there was one meeting on yellow fever which was held specially three or four years ago. It was a formal meeting and its minutes will be available, but that is a rather old meeting. But this discussion has been going on. This oration was given about two or three years ago and subsequent dialogue has been on a scientific basis rather than as an informal meeting."

3.7.18. In reply to another question on the extent to which Dr. Pandit's views had been accepted or rejected, the Director General, ICMR, stated in evidence:

"Actually, in October we had a meeting of the Virus and Arthropod Borne Diseases Expert Committee to which we had specially invited Dr. Pandit and he participated in the discussion very extensively. In fact, at the end of that discussion he was appointed Rapporteur to draw up the minutes, the consensus and the final conclusions of that meeting."

He added that the leading and best virologists and experts on arthropod-borne diseases had been brought together in this discussion and that the expert committee had indicated the safeguards which might be built in into the project in its further studies.

3.7.19. Referring to Dr. Pandit's theory, Shri Raghavan, Editor-in-Chief, Press Trust of India, stated during evidence before the Committee:

"As a matter of fact, when Dr. Pandit's theory was thrown up before them, at first they tried to pooh-pooh it until somebody told them that it was backed by Theiler. They then asked Dr. Pandit to join the expert group."

3.7.20. Dr. Pandit had expressed his views in May 1971 and the expert committee had been set up only in October 1974. The Committee desired to know why it had taken more than three years for taking official cognisance of Dr. Pandit's oration. The Director General, Health Services, stated during evidence:

> "I have presided over such meetings and given orations myself. In orations ideas are thrown and philosophies are developed, which we discuss informally amongst the scientists. But unless there is a very very pressing reason and very irrefutable scientific data are before us, one does not go about constituting committees and verifying the veracity of such statements. But, for scientific development work is being done at VRC, Poona and the NICD, Delhi and this idea is kept in mind. In animal experiments, for example, if a monkey is immunised against a particular virus, if we were to challenge it by another virus related to it, like dengue fever or chikungunya, will it be refractory to the challenge? These are the possibilities that are kept in mind always. If it does come, we come out with a publication saying 'yes, there is veracity in the statement; there is complete blocking of the virus, or partial immunity given to the animal, or one-fourth immunity or no immunity at all'. These are things for which no specific meeting is held. Such work goes on and one goes on referring to an idea given by so and so. I have given many ideas about the migration of birds, which have borne fruit, which the Russians have used. But one does not go on holding a meeting. This goes on as such in the scientific world."

The Director General, ICMR stated in this connection:

> "It is not as if between 1971, when Dr. Pandit made this statement, and 1974, when we invited Dr. Pandit, no committee had met. Experts and Virologists had met to consider the various aspects of the problem. But in 1974, we specifically made it a point to call Dr. Pandit so that he could interact with Virologists and we could come out with a consensus."

3.7.21. The Committee enquired whether any records were available to show that Dr. Pandit's warning had been constantly borne

in mind. The Director, National Institute of Communicable Diseases stated during evidence:

> "Initially, the main work of the Unit on Genetic Control on mosquitoes was confined to culex fatigans and all attention was given to the various aspects of this mosquito as well as the diseases transmitted by this type of mosquitoes. Later on, some work has been done on the genetic control on another variety. In genetic control, if a mosquito strain has been manipulated, only then there is some chance that either it becomes a better or poor nector of disease. When the work on genetic control on mosquitoes was done, there was a possibility that there may be small-scale release of genetically manipulated trolled aedes aegypti. Consideration was given to whatever Dr. Pandit had said and whatever literature was available on the nector potential of this species of mosquitoes was perused. But I may say that at the moment the strain which could be released is not ready. Preparatory work has been done. If and when the strain is ready, we are prepared to see that all the precautions are taken and everything by way of safeguard is incorporated if and when the experiment takes place."

The Director General, Health Services, added in this connection:

> "Coming to the specific genetic control of mosquitoes, regarding the possibility raised by Dr. Pandit, there are many other possibilities which have been raised by many other scientists. They will all be examined fully. Once we are completely satisfied, then the experiment of release of sterile mosquitoes would be undertaken. That opportunity has come now. This is the right time for us to determine the validity of Dr. Pandit's suggestion with the data that is available before the mosquito release takes place."

3.7.22. The Committee pointed out that mosquitoes had, however, already been released in Sonepat despite Dr. Pandit's warning. The Director, National Institute of Communicable Diseases replied:

> "Whatever Dr. Pandit had said, he did not say anything about the mosquito releases experiment. He mentioned about the control of Aedes aegypti and what particular reper-

**cussions it could have due to that control. And a change in the vectorial capacity of a mosquito can happen if it is genetically manipulated and this will only arise if we are thinking of releasing genetically manipulated strain of mosquitoes."**

3.7.23. The Committee asked when the mosquitoes were first released. The witness replied:

> "The first small scale release was in 1971 and the other was in 1973. The genetical component of these releases was Indianised. They could have been as harmful as the mosquitoes which were already present there."

3.7.24. In reply to another question as to what was meant by Indianisation, the Director General, Health Services stated:

> "Certain strains are brought from outside, and they are treated in certain manner and their genetic structure is changed. In that genetic structure we introduce certain new factors from the indigenous strain. For example, the hardiness of the mosquitoes, the mosquitoes which may be from outside, if they are susceptible to Indian climate, they will die. Therefore, such a release will be of no value to us. So, we want to build in this strain certain Indian characters so that they may be able to survive in the Indian climate and whatever diseases the Indian strain carry, they should also be able to carry. Otherwise, it will have very little value. It is as good or as bad as the Indian strain for carrying diseases or for surviving or for some other factors."

3.7.25. The Committee desired to know whether the field experiments had not started yet. The Director General, Indian Council of Medical Research stated in evidence:

> "These experiments were so far in what I would call the laboratory stage. Now, we have come to a stage when we have got to undertake field releases. It is at this stage that it is very essential for any agency to build in safeguards. So, we have come to a stage of real operation so far as communities are concerned."

In reply to another question whether the mosquitoes had not been released, the witness stated that only very small scale tentative

field studies had been carried out and that the first real operation would be started in February 1975.

3.7.26. Explaining the steps taken for the release of mosquitoes, the Director General, Indian Council of Medical Research stated:

> "We have taken the safeguard that in all the strains before we attempt to release, their ability to transmit other diseases specially yellow fever must be decided and it must be established that this is specially for aedes aegypti. Secondly, we have said that we should be definitely assured that chemosterilised factor (thiopepa) is negligible."

3.7.27. The Committee enquired whether, apart from all these safeguards, any monitoring agency was going to be set up before the field study. The witness replied:

> "We have taken steps to set up a monitoring body independent of ICMR and they will definitely have the veto powers."

When asked how the field experiments could then start in February 1975, when the monitoring agency had not been established, he replied:

> "According to the programme of the project it was to be released in February 1975. I do not say that it should be released in February. It was not my time-table. It was the time-table of the project."

3.7.28. Dealing with the emphasis of the GCMU Project on eradication of dengue, Dr. Jayaraman, Science Correspondent of the Press Trust of India, stated during evidence:

> "I am sure somebody could have explained why dengue was sought to be eradicated when there is an evidence that yellow fever would come in. That made me look for more evidence. Dr. Theiler and Dr. Donnes say: 'It is remarkable how often in older literature the statement is made that new arrivals to the Carribeans are exposed to an acclimatisation fever'. They are talking about the Carribean and Trinidad people. A newcomer to the Carribean was expected to be exposed to a minor disease which was generally called 'acclimatisation fever'. When our soldiers want to go up to Ladakh, they are acclimatised so that they do not get this oedema and other diseases. Here a newcomer to

Carribeans is acclimatised to dengue fever. They found out what acclimatisation fever was and finally it turned out to be dengue. But, in this country, fortunately, naturally, this protection exists. Then where is the question of eradicating dengue? I asked them at the seminar what was the rationale behind even thinking of eliminating it when such evidence already exists in the field. This is a book written by Nobel Laureates and throws light on the trouble that we may have by launching an experiment to eradicate this dengue."

He added:

"There was a seminar of the ICMR. I happened to go over there. I was surprised when I came to know that they were going ahead with this Sonepat experiment. In that seminar, I posed this question to the leader of this particular project. I drew their attention to the fact that they were concentrating all the resources of the unit on this particular aedes aegypti experiment. I asked them, 'why are you trying to remedy dengue?' According to Dr. C. G. Pandit the ICMR's former Director General and an authority in yellow fever, this is a dangerous procedure, because it removes natural protection against yellow fever in the Indian population. They did not know; they did not have the answer. In fact, the GCMU leader told me that he did not know about this cross protection at all. In fact, I was surprised to hear this from him."

Shri Raghavan, Editor-in-Chief, Press Trust of India, stated in this connection:

"The fact is that people who once get dengue fever become immune to the fatal yellow fever. This is a statement of well known authorities of the world including Dr. Theiler who got a nobel prize for his work on yellow fever vaccine...The statement that the Health Ministry gave priority at GCMU for eradication of dengue was not only an unwise statement, but if serious, it was an irresponsible action. If dengue was to have been eradicated through a mosquito eradication programme, the Virus Research Institute in Poona which is responsible for dealing with all viruses in the country should have been consulted. They were never consulted. I cannot prove it, but this is our information and we are satisfied that this is correct."

3.7.29. The Committee enquired from the Ministry of Health whether it was a fact that Dr. Brooks, the GCMU Project Leader had expressed his ignorance about Dr. Pandit's warning at the ICMR seminar. The Department of Health stated in a written note furnished to the Committee:

> "The Indian Council of Medical Research organises every Saturday, informal scientific talks in order to provide exchange of information and views by scientists. On 5th October 1974, the following were speakers on the topic 'Research on Genetic Control of Mosquitoes in India':—
>
> 1. Dr. V. P. Sharma, Senior Scientist.
> 2. Dr. C. F. Curtis, Geneticist.
> 3. Dr. G. D. Brooks, Proje t Leader.
>
> No formal proceedings of these scientific meetings are prepared
>
> While answering the questions from the audience, Dr. Brooks offered no comments on the point raised in the question."

3.7.30. Referring to the decision to continue the Sonepat experiment, Shri Raghavan, Editor-in-Chief, Press Trust of India, stated during evidence:

> "But even after the Expert Committee accepted that dengue gives protection, they went ahead with their decision on Sonepat project and put out fliers on Research on Mosquito Control. Incidentally, I find that these fliers that have been put out are in violation of the Registration of Books Act because I don't find anywhere the name of the publisher and the place it was printed at."

He continued:

> "There are four or five vectors—Aedes Aegypti, Aedes Albopictus, Aedes vittatus and even Culex Fatigans P.P. etc.—and they were purportedly going to eliminate only Aedes Aegypti for eliminating dengue fever. As a matter of fact, Aedes Albopictus and Aedes Vittatus are vestors not only of Dengue but of yellow fever etc., but they were going to eliminate only one variety of mosquitoes. . . The total number in Sonepat female aedes aegypti (which they were going to eliminate) is 900 (according to their studies). In fact, the population of aedes albopictus and aedes vittatus

is much higher than aedes aegypti. There is also the culex fatigans and they are also vectors though very ineifficient ones of dengue and yellow fever. But they were going to eliminate only this particular type of Aedes Aegypti mosquito."

3.7.31 On the question of postponement of the Sonepat experiment, Shri Raghavan stated during evidence:

"Our information is that, as a result of other developments—which I don't feel I should spell out—the Sonepat experiment has been abandoned."

He added:

"The Delhi experiments were field experiments. The Sonepat experiment was a full-fledged field experiment. I have given a map of Sonepat. Some time ago, the Statesman published that the experiment had been abandoned. The National Herald had also published it. The GCMU wanted to go ahead with it. Here is a flier (pamphlet) that was put out. As late as 17th February, they had made some field preparation to release the mosquitoes at the rate of 500 000 a day. Then other things intervened. Now, I understand that the experiment is abandoned. Now they want to transfer, I am told, this entire unit to Pondicherry. My only hope is that if this project is to be done in Pondicherry, let it be done by purely Indians. We should have neither foreign money nor foreign consultants. Even then I would very much hesitate to monkey around until some of our anthropologists and experts go into it. I do not want even WHO to come in."

3.7.32. The Committee asked whether the transfer of the project to Pondicherry was part of the extension of the agreement with the WHO. Shri Raghavan replied:—

"I do not know. There are so many contradictory statements made by the Government. At one stage, they say that the agreement has been terminated; at another stage, they say something else. So, I cannot say anything. All that I would like to say is that if this experiment is to continue, after talking to various people involved in the field, my view is that it should not have any sponsorship from outside."

**3.7.33. The Committee asked whether the GCMU experiment could not be useful to India and whether the Sonepat experiments were not aimed at obtaining information of scientific value for research. Shri Raghavan stated:—**

> "The genetic experiment, even if it is going to be successful is only potential. We do not have technology to create a barrier zone. The economic factor is also there. In Sonepat, even if they would have released more female Aedes Aegypti than the native population, which they were going to eradicate, it was not a serious scientific experiment. When Delhi experiment failed, they advanced theories, why it failed. They did not do this experiment somewhere else in the rural areas to prove the experiment and theory. Aedes Aegypti is one of the three species in Sonepat. Even if it is eliminated, dengue fever would be still there. The whole manner of doing this, the release on mass scale of mosquitoes etc. did not really show that it had a scientific purpose of genetic control, which would be applicable to India with its vast population and economy. You may have a very beautiful method of eradicating the disease, but at what cost."

3.7.34. Some facts about the Sonepat experiments on aedes aegypti furnished by an antemologist who wishes to remain anonymous which were handed over to the Committee by Shri Raghavan are reproduced below:—

> "Aedes Aegypti is not a public health problem in Sonepat. This breeds in cement cisterns where people store water. Among the other species which breed in the cisterns are: Aedes alvopictus, Aedes vittatus and Aedes unilineatas. At present population assessment is made by setting large number of ovitraps distributed throughout the town where eggs deposited by all Aedes species. In some localities, as much as 60 per cent of the eggs hatched turned out to be Aedes alvopictus and some small numbers of other Aedes species. Adult population (Aedes aegypti) estimates give a figure of 771 in an area of 20,000 sq. metre area. The average daily emergence was about 1,800 in an area of 48,000 sq. metres. Hand collection indicate the density of adults to be very low.

Genetic control, whichever technique is used, even if it succeeds is selective against Aedes aegypti only. Even if Aedes aegypti is eradicated, Aedes albopictus will grow without any inter-species competition.

No genetic system has been perfected against Aedes aegypti and a decision whether a genetic strain or chemosterilised males will be used has been postponed till November. Chemosterillants give 100 per cent sterility in males but in females no sterility or very low sterility.

It is contemplated to release 500,000 males per day distributed over 1500 points. The estimated number of females released will be about 2500—3000 females per day—a substantial addition in the peak season and more than the daily emergence in Sonepat in most of the year.

According to Max Theiler and W. G. Donns, Nobel Laureates (1973), dengue has given areas protection against yellow fever in Trinidad, West Indies. Eighty per cent of the population in Port of Spain are immune to dengue. It has been concluded that 80 per cent of the population contained antibodies capable of neutralising yellow fever."

3.7.35. The Committee desired to know the estimated population of female aedes aegypti species in the Sonepat target area. The Department of Health, in a written note furnished to the Committee, stated:

"The number of mosquitoes population will vary in different seasons. The mosquito population estimated in Sonepat target area (both male and female) during 1974 was about 1,15,000 in one day. Half of this would represent the female adult population."

3.7.36. As regards the other species of mosquitoes present in Sonepat and the ratio of their population to aedes aegypti, enquired into by the Committee, the Department of Health stated in a written note:

"Three principal domestic species at Sonepat are: Culex fatigans, A. aegypti and Anopheles stephensi.

Other Aedes encountered by the Unit in the area are:

(i) Aedes albopictus

(ii) Aedes vittatus

(iii) Aedes unilaneatus

(iv) Aedes D Macropterus.

The population of these are extremely low except for a small A. albopictus peak in August when it reaches upto 27 per cent of the Aedes population."

3.7.37. Since the proposed release experiment would only control aedes aegypti, the Committee desired to know whether this would not leave behind other species of aedes mosquitoes that are yellow fever vectors. The Department informed the Committee in a written note that the other aedes species had not been demonstrated to be involved in the natural transmission of urban yellow fever.

3.7.38. The Committee desired to know how it was ensured that, after completion of indianisation, everyone of the mosquitoes would be males 100 per cent. The Director General, Health Services stated:

"The point is very simple. We have got very well known techniques and methods of separating the sexes. We completely take out the males. There is not a single female. Even if there is one chance in a million of one female being there, all these mosquitoes are kept in a cage for a certain period of time and even if the female is impregnated, it will be impregnated by the sterile male and there will therefore be no damage to the environment as there would be no progeny. By screening over 99.9 per cent chances are that there will be no females at all and it will be only the males. The only change is that the males are sterile, but they have other characteristics of the Indian strain. That is what we want, that these males should compete with the local males and impregnate the female mosquitoes as a result of which only sterile eggs are laid and therefore the mosquito population goes down. This is the basic philosophy of the whole experiment."

3.7.39. The Committee asked whether it was true that during a recent oration at the ICMR, Dr. Ramachandra Rao had also asked the Health Ministry to exercise caution in the programme to eradicate aedes aegypti from India and that he had voiced a concern similar to that expressed by Dr. Pandit that not only aedes aegypti

but also culex fatigans played a beneficial role in this country. The Committee also desired to know whether Dr. Rao had ever raised this issue when he was an Officer on Special Duty in GCMU and later a WHO consultant. In a written reply, the Department of Health stated:

"Dr. T. R. Rao, who was consulted, has replied as follows:

'I have made no such statement. In my opinion eradication of A. aegypt. from India is not feasible at present, but good control is feasible in many places.. All that I have stressed is that whether even to control mosquitoes or not becomes a puzzling question. My exact words are: "Let me not pursue these thoughts further except to state that they naturally lead us to many philosophical questions relating to the social purpose and responsibilities of science as well as to many public health questions. Let us leave it to the wisdom of our statesmen and scientists to guide us in the right direction in this mater to ensure the health and well being of our brethren."'"

In another written note, the Department stated:

"Dr. Rao who was consulted has replied as follows:

'I have not stated that the absence of yellow fever in India is related to the immunity provided by dengue fever spread by A. aegypti nor have I categorically stated that culex fatigans play a beneficial role. In the context of the hypothesis, all that I have stated was that a benevolent role can be attributed even to a species like culex fatigans the ubiquitous nuisance mosquito and vector of filariasis, because it is a suspected vector of West Nile virus. The whole paragraph of the oration may please be read *in toto*. There was no occasion to prepare a note on the subject because control of mosquitoes is a well accepted principle in public health practice'."

3.7.40. The relevant paragraph of Dr. Rao's oration on 25th January 1975, a copy of which had been made available by the Department of Health, is reproduced below:

"We are also beginning to consider seriously as to what our attitude should be to the effective control or elimination

of some of the major arbovirus disease vectors, as for instance of A. aegypti or culex fatigans. While most of us, both public health men as well as entomologist had been holding the view that one of the best ways to control or prevent vector borne diseases is to attack the vectors and to prevent build up of their densities to levels needed for disease transmission (eradication being a hopeless dream in the present circumstances) it is being hypothesized that some of our vectors may in fact be doing us some good, though indirectly by transmitting some viruses which in turn have perhaps provided us protection against the establishment of other related viruses. This hypothesis has been in existence for quite some time but has been again brought to our attention by our seniormost expert in Tropical Disease-29. The view has received some support from a few instances in Africa and the Carribean, where in recent outbreaks of yellow fever the incidence of the disease was noted to be somewhat lower in regions in which antibodies to other related group B arboviruses were previously prevalent. Such a benevolent influence can be attributed in this country not only to Aedes aegypti but even to a species like our ubiquitous culex fatigans the principal nuisance mosquito and vector of filariasis because it is also a suspected vector of West Nile virus. I am however, certain that even the most ardent advocate of this line of reasoning would not be against the control of any vector to a limited extent to protect the population from the locally existing diseases or nuisances. Then the questions which arise are: If so, to what extent the control proceed? Should it not proceed at least to the level where the diseases the vectors transmit or the nuisances can just be checked? This limited control would indeed be the only practical proposal in the present state of our knowledge of bionomics and ecology of our vectors. That is also all that we can hope to do because of the administrative and financial resources we can command, both of which set limits to our ability. But by even just controlling the transmission of the local diaseses we may also interfere with the further doses of infection needed to keep up the immunity status in the human population. The alternative would be to allow free reign to our vectors, a thought which I am sure would be unacceptable to many. To effectively control

or not control the vector in such cases becomes a puzzling question."

3.7.41. The Committee asked whether one Dr. Paul Bress, a WHO virologist had attended the latest review meeting and, if so, what his comments to the proposal that newly released strains of aedes aegypti should be tested for their potential to carry yellow fever were. The Committee also desired to know whether the observations of Dr. Paul Bress had been recorded in the minutes. The Department of Health stated in a written note furnished to the Committee:

"Dr. Paul Bress, Virologist from WHO attended the 10th meeting of the Technical Planning and Review Group held in November 1974, in New Delhi.

"The question of testing the vector potential of the genetically manipulated strains of A. aegypti was discussed in great detail at the 10th Technical Planning and Review Group meeting. The consensus of the view-points expressed by the members as recorded in the minutes of the 10th meeting are reproduced below:

'However, many members expressed the view that testing for yellow fever virus may not be necessary. If the genetically manipulated strains of A. aegypti showed evidence of susceptibility higher than that of the Sonepat strains to chikungunya and dengue viruses, such strains would be discarded. If the susceptibility of the genetic strains to these viruses was not altered, the view was expressed that susceptibility to yellow fever virus is also not likely to be affected. This would permit a start of limited field releases without waiting for the delays that would be necessary to undertake the test with yello wfever virus. It was pointed out by one member (This member was not Dr. Paul Bress) that there was no experimental proof for such a view point. There was no published information on the genetics of susceptibility to viruses in mosquitoes'.

As there was general agreement among the members, individual opinions were not recorded".

3.7.42. With reference to the justification furnished by the Ministry that the study of aedes aegypti had been undertaken in view of

the fact that dengue and dengue hemorrhagic fever were death hazards, Shri Raghavan, Editor-in-Chief, Press Trust of India, stated during evidence:

> "The WHO held a seminar in Manila and recently in Bangkok also and nowhere in the seminars did they say that the elimination of dengue hemorrhagic fever can be done by the elimination of aedes aegypti. (through genetic control)."

### 8 Control of Anopheles Stephansi

3.8.1. The Committee desired to know whether it was a fact that no research had been carried out in India on malarial mosquitoes after 1965. Dr. Ramachandra Rao stated during evidence:

> "Three species of mosquitoes were taken up for testing the possibility of using these techniques under Indian conditions. The most useful for this purpose was the filarial mosquito. There is another species (Anopheles stephansi) which is found in certain places in India and this has been included in the programme but it has been given a slightly lower priority because of the limitations of finance man-power etc. As a matter of fact, in 1967-68, when these ideas were developed, malaria had practically disappeared from the country and the urgency with regard to malarial mosquito was not of that high order."

3.8.2. According to the Report of the Consultative Committee of Experts to determine alternative strategies under the National Malaria Eradication programme, which met at New Delhi from 17th to 20th August 1974, during 1963 and 1964, minor foci outbreaks occurred in the consolidation phase areas involving a population of two million treated by routine remedial measures. However, large scale outbreaks which could not be liquidated by routine measures were detected during 1965 and 1966 and 12 million and 17 million population respectively to occur in extending areas with consequent rise in incidence of malaria in consolidation and maintenance areas and during 1968, 91 million population were reverted to attack phase from consolidation and maintenance area.

3.8.3. The phase-wise incidence of malaria in the country from 1961 onwards was as follows:

| Year | Attack | Consolidation | Maintenance | Total |
|---|---|---|---|---|
| 1961 . . . . . | 49,151 | .. | .. | 49,151 |
| 1962 . . . . . | 54,454 | 5,121 | .. | 59,575 |
| 1963 . . . . . | 73,008 | 14,308 | .. | 87,306 |
| 1964 . . . . . | 83,604 | 29,232 | 46 | 1,12,042 |
| 1965 . . . . . | 68,132 | 31,492 | 561 | 1,00,185 |
| 1966 . . . . . | 59,306 | 85,223 | 5,627 | 1,50,156 |
| 1967 . . . . . | 1,21,069 | 1,34,479 | 7,583 | 2,63,131 |
| 1968 . . . . . | 2,35,759 | 22,388 | 16,734 | 2,74,881 |
| 1969 . . . . . | 2,00,810 | 28,829 | 20,008 | 3,49,647 |
| 1970 . . . . . | 5,06,819 | 50,151 | 24,687 | 6,01,657 |
| 1971 . . . . . | 10,93,25 | 88,683 | 1,41,184 | 13,23,118 |
| 1972 . . . . . | 10,48,435 | 1,31,790 | 1,32,581 | 13,62,806 |
| 1973 (prov.) . . . . . | 6,61,582 | 2,27,582 | 3,00,800 | 11,89,961 |

*Source* : Report of the Consultative Committee of Experts to determine alternative strategies under NAEP.

3.8.4. The Consultative Committee, in their Report, had also noted the fact that research in malaria and its various aspects had not received adequate attention during the last ten years and had observed as follows:

> "In the present context of anti-alaria programme and operations in the country, it was imperative that short-term and long-term research programmes were initiated to strengthen the National programme immediately and in time to come. The short-term research programmes are to be initiated immediately so that the results accruing from them can be utilised within the period of two to three years. They are more in the nature of technological developments immediately needed for implementing the project than exploratory studies seeking new knowledge for ultimate use in the fight against malaria. The long term projects will require several years of investigation before their results can be utilised for the programme."

3.8.5. Under these circumstances, the Committee desired to know the reasons for not undertaking research on anopheles promptly

and utilising the genetic control method. If no genetic strain of mosquitoes was available, the Committee enquired why chemosterlisation had not been tried, especially since such a method was being tried in the Sonepat experiments on aedes aegypti. The Department of Health stated in a written note:

> "The main object of the GCMU Project is to study the feasibility of Genetic Control of Mosquitoes with a view to control malaria and other mosquito borne diseases. Work on Culex fatigans was started because considerable research data in regard to this species was available, which was not the case with anopheles.
>
> The work on A. aegypti was taken up because:
>
> (i) there was considerable knowledge on the genetics of the species as well as its rearing;
>
> (ii) the appearance of dengue in a haemorrhagic form in Calcutta and Kanpur increased importance of a study of this species.
>
> Research on Anopheles had also been in progress since 1970 and had been intensified since November 1973. Further, on behalf of Genetic Control Unit, work on Genetics of A. Stephensi is being carried out at the WHO Reference Centre for Anopheles in the United Kingdom. Also investigations have been carried out in the GCMU Unit to determine the optional conditions for the chemosterilisation of the species but no release experiments have been carried out.
>
> It is a fact that chemosterilisation was being considered for experiment in Sonepat.
>
> The feasibility of chemosterilisation of anopheles is also being investigated at the GCMU Unit, as already stated earlier."

3.8.6. Explaining, what according to him, were the reasons for concentrating on aedes aegypti instead of undertaking research on anopheles, Shri Raghavan, Editor-in-Chief, Press Trust of India stated during evidence:

> "One is purely from public point of view. Malaria and the anopheles is no problem in America. So, they were not interested in that. Secondly, as I said, all the published

record is in support of the view that we have this strain, aedes aegypti, identified as a military weapon system. In entomological warfare, according to the Sipri Report, yellow fever is called OJ and the delivery system was called AE. About this system, I have not been able to find anything as they did not talk to us. The Health Ministry even produced a white paper after our story which never saw the light of the day because the PAC intervened and the white paper was shelved. If I am able to lay my hand on it, I will send it to the Committee. The white paper, to the best of my knowledge, was prepared by a very able gentleman Dr. Ramachandra Rao. He was brought by ICMR but paid by WHO in order to write that paper. It was a massive document. It was to have been presented to the Parliament before the Monsoon session but something went away, that somebody told them that the white paper would not stand the scrutiny of any third-rate entomologist, leave aside an expert. So they very wisely abandoned it."

### 9. Mosquito Dispersal and Biological Warfare

3.9.1. A note furnished by Shri Raghavan, Editor-in-Chief, Press Trust of India, explaining the strategic, importance of biological weapons is reproduced below:

"Biological weapons are not reserved only for war. They lend themselves to covert strategies of subversion or economic warfare. According to Sipri Report 'the insidious effects of many CBW agents particularly infective ones make them suited to sabotage for not only they cause widespread damage but their delayed effects may also enable the saboteur to escape detection. This is one of the few contexts in which contagious disease agents seem to be hold out such military attraction, for an attacker might reckon the resemblance between a natural and unnatural epidemic to be close enough to divert suspicion. Recurrent acts of terrorism and assessination, successive crop failures, outbreaks of disease or food poisoning that overextend the public health services—all or any of these may spread alarm and despondency, foster disaffection with a ruling regime or weaken the country's industrial capacity. Small countries that depend for their economic

viability on the annual harvests of certain crops might be particularly vulnerable to this sort of activity.'

Biological weapons are said to be better than chemical weapons for strategic applications because any extensive use of chemical weapons would be easily discovered by the country attacked and the source of the attack also could be found. 'On the other hand', says the report to U Thant, 'it would be extremely difficult to detect isolated acts of sabotage in which bacteriological weapons were used and especially if the causative organism were already present in the attacked country'. In other words it would be natural for the enemy to think of yellow fever weapon against India or a country with similar conditions because the causative organism, the aedes aegypti, is already present in large numbers. And if that happens there would be no way of finding out whether it was a natural epidemic or a deliberate attack."

3.9.2. Two other notes on biological warfare and the use of yellow fever as a biological weapon, furnished to the Committee by Shri Raghavan are reproduced below:

**"Mosquito Dispersal and Biological Warfare.**

An analysis of GCMU's activities in the last five years suggests that GCMU is primarily interested in the collection of data on the ecology and dispersal of Indian mosquitoes particularly aedes aegypti which is a vector of yellow fever. There is enough published information available to show that these data have a bearing on biological warfare.

For instance it has been reported in the U.S. Congressional Committee on Foreign Affairs that 'mosquitoes and ticks are transmitters of disease and as vectors they have to be looked upon as having potential military significance. There are numerous references to the use of mosquitoes and other insects in biological warfare in a recent report published by the prestigious Stockholm Peace Research Institute. Sipri Report on 'CB weapons today' says that the employment of such vector weapon systems in the United States is known as entomological warfare. The

entomological warfare weapon according to the report comprises 'a container for delivering vectors—infected mosquitoes perhaps—to the target area and then releasing them over it'. It is also stated that the entomological warfare programme was started by the US in 1953 at the biological warfare laboratory at Fort Detrick in Frederick Maryland. Several devices including frangible bomblets known as entomological bombs do exist for dispensing infected arthropods for use in BW vector systems. This mode of BW was allegedly used by the Japanese against China in World War II and by the US against Korea in the Korean War according to a report by the International Scientific Commission for the Investigations of Facts concerning Bacterial Warfare in Korea and China. According to Sipri the U S tested an unidentified vector system on Baker Island in the Pacific in 1965.

Reference to entomological warfare has also been made in an expert committee report to the UN Secretary-General U Thant in 1969. The report clearly stated that 'certain mosquito species (yellow fever mosquitoes aedes aegypti) have naturally spread to many parts of the world from their original home in Africa. It is conceivable that in the war the introduction of such insects on small scale might be tried for offensive purposes'. Also in the London conference on CBW in 1968 it was pointed out that "there is also the possibility of the spread of infection by use of living vectors such as insects etc. Very much is known now about the ecology of such vectors and the way in which they participate in the dissemination of infection'.

There are several advantages in the use of arthropods like mosquitoes as carrier of BW agents like viruses which may explain the enormous interest of the U S men mosquito dispersal studies. BW agents can be sprayed from aircraft but they have to be inhaled to be effective. Again these agents may be destroyed by heat, rain and the sun's ultraviolet radiation and winds may throw them off target. These drawbacks can be remedied by using mosquitoes and other insects as carrier of B agents. As long as the virus is carried by the mosquito heat or rain will not affect it. Secondly, mosquitoes bite people and animals and therefore introduce the BW agent through the skin directly into blood. According to Sipri Report, 'the use of arthro-

pod disease vectors such as infected mosquitoes' is one way of securing percutaneous effectiveness from bulk-dissemination of BW weapons.

According to Sipri Report arthropod disease vectors in BW can increase area coverage because each 'infected arthropod is a minute self-dispersing weapon'.

But the use of mosquitoes in BW is possible only if their behaviour, habits, dispersal and ecology are known beforehand. And it is precisely this information that is becoming available from GCMU experiments. This point has been very clearly brought out by the report submitted to U Thant. The report says: 'The knowledge gained through the study of artificial epidemiology and in the study of artificial dispersion of bacteriological agents both in the laboratory and in the field had shed some light on some of the factors concerned (with entomological warfare)'. It may be worth noting that a project similar to GCMU was set up in Burma in 1967 by the Advanced Research Projects Agency (ARPA) of the U.S. Department of Defence."

**"Yellow Fever as a Biological Weapon against India**

Aedes aegypti is a species of mosquito that came to India many years ago from Africa. This mosquito is a vector of yellow fever a fatal disease. This disease however has never appeared in India. Therefore it is not a public health problem whereas malaria spread by anopheles mosquitoes and filariasis transmitted by culex fatigans are. But the GCMU has so far not done even preliminary studies on malarial mosquitoes but has been concentrating all its resources on the study of Aedes aegypti. It has exhaustively studied the behaviour, ecology and other habits of the species in Sonepat in Haryana and was planning to perform a major field experiment there to study the dispersal pattern of Aedes aegypti by releasing 500,000 mosquitoes a day—a number that is typical of what would actually be used in an entomological warfare. USPHS had asked GCMU to give utmost importance to Sonepat experiment on this yellow fever vector. Two weeks ago the Sonepat experiment was abandoned on apparent effect of pressures and concern aroused by the PTI report of

July 28 which alleged that the release experiment was an attempt to perfect the yellow fever BW system.

It was known in the beginning of the century that India is a country receptive to yellow fever. It has plenty of Aedes aegypti and abundant monkeys. The monkeys are excellent reserviors for the bellow fever virus and Aedes aegypti is the right kind of mosquito for spreading the virus from monkey to monkey. A number of other mosquito species present in India can spread the virus from monkey to man and from man to man. Despite these ideal conditions yellow fever had not struck India for reasons described in....

India's vulnerability to attack with yellow fever as BW was known to the US in the World War II. According to C.G. Pandit, former Director ICMR, 'the Government of India early in 1940 received confidentially the information from the U.S. that in the event of war breaking out in the Fareast, there was the possibility of Japan resorting to BW with yellow fever virus'. Therefore, PTI's original statement that yellow fever virus is a potential BW agent is not a figment of imagination.

It was explained that ecological and dispersal study of mosquitoes are vital for their employment in entomological warfare. It is precisely these data that would be gathered in the planned Sonepat experiment. In this context the possibility that GCMU was after these data for conceivable development of yellow fever BW system cannot be ruled out. In fact there is sufficient published information to show that the US in the past had worked on such a system and was keen to perfect it. It is also understood that the U.S. delayed ratification of the General protocol banning CBW so as to collect all information relating to yellow fever as a BW system.

According to information in the Sipri Report, the US Biological Warfare Laboratories had examined some 200 pathogens but the 'greatest BW interest has so far been attached to a few pathogens that include 'yellow fever virus'. The report says that this virus is 'a standardised BW agent', and is known as 'Agent OJ'.

From published papers and other sources a good deal is known about research programmes at US BW Centre at

Ft. Detrick. For instance it is reported (Science Magazine, January 13, 1967) that 'diseases that appear to be among those regarded as potential BW agents include viral diseases such as dengue fever, several types of encephalitis, pittacosis and yellow fever'.

As early as in 1960, Sipri Report says, the US germ warfare programme had progressed 'from concept to feasibility and from basic research to development of a completely new and potentially most effective BW weapons system. This apparently related to a combination of yellow fever virus and aedes aegypti mosquito'. The report further states that techniques had been developed for infecting mosquitoes of this species with the yellow fever virus and subsequently keeping them alive for at least a month in such a manner that single bites from 30 to 60 per cent of the insects are capable of initiating the disease in susceptible individuals. Destruction of the U.S. Stockpile of BW agents commenced in July 1971 with completion scheduled for October 1972 but agent OJ was not among those listed by Sipri as destroyed.

The BW potential of agent OJ had also been realised by the expert committee on CBW that submitted its report to U Thant. The Committee had said clearly that 'urban or classical yellow fever once eradicated or controlled from any area might be reintroduced as a result of bacteriological warfare'. The report warned that 'it might be extremely serious if the virus were introduced into Asia or the Pacific Islands where the disease appears to have never occurred but where local species of mosquito are known to be able to transmit it'.

It has been reported (Science Magazine, January 13, 1967) that among the papers presented by Ft. Detrick scientists at a conference on Aerobiology held in Chicago in March, 1967 was one on 'attention of aerolized yellow fever virus'. This again confirms that the U.S. was developing an yellow fever BW system as early as in 1967. While this research refers to spray in the form of aerosols, the Sonepat experiment was to have supplied for the first time the crucial information on the dispersal of Aedes aegypti necessary for developing vector borne yellow fever BW system.

Aedes aegypti research is useful from another angle. It is not only a carrier of yellow fever virus but is believed to be a carrier of a relatively new BW agent called 'Marburg Agent'. According to Sipri report the Marburg Agent can be used to sterilise people because of the agent's affinity to the testis. 'Alternatively', the report said 'the goal might conceivably be an ethnic weapon exploiting bio-chemical differences between races'. Nothing on Marburg agent has been published in open literature because the agent was discovered only in 1967."

3.9.3. The Committee desired to know the character of the Stockholm Peace Research Institute. Shri Raghavan stated during evidence:

"It is of eminent western academicians and scientists, specially of impeccable credentials, whom nobody can accuse of pro or anti."

3.9.4. On the question of the importance of a study of dispersal of mosquitoes, Fr. Jayaraman stated during evidence:

"I want to give you an instance. Of course, in one case, there is an allegation, never confirmed, that the US and Japan had used insects to infect people. That was done allegedly by the United States in Korea. I am sure, it was done. And Japan did it in China during World War II. Those offensives were not successful because the Americans did not know the insect ecology before it was released. Only to fill up that gap the dispersal study is very important and a lot of research has already been done. The method was to infect the aedes aegypti with these viruses and release the viruses in that form; all these things had already been done.

I want to tell you where this has been used. In 1971 or so, in the Southern United States horses were threatened with Venezeulean equinine encephalitis and it is mentioned in the Sipri report also. This is caused by the VEE virus carried by a particular mosquito. This particular disease came from Mexico which is south of Texas. They wanted to create a belt 300 mile long. But how would they do it? How these mosquitoes would behave? Where would they go? How far they would travel? These were the problems at that time. But the information was there

from a study already done. So, they selected a few horses in that particular zone and gave them the vaccine and protected them and it was not necessary to vaccinate all the horses. The vaccines were not available with the United States Civilian side but they had reduced the amount of vaccine by using the previous knowledge on mosquito ecology. This knowledge can be used in the other way also. They can use this knowledge and send the arriv. infected mosquitoes to the target as a BW agent. Here the vaccine was used for defensive purposes. As the civilian side were not having enough vaccines, so these were supplied by the military laboratories. But there, these were prepared for offensive purposes.

If we take up the experiments and get the primary data, they might also be useful to us later. But as far as I know, we do not have any plan to utilise it. But we are giving these data to somebody else who already has the machinery to utilise it. So, we are at the disadvantage. We shall be benefited by this experiment only if we have the readymade technique but we shall never reach that stage by reading literature or manuals. This genetic control is potential but it can never be practical. It might be feasible technically but financially it might not be feasible for the simple reason that we still have to have barrier zones to establish. And for this we may have to spend much more money than what we are spending on insecticides. This money can be spent on sanitation. And after spending money, if the project does not take off, then we are losers. As Dr. Karan Singh said, it might be for bad or for good but the take off may be 30 or 40 years later. For 30 or 40 years, we will be sitting on the edge of a razor. We do not know how it will work. This is the position."

3.9.5. An extract from the report submitted to the UN Secretary General U Thant in June 1968 by a specially constituted group of consultant experts, with William Epstein, Director of the Disarmament Affairs Division as its Chairman on Chemical and Bacteriological Warfare, is reproduced below:

"Any country which resorted to BW would presumably try to infect with a single blow a large proportion of an enemy population with an exotic agent to which they had not been immune through previous exposure. Such exotic agents would lead to the appearance of dieases

which normally had not occurred before in a given geographical area either because of the absence of organism involved and/or of natural vectors. In addition a disease which had been controlled or eradicated from any area—urban or classical yellow fever from many tropical and subtropical countries—might be reintroduced as a result of bacteriological warfare.

If the introduced disease were easily transmissible from man to man and if it was one against which the population had not been effectively immunized it is possible to imagine what could happen by recalling the 1957 influenza epidemic."

3.9.6. Commenting on the above observations of the group of consultant experts to which attention was drawn by the Committee, the Director General, Health Services stated during evidence:

"The method of bacteriological warfare as described and narrated by you is on scientific basis is correct, that if germs are introduced in an area where there is no disease and the population is not immune by any manner or method, either by inhalation, annihilation or injection or through the agency of vectors as we call it, it is possible to spread a disease in a virgin soil or in a country where the disease had not been there before and where the people had not been immunised."

3.9.7. The UN Report further states as follows:

"The gravity of these risks (from BW) would depend on the extent to which the community or the species in the country attacked contained animals which were not only susceptible to infection but were living in so close a relationship to each other that the infection could become established. For example not all mosquito species can be infected with yellow fever virus and if the disease is to become established those which can become vectors must feed frequently on mammals such as monkeys which are sufficiently susceptible to the infection. A natural focus of yellow fever is therefore very unlikely to become established in any area lacking an adequate population of suitable mosquitoes and monkeys.

3.9.8. With reference to the establishment of a focus of yellow fever, the Director General, Health Services, stated during evidence:

"With regard to the possibility in India we have given a great deal of thought whether, either by accident or by design, somebody could establish a natural focus of infection in the country. The monkeys are plentiful in the country and also the type of vector which spreads yellow fever from man to man, that is, Aedes aegypti, is also prevalent in the country, but information on several other aspects is lacking, viz., regarding the spread of infection from monkey to monkey, whether the right type of or the vector type of mosquito or insect is present in the country or not. That study has not been done. As a matter of fact, yellow fever studies in India are completely and totally banned by the Government of India because we cannot take the risk that even for experimental purposes any study of this nature be done. What we are contemplating is that if any future studies have to be done, they will have to be done with the collaboration of the countries where yellow fever is present with also adequate laboratory facilities. But theoretically it is possible to introduce the virus of yellow fever in India because monkeys are susceptible to yellow fever but whether there are vector and mosquitoes present which will be able to transmit the disease between monkey to monkey or from monkey to man, these investigations have not been done and that we will not like to do in India because of the dangers involved in such studies."

3.9.9. Other extracts from the UN Report are reproduced below:

"Importation of this disease (yellow fever) is possible wherever a suitable environment and susceptible animal and mosquito hosts exist. This occurred naturally in 1960 when a previously uninfected area of Ethiopia was invaded by yellow fever and an epidemic resulted in about 15,000deaths. Because of the inaccessibility of the area some 8000—9000 people died before the epidemic was recognised. The epidemic was extinguished but is likely that a permanent focus of yellow fever infection has been established in this area previously free of this disease. It might be extremely serious if the virus were introduced into Asia or the Pacific islands where the disease appears

to have never occurred but where local species of mosquito are known to be able to transmit it."

"Certain mosquito species (yellow fever mosquitoes aedes aegypti and a malaria mosquito anophones gambiae) have naturally spread to many areas of the world from their original home in Africa and have been responsible for serious disease problems in the areas that have been invaded. It is conceivable that in the war the introduction of such insects on small scale might be tried for offensive purposes."

"Yellow fever is still enzootic in the tropical regions of Africa and America. Monkeys together with mosquito which transmit the virus constitute natural foci ensures survival of the virus between epidemics."

"Malaria is a serious endemic disease in a susceptible population but it is difficult to envisage its possible employment as bacteriological weapon because of the complex life cycle of the parasite."

3.9.10. About the strategic applications of biological warfare, the UN Report observes as follows:—

"Any extensive use of chemical weapons would be known to the country attacked. The source of the attack would also probably be known. On the other hand it would be extremely difficult to detect isolated acts of sabotage in which bacteriological weapons were and especially if the causative organism were already present in the attacked country."

3.9.11. Since India has the desired combination of suitable mosquitoes (aedes aegypti) and monkeys, the Committee asked whether this combination was not too irresistable for anyone who might want to introduce the virus of yellow fever. The Director General, Health Services replied:

"In India, the situation is favourable. The monkeys are there, the mosquitoes are there and the population is a susceptible population. It is an ideal situation for the spread of the disease. That is why we are so much worried and want to see that no focus is established in any

part of the country. A reservoir should not be established in any part of the country. The reservoir is in the monkeys. For the monkeys to become the reservoir, there should be three or four things. First, there should be the virus available in the country in the sense that either a naturally infected mosquito comes along with the jumbo jets that come here or a human case in the incubation period has been allowed to come into the country. If the mosquito had been infected and it bites a monkey, a focus of reservoir could be established. This is how it could take place. A great deal of study is required of Aedes aegypti which can convey infection from man to monkey and from one monkey to another monkey. For local transmission of the virus in the monkey population, what happens if man need not necessarily be exactly the same thing in the monkey population. This is a subject which requires study, but I cannot afford to study these problems in India because I cannot let the virus in here. They will perhaps be studied in laboratories in Africa, in Entebbe in Uganda. We may negotiate with them regarding the susceptibility of the genetically manipulated Aedes aegypti to yellow fever. Studies are needed also to find out as to what is the vector which conveys infection between monkeys and how the natural foci or infection can be established. All this knowledge I would like to collect in some other country rather than in mine. Because these factors are not there, the chances of the monkey becoming a natural reservoir of yellow fever are rather remote."

3.9.12. It was also observed by the Committee from the UN Report that the behaviour of chemical and biological weapons is influenced to a great extent by extraneous factors. While the effect of wind and rain can be evaluated to an extent quantitatively, others which reflect the general ecological situation and the living conditions of physiological state of the population exposed to the effects of the weapons are more difficult to define and this would be true also of pathogenic agents which are deliberately dispersed. The UN Report also pointed out that the knowledge gained through the study of the epidemiology and by the study of artificial dispersions of bacteriological agents both in the laboratory and in the field had shed some light on some of the factors concerned.

3.9.13. Since the GCMU in New Delhi was involved in the study of the artificial dispersions of the mosquito vectors, the Committee

asked whether there was not a likelihood of these studies being utiliesd by interested parties to assess the behaviour of potential chemical and biological weapons. The Committee also desired to know what steps had been taken to ensure that the results of such experiments were not misused or abused. The Director General, Health Services stated during evidence:

> "What has been read out is a distinct possibility. It can be done. In science there are good uses and bad uses. In atomic energy, there are peaceful uses and also uses for destruction. So, the possibility is definitely there that the knowledge that will be gained by genetic control, how the release takes place, how far the mosquitoes go, how long they survive, what is their biological behaviour, this knowledge can certainly be used for putting virus into these mosquitoes and starting a focus of a disease like yellow fever in that area. That possibility cannot be ruled out. It is there all the time. The only precaution one has to take is that misuse does not take place and it is for this purpose that I have been one of the votaries that the whole thing should be entirely under ICMR and Government of India. The Government of India and ICMR have taken steps after your advice and other discussions here to see that the whole project is taken over under the auspicious of the ICMR."

3.9.14. The Committee desired to know whether the Director General, Health Services had known about the germ warfare implications of the research before the publication of the PTI news report. The Department of Health stated in a written note furnished to the Committee:

> "Dr. J. B. Shrivastav, who was consulted in the matter, has replied as follows:
>
> 'I have been all along of the view right from 1968 when this proposal was mooted by WHO that in a biological experiment of this nature where the data can be misused there should be adequate safeguards and proper controls. In this connection, I chaired a meeting on 11th October 1968 in which Director General, ICMR, Director, NICD and Deputy Secretary (P.H.) were also present. The conclusions arrived at this meeting were forwarded to the Ministry of Health'."

**3.9.15. On the proposed experiment at Sonepat and its military implications, Shri Raghavan stated during evidence:**

> "Our report had also expressed special concern at GCMU's proposed experiment at Sonepat for collecting dispersal data on Aedes Aegypti or the yellow fever mosquitoes because on analysis it was felt that these data are crucial for perfecting a system to employ yellow fever as a BW weapon. There is enough published evidence to prove that this concern was rational and basically correct. Here, I have before me, what I would call a 'micro map' prepared by the GSMU. I do not know whether our military people have got such a map of Sonepat. I am passing it on to the Committee."

3.9.16. Shri Raghavan was asked by the Committee whether it would be correct to conclude that the experiment had been conducted with a view to waging a chemical, bacteriological, biological and virus war should the occasion demand it, against India by the U.S. Government or with the object of finding out how best India could be used as a base for waging a chemical and biological war against India's neighbours, particularly the USSR and China. The witness stated:

> "I cannot really say where contingency planning of a military establishment begins and ends and where the usage of potentialities begins and ends. All that I would like to say is that I have not been able to find any argument or any public evidence which casts a doubt that the data have applicability to the CBW programme and, secondly, that the data are not necessary to fill the gap that would appear to be in existence in this particular field and, thirdly, that the programme otherwise is of such importance to us. I have not come across such evidence. It does not matter to me whether it is going to be used against the Soviet Union or China or it is going to be used against India or Pakistan or Ceylon or any other country; I just don't want the CBW programme to continue, whether it is going to be used against anybody or not. I don't want a chemical and biological weapon warfare programme because I think we should not monkey around with certain vital things of which we do

not know enough—we are all only transient passengers on this earth. I just don't like it.

Secondly, our country and our defence apparatus must take note of the fact that they have to do research in order to know how to counteract it. I am not going to be like Mahatma Gandhi and say that even if somebody hits me. I am not going to hit back. I am not Mahatma Gandhi and I don't expect my defence apparatus to be a Mahatma Gandhi. Whatever research is done, must be done by our people—the people of India."

3.9.17. In reply to another question whether this experiment was not permissible in the United States, Shri Raghavan stated:

"Even if they have made the experiment in U S, they could not have any knowledge of how the mosquitoes behave in India. Nature cannot be identically recreated in some other place in order to study it. Without knowledge as to how a mosquito which is released at point 'X' reaches point 'Y', you cannot do it. That is the gap today in CBW warfare programmes."

3.9.18. The Committee desired to know whether it was Shri Raghavan's view that there should not be a free flow of research and information in this regard. Shri Raghavan stated:

"I might put it perhaps slightly differently. In any of these cases, I would say that until my fears or suspicions or anybody's suspicions which are reasonable are proved to be totally incorrect, nothing should be done. May be the fears are exaggerated but still you cannot monkey around with the health of the country or the security of the country. I am all for a free flow and exchange of information on the basis of the outcome of the research but not of primary data for research."

3.9.19. When asked whether he was suggesting that the GCMU experiment should be continued with safeguards, Shri Raghavan stated:

"I am not saying that it should continue. I will not know. All that I would like to say is that if this experiment has to be continued, and to me, it is a very big 'if', if qualified people, disinterested people, and I hope some

people from the Defence Ministry get involved into it if they think that the experiment should be continued, then it should be continued under safeguards to ensure the health of our people; it should be continued under the circumstances where the primary data will not be available to any outsider."

He added:

"Under the present method of functioning, I feel very much concerned if this is continued. I do not see any proof of its usefulness; whereas there is enough evidence to say that it could be inimical to us."

He stated further:

"I do not find that there is anything which could justify wasting our time in such a programme. Even if dengue is to be eliminated, but this does not seem to have anything to do with it."

3.9.20. Referring to the US proprietory rights in the GCMU Programme, the witness stated:

"There are two things involved in this question of property. In all PL-480 agreements, the patent is vested with the United States Government. The point is that it is a question of commercial property. But my concern would still be the same about these experiments even if the commercial property rights were not there, because the US Army or the British Army or the French Army or the Russian Army or the Chinese Army and for that matter the Indian Army are being paid by the tax-payers to kill, people to protect themselves from being killed and to protect their population from being killed. They are not in the business of protecting the health of the people or bird watching (BNHS-MAPS), but only in the business of warfare. No tax-payer is having those costly apparatus to do this health job. So, if a foreign army is interested in it, I would look upon it with a great deal of suspicion."

3.9.21. The Committee desired to know what machinery existed and the basis on which conclusions were drawn to determine

whether a project was primarily beneficial to India or not. Shri Raghavan stated:

"Unfortunately, we are a poor country and we have a lot of people who are trained, who would like to do research and they do not have rupee finance for research. Foreign embassies are waiting for such persons and they give scholarship for 'X' project which can be tied with 'Y' project of their country. Shri Jayaraman is happy because he got the scholarship to do research. Whatever may be the other field, he does not bother. Either he does not know or turns a blind eye and does not ask too many questions. If it is agriculture, he goes to the IARI, if it is medicine, he goes to the ICMR, and if it is something else, he goes to somebody else. He does not bother about the project because he will be gainfully employed in a scientific way. If it is United States, they mention to our Embassy in Washington or more likely to the US Territorial Division in our External Affairs. So, the poor Joint Secretary may or may not be very distinguished diplomat. But he is absolutely innocent in all these matters which are going to be discussed with him and the poor man as anyone of us may think that intelligence or secret means to keep things under lock and key. But he does not know that that information can be had from the published material from elsewhere. So, the poor Joint Secretary of the Territorial Division only thinks that the Ambassador setting in Washington wants to improve relations. It may be true with the Germans, it may be true with the Russians, it may be true with the Chinese and it may be true in the future with our neighbouring country, Pakistan. So the project is O. Kayed. This is the basic defect.

In 1972, after we won the war of Bangladesh, we were very much flattered. At that time, the World Bank sponsored a study of how roads could be built with indigenous material and at low cost. India was selected for this study. We felt flattered at that. I am sure, all of us were very happy that the white men are learning from us and the data they required was supplied. Then, they looked into all the data how border roads were built cheaper and then they wanted to study some border roads. The project was cleared by the Defence Ministry

and a British consultancy firm under this study went to the Tithwal sector to study the border roads there. It is curious that this was cleared by the Border Roads Organisation which is a part of the Defence Ministry. This came to our knowledge and as a result of the prospect of our releasing the story it was terminated but by that time they had seen the places. And since, I in this particular case, happened to mention it to the Defence Minister and asked him whether the consultants had visited the Tithwal sector, he said that he could not believe it. Perhaps if we ask our Army General, he will say 'what do you mean, we have sent two sentries along with them' as if two sentries would prevent them from collecting any information. This is happening in an apparatus that is trained to defend and you can realise that it would be more so when the Territorial Division of External Affairs Ministry has to deal with this matter.

We must have a central organisation in which no operating agency should be involved that has a real interest to pursue or put through a project. They should not be represented there. It should be some other people like the Cabinet Secretariat or somebody else. They may not be experts in every field. If somebody comes and talks about microbiology, you must have the sense to know you have to get expert advice from somewhere. You must find out what this project is all about. We should know, is it in our interest, is it within our framework, is it of any use to us? In our country this does not happen.

This is a study of DOD Sponsored Research at Stanford University (USA) Volume I. I opened casually page 48. The title is Geometrical Acoustics at Gigahertz Frequencies (very high frequency Acoustic Components for Delay Line and Memory Devices). Contract No. is N00014-67-A-0112-0001.

'The goal is the development of a new knowledge and techniques for crystalline materials which can be used in high frequency acoustic wave applications. The work is a basic investigation of gigacycle electro and magneto-acoustic waves in crystalline solids with application to delay lines, memory devices and signal processing devices in electronic equipment'.

It goes to explain the defence interest involved in it. Under the Mansfield Amendment to the US 1969 Law they have to say what is the Defence interest in it. So the innocent sounding project really turns out to be a defence related project.

In our Delhi University, there was a programme to study ultra high frequency radio transmissions in Ionospheric atmospheric conditions. If you look into that branch you will find that it is of very great importance in respect of Ballastic Missile communication which come from ionosphere—from Asia, from Soviet Union, in the Pacific or if you want to have a counter equipment to deal with it you have to know quickly from where it comes. What is the effect of radio waves and how monsoon affects it? This is very essential because counter-action has to be taken within 25 minutes. So, it is very very important field of research. This ionospheric data is not of very vital value to us today, but it is to them. It is important for them for Diego Garcia, for example.

The projects which should have been started by our people are not started because of non-availability of finance. Foreign finance comes for collection of data in certain essential fields—Microbiology, Continental Shelves, Radio atmosphere, etc., and projects are started and run."

3.9.22. In a written note furnished to the Committee, Shri Raghavan had stated that Dr. Paul Bress, the WHO virologist who attended the 9th GCMU review meeting in November 1974, was formerly with the French biological warfare unit. The Committee desired to know the credentials and previous jobs of Dr. Paul Bress and whether he had been associated with chemical and biological warfare research in France before becoming a WHO virologist. The Department of Health stated in a written reply that the WHO had been addressed in this regard and that their reply was still awaited.

## 10. GCMU in other countries

3.10.1. The Committee asked whether it was a fact that the WHO had set up a similar mosquito control unit in Tanzania and that

the unit had been expelled from that country. Dr. Ramachandra Rao stated during evidence:

> "We were most welcome in Tanzania. I belonged to the ICMR and I went to Tanzania on deputation for a period of four months."

The witness added:

> "There is no Unit of similar nature in Tanzania at all."

He stated further that he was not quite certain whether the Unit was working at present.

3.10.2. When the Committee asked whether the Unit had been expelled from Tanzania for political reasons, Dr. Rao replied:

> "If you permit me, I think a little clarification is necessary. One must distinguish one from the other. One was the malaria research programme which ended in 1968 and the other programme was the research unit which continued for a long time."

In reply to another question whether the research unit was still continuing, the witness stated:

> "It was terminated after about 6-7 years work. The two must be kept separate. I want to help the Committee in the matter."

3.10.3. Subsequently, in a written note furnished to the Committee, the Ministry of External Affairs stated as follows:

> "Malaria Eradication Programme in Mainland Tanzania Administered by WHO is proceeding continuously since its inception. However, in July 1968 ten-year old WHO Programme for Malaria Eradication in Zanzibar and Pemba Islands was terminated by Zanzibar Government. WHO were not given any reasons for termination of programme by Zanzibar authorities but were merely told that their services were no longer required in Zanzibar and Pemba.
>
> Around end of 1973, Zanzibar authorities made approach to United Nations for assistance in various fields including health. Plans are now being drawn up by WHO to assist Zanzibar in Malaria Eradication."

3.10.4. On the question of termination of the GCMU Project in Tanzania, Dr. Jayaraman, Science Correspondent, Press Trust of India, stated during evidence:

> "It is not the GCMU unit in Tanzania but, I understand from the information I got, that even before coming to India they had tried to set up an Aedes Unit in one of the cities of Tanzania. At that time, Dr. Ramachandra Rao who was Director of the Virus Research Centre and Dr. Paul of the WHO—who was the brain child behind the GCMU here—were the two people who had been assigned to go to Tanzania. They went there and set it up, but after a few months they were kicked out."

3.10.5. The Committee askesd whether the witness knew the specific reason for this. Shri Raghavan stated:

> "No, we could not get that information at all. All that we found out was that a unit tried to function there but was asked to vacate. The primary reason is not known."

He added:

> "Unless the Tanzania Government comes to our assistance, I really cannot hazard a guess. All that we had been able to find out is (and I hope it is nothing more and nothing less than that) that there was a programme similar to our GCMU mosquito programme relating to Aedes aegypti, which has nothing to do with malaria. As a matter of fact, the GCMU project mentioned something about the malaria mosquitoes being tackled, but they have not even studied how to set up a colony of mosquitoes; so how can they eliminate them? They have not come to the first phase of this proposition in this matter. All we know is that (and if somebody says it is not true, we are prepared to stand corrected) there was an attempt to set up a unit relating to Aedes aegypti in Tanzania which was terminated within a few months. All that I am prepared to say is that the information that we have been able to gather says that it related to Aedes Aegypti mosquitoes."

**3.10.6. Drawing the attention of the Ministry to the comments of the Director, National Institute of Communicable Diseases, in 1968, on the WHO proposal on genetic control of mosquitoes wherein he had stated that the small scale studies on culex fatigans carried out in an isolated village Okpa in Burma were not continuing, the Committee desired to know the reasons for the studies being discontinued in Burma. The Director General, Health Services, stated during evidence:**

> "This report concerns the meeting which took place in Geneva between the Director General, World Health Organisation and others. I am aware of the fact that there was a project of this nature in Burma but the precise reasons why it was discontinued there, whether they were technical, administrative or political in nature—I am not aware of, but it is a fact that the project was discontinued in Burma."

Dr. Ramachandra Rao added in this connection:

> "The Burma experiment, if I understand, was a very short experiment conducted by WHO for a particular season. That is all I know of it and as soon as the season was over, the experiment was wound up. Beyond this I was not aware."

## CHAPTER IV

## BIRD MIGRATION STUDIES

### 1. Introduction

4.1.1. The Bombay Natural History Society is the pioneer organisation in the study of bird migration in India The first efforts were in 1928 when several species of migratory ducks were ringed in the Dhar State of Central India. From 1959 -1966 the Society has been collaborating with the World Health Organisation in a study of the role of migratory birds as disseminators of vectors or virus disease agents. This has been in conjunction with studies at the Kirestkae Shosse Institute of Poliomyelitis and Virus Encephalitis, OMSK, USSR and the Virus Research Centre Rockefeller Foundation, Poona, India. By 1966, 82,000 birds of 127 species from 26 families had been ringed, with 154 recoveries.

4.1.2 Since 1967, the bird migration studies have been conducted under the joint sponsorship of the Smithsonian Institution, Washington and the Migratory Animal Pathological Survey (MAPS), Bangkok.

4.1.3. The following are the major aims of the Bird Banding Project:

(i) To plot accurately the migratory routes of the hundreds of migratory species coming into India during winter. To calculate their period of stay in the winter quarters, study the alterations in the plumage, their relationship with the resident birds, the food and feeding habits in the wintering areas.

(ii) Resident birds have been banded by the Society to know more about them and their distribution. Their measurements, plumage variations and informations such as sex ratio and weights are being incorporated in works on the birds of India.

(iii) To investigate the possibilities of birds being carriers of certain virus diseases. For this, blood samples are taken from birds and sent to experts at laboratories where they can be tested.

(iv) To collect various ectoparasites found on birds, identify them and study their importance in the pathological point of view. Scientists from the United States are helping us with this research, through the MAPS.

4.1.4. An extract from the Interim Report on the activities of the Bombay Natural History Society's Bird Migration Study Project from 1959 to 1972, furnished at the instance of the Committee, is reproduced below:—

"In March 1959 Dr. Salim Ali attended, as a representative of the Bombay Natural History Society, the meeting of a Scientific Group of ornithologists and virologists convened at Geneva by the World Health Organisation to consider the question of research on birds as disseminators of arthropod-borne viruses and put forward a scheme for the establishment of a bird-ringing centre in the Rann of Kutch. This area seemed appropriate for the purpose in hand because a considerable portion of the birds migrating into India from the northwest, i.e., from eastern Europe, Siberia and Central and Northern Asia, come down the Indus Valley and across the Great Rann into Kutch, Gujarat and the Saurashtra peninsula. There is also evidence that Kutch lies on the eastern fringe of a broad stream of migration from central and northern Asia in a south-westerly direction in autumn (and *vice versa* in spring) across Afghanistan, Baluchistan, Sind, and the Arabian Sea into Somalia, Ethopia and further south in Africa. The outbreak of a form of encephalitis in the Kayasanur Forest area in Mysore, the virus of which was reported in 1957 to be related to a group of viruses occurring in the Omsk region of the USSR, suggested the possibility of its having been carried by migrating birds. The Scientific Group was impressed by the possibilities of the scheme. Its recommendation was accepted by the General Body of the World Health Organisation, who granted the initial funds to the Society.

Between the years 1959 and 1972, 270, 294 birds of 531 species belonging to 60 families were ringed and blood samples

were taken of approximately 4800 birds. 28,400 birds were examined for ectoparasites. The blood samples obtained were sent to the Institute of Diseases with Natural Foci, Omsk, USSR upto 1966 and also to the Birus Research Centre, Poona (India). The ectoparasites were studied by the Virus Research Centre upto 1966. From 1967 the majority of blood samples and ectoparasites were sent to the Migratory Animals Pathological Survey* at Bangkok for study. Full results are not yet available.

While the study of possibilities of dissemination of arthropod borne diseases remained the main objective during the years the project was funded by the World Health Organisation, the efforts of the Society were primarily directed towards the study of migratory movements of extralimital and resident bird species from the year 1967 on. The Smithsonian Foreign Currency Programme commenced providing funds for the project from 1967."

### 2. Bird Migration Studies and Biological Warfare

4.2.1. A note furnished to the Committee by Shri Raghavan, Editor-in-Chief, Press Trust of India on the Bird migration study at the Bombay Natural History Society and its place in the biological warfare programme is reproduced below:

"The military significance of migratory birds lies in the fact that they take predictable routes and arrive at predictable times at predictable places. They can carry viruses in their blood or on the mites and ticks that harbour themselves on the birds' feathers and other places.

The use of migratory birds in BW was apparently realised by the US biological warfare researchers in the 1960s. The agency that was entrusted with this job is the Migratory Animal Pathological Survey (MAPS) of the United Stateas Army with its South-east Asian headquarters in Bangkok.

In 1965 MAPS financed a bird migration study in Brazil and the exposure of this in the American Press brought an end to it. This has been so stated in Nature, the British magazine in its January 10 issue.

---

*of the United States Armed Forces Institute of Pathology.

According to Sipri report, 'the various army and medical research units of the Navy studying bird migrations and local infectious diseases in the middle-east and far-east' have contributed to the CB research and development programme. In other words the so-called BNHS bird migration study sponsored by the US Army is a little more than just watching birds as the Health Ministry and the BNHS have made it to appear. In fact the US Army was so much aware of the BW potential of migratory birds that when they tested their BW weapons in the pacific in the 1960s, the army conducted with the help of Ft. Detrick preliminary studies to find out, according to Sipri, if migratory birds would carry the BW agents away from the test zones and into populated areas

As mentioned....BNHS had been sending blood samples for analysis abroad including the US army laboratory. BNHS had extensive collaboration with the Smithsonian Institution whose connection with the US Army has been revealed in....Dr. Dillon Ripley of Smithsonian worked for several years at BNHS. His presence at BNHS is likely to be a little more than coincidental considering the fact that Dr. Ripley was reportedly the former chief of the office of Strategic Services precursor to the CIA."

4.2.2. The Committee desired to be furnished with details of the nature of the bird migration studies carried out by the Bombay Natural History Society and enquired whether it was correct that blood samples of migratory birds visiting India had been sent by the Socicity to the Smithsonian Institution for analysis. Dr. Ramachandra Rao stated during evidence:

"I know something about it. The Bombay Natural History Society has been interested in the migration of birds. As you are aware, Dr. Salim Ali, a great scientist, has been interested in birds and bird migration when a certain disease were discovered in South India, a view was put forward that perhaps migratory birds can carry the diseases across the Himalayas in the winter and summer seasons. So, he suggested a scheme to the World Health Organisation; at that time the WHO gave him a small

---

BW: Biological Warfare

bNHS: Bombay Nat tal History Society.

grant. Later he found that this aspect was not leading to any results and the WHO then did not grant funds for further schemes. Dr. Salim Ali then entered into an agreement with Smithsonian Institution which is also doing similar research work and he received a grant from the Institution for this purpose. But I do not think he sent the bird serum to any country. He was merely associated with the work of ringing the birds and releasing them in various places in the West and the East and also the birds released in other parts of the world come to India. Therefore, he was getting the knowledge of the distribution of the birds.

Since 1969, he has also been collaborating with the USSR team consisting of virologists in Moscow. When some of these scientists came to Bharatpur in 1973 to study Indian birds, they met Dr. Salim Ali and collaborated with him. This was done under the auspices of the Government of India and the team came to India with the assistance of the Government of India. This team was financed by the mutual agreement between the Government of India and the USSR Academy of Medical Sciences."

4.2.3. Subsequently, in a written note furnished to the Committee, the Department of Health clarified that the MAPS Project and the PL-480 Projects with Smithsonian were entirely different projects and that blood samples were not analysed by Smithsonian scientists. The Department also informed the Committee that the collaboration between BNHS and the Smithsonian Institution was during the periods 1967-68 and 1971-72.

4.2.4. In another note furnished to the Committee, the Department of Health confirmed that blood smears on slides had been sent by BNHS to MAPS in Bangkok during 1967-68.

4.2.5. The Committee desired to know how Dr. Ramachandra Rao, who was a member of the Executive Committee of the BNHS had not known where the blood sera was being analysed. In a written note furnished to the Committee, the Department of Health stated:

"Dr. T. R. Rao who was consulted in the matter has replied as follows:

'I was answering from memory. My impression was that blood *smears* and not *sera* were being sent either to MAPS or Smithsonian. I do not recollect whether work connected with any "sera" sent to them was discussed during the very few meetings of the Executive Committee of the BNHS which I attended and, if discussed, the matter has not left any impression on my mind'."

4.2.6. The Committee called for the copies of the report of the studies on bird migration carried out in collaboration with the World Health Organisation, Smithsonian Institution and MAPS. The Department of Health furnished a copy of the interim report on the activities of the BNHS upto 1971 received from the Society. As regards the report on the study by MAPS, the Department informed the Committee that it would be furnished on receipt from BNHS.

4.2.7. The Committee desired to know how many scientists from the Rockfeller Foundation working in the Virus Research Centre, Poona, had collaborated in the BNHS study. According to the information furnished by the Department of Health in this regard, the following scientists from the Rockfeller Foundation had collaborated in the BNHS study:

| | | |
|---|---|---|
| 1. | Dr. Telford H. Work . . . . . | 1955 to 1958 |
| 2. | Dr. H. Trapide . . . . . | 1956 to 1962 |
| 3. | Dr. Charles R. Anderson . . . . . | 1958 to 1967 |
| 4. | Dr. H.E. Webb . . . . . | 1958 to 1960 |
| 5. | Dr. Jorge Boshell . . . . . | 1960 to 1965 |
| 6. | Dr. Donald E. Carey . . . . . | 1961 to 1967 |

4.2.8. The Committee desired to know who had selected the sites for the experiments. The Department of Health stated in a written note furnished to the Committee:

"It seems that the studies in Kutch area were initiated by the BNHS after discussion with Dr. Telford H. Work, the then Director of the VRC. There is nothing on record to show that other areas were chosen by the BNHS in consultation with the VRC."

4.2.9. The Committee asked whether the Smithsonian scientists, including Dr. Robert Fleming Jr. and Dr. D. Ripley were working

at BNHS during the WHO sponsored study. Dr. Ramachandra Rao replied during evidence:

> "I am not aware where they were working. Dr. Ripley is the chief of the Smithsonian Institution and he is one of the renowned scientists. He has written a book on Indian birds and Dr. Salim Ali had been very close with him."

4.2.10. The Committee desired to know whether Dr. Ripley was the former Chief of the Office of the Strategic Services (OSS), precursor to the Central Intelligence Agency (CIA). In a written note furnished to the Committee, the Department of Health stated:

> "Dr. Salim Ali of the Bombay Natural History Society was addressed in the matter. He has replied as follows:
>
> 'S. Dillon Ripley interrupted his academic studies in 1942 to enter war service in the Office of Strategic Services. He was assigned in 1943 to the South-east Asia Theatre to work on military intelligence on Japanese forces. He resigned his wartime job in 1945 and resumed his academic career at Yale University, working his way through the ranks of the Department of Biology to Professor by 1961. He also became Director of the Natural History Museum of that University in 1959. In 1964, he was appointed Secretary (=administrative head) of the Smithsonian Institution in Washington, the largest complex of museums, cultural and scientific institutes under one administration in the world. He has also become a member of the US National Academy of Sciences and many other bodies, testifying to his scientific reputation in his field of study. He still finds some time to keep up his research and publishes in scientific fields. Dr. Ripley has been associated with myself in publishing on the birds of India and Southern Asia. However, he has not been concerned with the pathology studies of migratory birds.
>
> In my estimation his scientific and administrative work since resuming his professional career thirty years ago, and the record of that work, precludes any other conclusion than that of dedication to science and research'."

4.2.11. Extracts from a note furnished to the Committee by Shri Raghavan, Editor-in-Chief, Press Trust of India, on the BNHS-WHO-

**Smithsonian-Rockefeller Foundation-MAPS network for data gathering are reproduced below:**

"PTI report of July 28 had categorically stated that the WHO had sent four copies of the WHO-BNHS report on bird migration work to the US Army Migratory Animal Pathological Survey South-east Asia headquarters in Bangkok. The WHO reports were sent by Geneva headquarters to Elliot Mclure of MAPS and copy of the letter addressed to Mclure was seen by the PTI reporter himself. This direct connection with the US Army by WHO which did not bother to send the report to Health Minister on a project that concerned India raises a question Did WHO join hands with BNHS because of US Army's interest in virus transport to India through migratory birds? It was mentioned earlier that a similar project by MAPS in Brazil in 1968 went a foul after it was exposed in the American press."

"The BNHS had directly signed an agreement with MAPS. BNHS also collaborated with the Smithsonian Institution in Washington, D C. But it is well-known that Smithsonian occasionally works for the US Army. For instance an army spokesman had revealed in the US congressional hearings (1969) that the advice of the Smithsonian was sought in identifying a suitable institution to do (CBW) work. It has been reported by Sipri that various army and navy medical research units studying bird migrations in the middle-east and far-east have contributed to the chemical and biological research and development programme, thus making it clear that the BNHS-MAPS study had military objective."

"The BNHS and the Virus Research Centre in Poona had also collaborated with the U.S. Rockefeller Foundation. The Foundation was in fact running the VRC from 1953 till about 1967. It must be pointed out that many of the scientists in the US germ warfare laboratories were recruited from Rockefeller Foundations. The Foundation had specialised in identifying arboviruses around the world. It found the Kyasanoor Forest Disease Virus in Karnataka in 1957. This and several other arboviruses discovered by

---

CBW: Chemical and Biological Warfare.

MAPS: Migratory Animal Pathological Survey of the USArmed Forces Institute of Pathology.

**the Foundation have, according to Sipri report, 'engaged the attention of military microbiologists'. It is worth noting that when KFD broke out in Karnataka a vaccine for this was supplied to India by the US Army."**

4.2.12. Excerpts from the Hearings of the US Congress House Committee on Foreign Affairs published under the title 'Chemical-Biological Warfare: US Policies and International Effects' on the use of the Smithsonian in determining what areas might be suitable for CBW tests are reproduced below:

Congressman Richard D McCarthy, in his analysis of differences and replies on CBW from Departments and Ambassador Yost (Appendix C, pp. 347—367 of the book), had *inter alia*, observed as follows

> "I also find use of the Smithsonian, even if not on CBW itself but rather in determining what areas might be suitable for CBW tests, of questionable discretion in view of the Institution's international reputation and need to keep clear of any doubt as to the nature of its work."

McCarthy had asked the Department of Defence

> ' Does the Army use any discretion as to what types of institutions should be encouraged or pressed into accepting funds for work in chemical and biological warfare? Does the Army see any conflict in asking a purely civilian institution, such as the Smithsonian, to do work that might conflict with the Institution's activities abroad?"

The Department of Defence had replied as follows in letter dated 15th April 1969:

> "The Army certainly uses discretion in selection of all of its contractors. The advice of the Smithsonian Institution was sought in identifying a suitable institute to do this work. As a result, they submitted a proposal which was accepted. As a direct consequence of this work, there have been 45 papers written by Smithsonian scientists and published in the scientific literature. This has been a remarkably productive scientific investigation brought about by a coincidence of interests in the fauna of the area.

The Smithsonian Institution was never asked to do nor did they do, any 'military' chemical and biological warfare research. It carried out scientific investigations appropriate to its character and objectives, and published the significant findings in the scientific literature. These results are available for use by the Army, by any other government agency, or by any nation or scientist wishing to do so."

4.2.13. Explaining the link between the Smithsonian Institution with the US Department of Defence, Shri Raghavan stated during evidence:

"Mr. Ripley, who almost landed in our country as Ambassador, worked at BNHS before and during the WHO-BNHS study. He was the chief for the Asia region of the Office of Strategic Services, the precursor to the CIA. Now the Defence Department was asked by Representative McCarthy in the 1969 hearings on CBW whether DOD had used Smithsonian Institute in their chemical and biological warfare research and if so, how they justified it. Considering the fact of its other 'avatars' outside as the great protector of wild life etc. The Defence Department said that they did not use Smithsonian Institute in actual research but they used it as contacts with outside people to do the work. In BNHS, the sera was sent to MAPS in Bangkok. Dr. Salamali of BNHS who is a very respectable gentleman said that this study was about birds but actually this has nothing to do with birds. Any explanation that has smears and viruses was about birds is really for the birds. If you summon the Director of the Virus Research Centre, Poona, and ask for the papers of the research conducted on virus of migratory birds at his Centre my information is that he won't be able to tell you anything because all the papers have disappeared with Rockefeller scientists who worked there. Our poor Director would not be able to say as to where the files have gone. In fact, there is some basic defect in our administrative machinery.'

4.2.14. The Committee asked whether the blood sera sent to MAPS in Bangkok had also been investigated in India. Shri Raghavan stated:

"They may claim that these sera and everything were examined in Poona VRC. But, as a matter of fact, the Poona

VRC, to the best of my enquiry, only identified the ticks and parasites that the birds carry. Virus were never tested in India to the best of my knowledge. It might have tested Kyasanur Forest Disease (KFD) and this was the privilege of Rockfeller scientists who were the people who were running the Poona VRC at that time. If they had tested other BNHS studies and viruses I challenge VRC to prove it with papers that particular sample and class number etc that it was tested for group A, B or this thing and this was the result. I understand that the files are not there at all. If anybody had conducted any research, they removed the research papers and went away. Before 1965 or 1969 when BNHS and MAPS were there, blood smears were sent to Bangkok."

4.2.15. The Committee asked the Department of Health whether it was a fact that the Virus Research Centre, Poona had examined only mites and parasites and not blood samples. The Department stated in t written note:

"It is a fact that since the discovery of KFD virus in 1957, the BRC has been interested in the possible dissemination of this virus through various ectoparasites including those found on birds. The studies from 1959 to 1969 were largely connected with identification of ectoparasites submitted to VRC by the BNHS during the course of the latter's study on migratory birds. The ectoparasites were not tested by the VRC."

4.2.16. The Committee desired to know whether before agreeing to the collaboration between BNHS and MAPS, the Ministry concerned had examined why the US Army and its wing MAPS were interested either in virus study or bird migration. The Department of Health stated in a written note:

"The Ministry of Defence, Government of India, approved the project entitled 'Migratory Animal Pathological Survey (India)' on a technical point and the approval was conveyed by the Ministry of Defence to Dr. Fuller, Science Attache, US Embassy, New Delhi. The Ministry of Defence have no records to show whether they tried to find out why the US Army and its wing MAPS was interested either in virus study or bird migration."

4.2.17. **Explaining the grounds on which the project had been cleared by the Ministry of Defence, the representative of the Ministry stated during evidence:**

> "Although the project with Dr. Salim Ali was in progress for nearly ten years, it was referred to us for the first time in 1967 for a continuation of the grant and the Scientific Adviser at that time was aware that the granter of the project was the US Army research group and the work that has been done for the last ten years on this project, including the annual report, and a number of papers, published on this project were seen by the Scientific Adviser and in his judgement he felt that the continuation of the project for one year, for which permission was actually sought from us, would be in the academic interest for the simple reason there was no visit either by Indian scientists or by foreign nationals to any areas which we considered, at that time, to be sensitive areas from the military point of view. Hence the project was cleared by the Ministry of Defence on this technical point."

4.2.18. When the attention of the witness was drawn to the fact that blood smears had been sent to MAPS in Bangkok, he stated

> "We only cleared the project from this technical point of view and the conduct of the project was not with the Ministry of Defence. The details of the project: how it is conducted, how samples were collected, where they were analysed, etc., were not for the Ministry of Defence. We only cleared it on this point of visits of Indian nationals or foreign nationals to forward areas or sensitive areas."

He added:

> "This matter was first referred to us in the year 1967 by Dr. Salim Ali and the project was submitted to us through the US Attache in Delhi. On that project there is no mention of this Smithsonian Institute. We were aware that the granter of the project was the US army research group."

4.2.19. Extracts of Notes from File No. 0105/242/SA's Sectt./RD. 79 of the Ministry of Defence, furnished by the Ministry at

the instance of the Committee, relating to approval of the Migratory Animal Pathological Survey (India) are reproduced below:

"The United States Army Research and Development (Far East), has made a grant of 4,500 dollars to the well-known Indian Ornithologist, Dr. Salim Ali of the Bombay Natural History Society for undertaking Bird Migration Studies in India. The purpose of the project is to study the relationship between wild birds and their effect on man as dissiminators of insect borne virus diseases. The project is designed to collect ectoparasites of birds both migratory and non-migratory and to ring the birds to obtain more information about their summer sojourn in breeding grounds in Central Asia and farther north.

In a personal reference to SA, Dr. Salim Ali has sought the clearance from the Ministry of Defence for acceptance of the grant for the proposed project

Dr. Fuller, Science Attache to US Embassy saw the undersigned on 18th October, 1967 in this connection. It appeared that he had earlier approached the Scientific Adviser who advised him that the details of the project may be sent to him for examination. Dr. Fuller during his meeting with the undersigned furnished a copy of the grant agreement giving details of the project. He also handed over a list of projects on different subjects which are being supported by the US Army Research and Development Group (Far East) in various countries in Far East and South East Asia and a copy of the Annual Progress Report on Migratory Animals Pathology Survey 1966 reporting progress of bird migration studies in South East Asia and Far East.

Sometime back a number of US Defence agencies had approached the Indian Institute of Science, Bangalore and also other Government and non-Government Scientific Institutions in India for undertaking research on projects of mutual interest with the financial support of these agencies. Some of the institutes approached Defence R&D Organisation to know if Defence was interested in such projects. Since the Ministry of Defence have already an understanding with the Advanced Research

Projects Agency of the USA Department of Defence in respect of scientific projects of mutual interest, the Ministry of Defence felt that in respect of collaborative defence research schemes the proposals emanating from the various Defence agencies in USA should be routed through ARPA to ensure proper coordination. Similarly, in India such collaborative research proposals of interest to Defence should be negotiated through Defence Research and Development Organisation. The subject is also going to be discussed in the next meeting of SACC.

The present reference is perhaps a direct result of the known views of the Ministry of Defence as indicated above.

So far as the present proposal is concerned, it is a continuing project which the Bombay Natural History Society has been pursuing since 1959 in collaboration with World Health Organisation for determining the role of migratory birds in the spread of virus diseases. In this project birds were trapped, ringed and ectoparasites and blood specimens were collected. The blood specimens collected during those investigations were investigated by the KS Institute of Poliomyelitis and Encephalitis, OMSK, USSR and the ectoparasites by the Virus Research Centre at Poona. So far, 4 papers have been published in the Society Journal incoporating results of this collaborative study.

These investigations are now facing closure unless fresh funds are made available to the Society who have established camps in almost all sectors of the country from Kerala in the South to North Bihar and from Chilka Lake in the East to Kutch in the West. The investigator proposes to continue these studies with the proposed grant from US Army Research and Development Group (Far East). The major effort under this project will be concentrated at Keoladeo Ghana Bird Sanctuary, Bharatpur, Rajasthan in North West India, which attracts a large number of migratory birds during cold weather. The area has also a very good non-migratory avian fauna. As usual birds will be ringed and blood samples and ectoparasites collected. These will be sent to Migratory Animals Pathology Survey Office at Bangkok.

It is clear that Dr. Salim Ali who had been the Chief Investigator in the Migratory Animals Pathology Survey* in India since 1959, is eminently suitable for undertaking the proposed project. So far as his training, experience and technictal ability are concerned, there can be no fitter person for the proposed study. It is observed that collection of ectoparasites and blood samples is an integral part of the study. Presumably suitably trained technician would be recruited for undertaking this job.

The results may have a remote significance in the operation of aircraft in the area.

SA is away on leave and, therefore, I am sending this case to the Ministry for approval.

(Sd.)

Dy. Chief Scientist.

We need not object to the scheme. Visits to forward areas however will not be possible without clearance from Ministry of Defence.

(Sd.)

JS(PS)

I think we can accept this scheme. There is no visit to forward areas, either by Indians or by foreigners envisaged at all in this scheme. It has come to us only on a technical point.

(Sd.)

S.A.

(4-11-67)"

4.2.20. The Committee desired to know the reasons for sending the blood slides to Bangkok. The Health Secretary stated during evidence:

"Since this question had been raised by you earlier, we got in touch with Dr. Salimali and the information supplied by him is before me in the file. If you permit me, I will read it out. He says:

*of the United States Armed Forces Institute of Pathology.

'It was decided to investigate the possibility of migrant birds carrying virus-infected ticks on their southward migration into India. The Society was invited to sutdy the problem. Funds were provided by the WHO. The ticks and blood smears obtained from birds were studied by the Virus Research Institute, Poona and the Institute of Diseases with natural foci at OMSK, USSR, respectively. No satisfactory evidence of bird involvement in the transmission of the virus was obtained and the VRC is continuing its search for alternate hosts. The Society's migration studies continued from the beginning upto the year 1972'.

This is all the information that I have been able to get."

4.2.21. The Committee asked whether the Ministry of Defence had any machinery of their own to find out whether somebody was upto some mischief somewhere. The representative of the Ministry of Defence replied that there was no machinery in 1967. When asked whether any machinery existed at present, he replied in the affirmative.

4.2.22. The Committee desired to know whether the Military authorities had any machinery to detect experiments conducted by foreign agencies in India which might be against the interests of the country or whether it was necessary that somebody should make a report to that effect. The witness stated:

"We have methods by which we know what kind of research projects are undertaken in the country. There are two channels of information—either through the Ministry of Education or the other Ministries where the research is being conducted. They refer the matter to us in case any security clearance is required or the project itself is referred to us directly before it is referred to the other Ministries for any clearance. The second channel is the projects which are granted by the Defence Ministry in which case of course we are always in the picture. These are the two channels of information we have for the research that is being conducted in the country."

4.2.23. In view of the fact that MAPS was exclusively an agency of the United States Army, the Committee desired to know how it was ensured that the results of the studies of blood smears of migratory birds were not utilised for the induction of germs into the

country. In a written reply furnished to the Committee, the Department of Health confessed:

> "In scientific studies it is not always possible to visualise the use to which a particular can be put to. Hence it will be difficult to anticipate all contingencies and take measures against them."

4.2.24. The Committee desired to know whether it was a normal practice for Government or private organisations in the country to collaborate with foreign military organisations on scientific projects. The representative of the Ministry of Defence stated during evidence:

> "From the information I have on the files there was an understanding at that time by the Ministry of Defence with several governmental agencies outside in this manner that any project which had any defence sensitivity should be channelled through the Ministry of Defence. On the one side, in this particular case, the understanding was that any project that was referred from the United States should go through ARPA—Advance Research Projects Agency of United States. This was the understanding we had."

4.2.25. Subsequently, in a written note furnished to the Committee in this regard, the Department of Health stated:

> "Scientific Projects are being dealt with by various Ministries and organisations. The Council of Scientific and Industrial Research, ICAR, Defence Research Organisation, ICMR, All India Institute of Medical Sciences, Postgraduate Institute of Medical Education and Research, Chandigarh, Vallabh Bhai Patel Chest Institute, Department of Science and Technology, Department of Agriculture, were therefore, addressed in the matter. Replies from all except the Department of Science and Technology received. It is seen from the replies received that the CSIR, ICAR, Defence Research and Development Organisation, ICMR, All India Institute of Medical Sciences, Postgraduate Institute, Chandigarh and Department of Agriculture do not have normally collaboration with any foreign military organisation on any of their scientific research. However, the Indian Council of Medical Research who is incharge of PL-480 Projects in so far as biomedical research is concerned, has two projects, namely (i) Human Biology Studies on differentiated tissues under Dr. G. P. Talwar, Professor of

Biochemistry, All India Institute of Medical Sciences, New Delhi; and (ii) Coordinated study on infectious bepatitis in India under the Director General, Indian Council of Medical Research, which have some connection with the Naval Research of U.S.A. The first project is being carried out in collaboration with the office of the Naval Research, U.S.A. and for the second project, the Naval Research, USA is the supporting agency. The second project has been approved by the ICMR Screening Committee and Government of India, but has not yet been started. In the Ballabhbhai Patel Chest Institute a project relating to the relative role of cardiac afferents in the regulation of the cardiovascular functions under physiological and experimental conditions, under Dr. P. D. Gupta, is being supported by grant for the purchase of equipment and laboratory supplies which are not available in India by the U.S. Air Force through the European Office of Aerospace Research Brussels, Belgium. Tris Project was cleared by the Ministry of Education, Government of India."

4.2.26. A note on ARPA—Advance Research Projects Agency of the United States Defence Department furnished to the Committee by Shri Raghavan, Editor-in-Chief, Press Trust of India is reproduced below:

"ARPA according to New Scientist (August 8, 1974) 'is an elite group of civilian scientists conducting high risk research and development of a revolutionary nature in areas where defence technology in the U.S. appears to be falling behind or in areas where the U.S. cannot afford the risk of falling behind'. ARPA, it said, was responsible for evolving the herbicide warfare programme under the guise of food technology research. Again ARPA financed a GCMU-like project in Burma in 1967 before GCMU was set up in New Delhi. It was again ARPA that conducted a blood group survey in South India and other Asian nations. This blood group survey, according to New Scientist article, was related to the development of ethnic weapons by exploiting genetically related susceptibilities and intolerances in order to use germ or chemical weapons selectively against certain populations. India has four seismometer stations all supplied and maintained by ARPA for detecting underground nuclear explosions. The new scientist revealed

ARPA: Advance Research Project Agency of the United States Department of Defence.

that within ARPA is a project called 'AGILE' a counter-insurgency research programme responsible for opening up limited warfare technologies."

4.2.27. The Committee desired to know the background of ARPA and the nature of work done by them. The Committee also drew the attention of the Ministry to Project AGILE, a counter-insurgency programme within ARPA and asked whether the Ministry of Defence was aware of such activities of ARPA before entering to an understanding that any collaboration project referred to by the United States should go through ARPA. In a written note, the Ministry of Defence stated:

"ARPA is the Advanced Research Projects Agency of the United States Defence Department. This agency is responsible for the support of research projects with the Department of Defence funds in various well recognised centres for research both in the United States and abroad. From the records available to us, it appears that in 1967 when the clearance for the BNHS project was given on a technical point, our Organisation was not aware of the Project AGILE supported by ARPA."

4.2.28. The Committee desired to know why the Ministry of Defence did not think it necessary to examine and evaluate the BNHS Projects to find out the possible objective of the US Army in the study. In a written note furnished to the Committee, the Department of Health stated as follows:

"The Ministry of Defence who were consulted in the matter has replied as follows:

'The BNHS had been working on this project since 1959 in collaboration with the World Health Organisation and four papers had already been published in the BNHS Society journal incorporating the results of the study. The proposal for the continuance of the study of Indian bird migration was received by the then SA in October, 1967. During the period 1959—1967 the blood specimens collected were investigated by the KS Institute of Poligmyclitis and Encophalitis, OMSK, USSR and the ecto-parasites by the VRC at Pune.

It is not known from the records why the Defence Research and Development Organisation to whom the proposal was sent did not think it necessary to examine and evaluate

the BNHS project. It appears that since it had been in progress for nearly 8 years in collaboration with the WHO and clearance for this project for continuance for a period of only one year had been asked, and no visit to forward or sensitive areas by either Indian or foreign scientists was involved, such a clearance was given'."

4.2.29. The Committee called for the files relating to the collaborative work between the Bombay Natural History Society and the Virus Research Centre, Poona, on bird migration studies. From a perusal of the files made available to the Committee by the Department of Health, the Committee found that the Virus Research Centre, Poona had only identified mites and termites furnished from time to time by the Bombay Natural History Society and had not examined any blood samples.

4.2.30. From one of the files (No. 506(10)I) the Committee found that Dr. Ramachandra Rao, the then Director of the Virus Research Centre had, in his letter dated 15th October 1969, requested Dr. Salim Ali of the Bombay Natural History Society to let him know how the sera and the parasites collected from the birds in the Aurangabad District had been dealt with. Dr. Salim Ali in his reply dated 17th October 1969 had stated that the ectoparasites collected from birds in Aurangabad District had gone 'as usual' to MAPS in Bangkok and that there they would be sorted out and sent to the respective specialists for working out. Dr. Salim Ali had also stated that 'it is usually the last we hear of the material'. Dr. Ramachandra Rao's letter and Dr. Salim Ali's reply thereto are reproduced below:

"Dear Dr. Salim Ali:

I have seen with much interest your recent report No. 8 on the BNHS Migration Study Project. I would be grateful if you could let me know how the sera and the parasites collected from the birds in the Aurangabad district, Maharashtra State, have been dealt with. I am asking this question, particularly because we are very much interested in the ectoparasites of this area and also the prevalence of antibodies to arboviruses in this region. We shall be grately interested in seeing the technical results of this work.

Best regards,

Yours sincerely,

(Sd.) T. RAMACHANDRA RAO"

"Dear Dr. Ramchandra Rao,

The ectoparasites collected from birds in Aurangabad dist. (Report No. 8) have, as usual, gone to MAPS in Bangkok as *quid pro quo*. There they will be sorted out and sent to the respective specialists for working out. This is an unsatisfactory arrangement in so far as the Society is concerned since it is usually the last we hear of the material. We have not been collecting any sera because of technical limitations—only blood smears. The slides also go to MAPS.

I would be happy if in future you could send a couple of your technicians with our field teams from time to time to collect ectoparasites and sera for study at the VRC. It seems a pity not to be able to make fuller use of our opportunities. We now have a camp operating at Point Calimere in Tamil Nadu and are planning another one at Nal Sarover in Gujarat from the first week of December. The Bharatpur camp is of course there as usual.

The annual conference of MAPS workers in Southeast Asia is to be held in Bharatpur on 5th and 6th December. Dr. McClure of MAPS and Dr. Watson of the Smithsonian will be there. I would be very glad if you could also participate in this, because we could then have the benefit of your suggestions and advice about the closer coordination or our activities so as to make them more meaningful from the arbovirus point of view. Please let me know if you can come.

Yours sincerely,

(Sd.) Salim Ali.

This will go to show that Dr. Ramchandra Rao had clearly misled the Committee by stating only blood smears and not sera (page 177) were being sent either to MAPS or Smithsonian.

4.2.31. Since the Ministry of Defence had cleared the BNHS-MAPS study, the Committee desired to know whether the Ministry had not considered it necessary to obtain a copy of the report of the study. If the Ministry had not considered it necessary, the Committee also desired to know the reasons for this complacent attitude of the Ministry towards a project in which the US Army had evinc-

ed considerable interest. In a written note furnished to the Committee, the Ministry of Defence, who had been consulted in this regard by the Department of Health, stated:

> "As explained earlier, the clearance for the BNHS study was given by DRDO on a technical point viz. security clearance, as no visit of Indian or foreign scientists to forward or sensitive areas was involved. This clearance was given for the continuance of the study for one year. This study had been continuing for nearly 8 years before the proposal was referred to DRDO and DRDO was not directly involved in the manner of progress of the project and in the results of the study at that time. Hence, it appears that the copy of the report of the study was not obtained."

4.2.32. The Committee desired to know whether any grants were given by the Ministry of Agriculture to BNHS. In a note furnished to the Committee, the Department of Health stated:

> "The following grants were given by the Ministry of Agriculture to the Bombay Natural History Society:

| *Year* | *Amount of Grant sanctioned* |
|---|---|
| 1972-73 | Rs. 50,000 |
| 1973-74 | Rs. 22,500 (in two instalments of Rs. 12,000 and 10,500)." |

In another note it was stated that the Ministry of Agriculture had no information regarding MAPS other than the release of grants to the Bombay Natural History Society.

4.2.33. The Committee asked whether the reports on the work done by BNHS were received by the Ministry. The representative of the Ministry of Agriculture replied during evidence:

> "The Ministry of Agriculture came into the picture in 1972-73. The report has not reached our hands. If the Committee desires, when the report is received, we can place it before you."

---

DRDO: Defence Research Development Organisation.

**4.2.34. The Committee desired to know whether the World Wild Life Fund obtained any grants from MAPS. In a written reply, the Director General, World Wild Life Fund informed the Ministry of Agriculture that the World Wild Life Fund had never received funds nor had had any association with the Migratory Animal Pathological Survey (MAPS) of the US Army.**

4.2.35. The Committee asked whether it was correct that Dr. **Siedensticker of the Smithsonian Institution had made four or five visits to the coastal and estuary areas in Sunderbans for catching** tigers, which did not succeed. The representative of the Ministry of Agriculture stated:

> "Dr. Seidensticker was in Nepal on some project which had some connection with Smithsonian But when he came here, he had no job or no connection with that project and the Smithsonian Institute. He was, what is generally known as, a free lance. I am not personally aware as to how many trips he made. But I know that he stayed for a number of days. Not only was there a 'she' but there were also a number of other 'he's, including West Bengal Government officials."

## CHAPTER V

## ULTRA LOW VOLUME SPRAY PROJECT AT JODHPUR AND PESTICIDE RESEARCH AT PANTNAGAR

5.1.1. A note furnished by Shri Raghavan, Editor-in-Chief, Press Trust of India on the Ultra Low Volume (ULV) Spray Project at Jodhpur and Pesticide Research at Pantnagar is reproduced below:

"An US Agricultural Department (USDA) expert is working at the Pantnagar agricultural university running a PL-480 financed project on the development of microbes and viruses for destroying agricultural pests. It is now learnt that there are a few more microbial pesticide projects under PL-480 scheme including one at the Gujarat Agricultural University in Anand. This new technique, its advocates claim, will replace pesticides in agriculture in the same way GCMU advocates claimed that their project would replace DDT in the health field. It must be pointed out that the microbial pesticide projects involve development of microcapsules for encapsulating viruses.

These projects are pushed under the garb of revolutionary pesticide research. But one must not lost sight of the fact that data gathered during such projects and the techniques in field experiments to test the feasibility of such methods are hardly different from those involved in BW research programmes. There is enough published information to prove this.

According to the Sipri Report, micro-encapsulation is a technique for wrapping microscopic particles in individual protective coatings. This method was initially developed for replacing typewriter ribbon (the ink droplets were wrapped in microcapsules and deposited on typing paper thus eliminating the ink carrying ribbon). Later the technique was borrowed by pharmaceutical industry and by germ warfare experts whose interest was to protect the BW agents from sunlight etc. and to preserve the viruses (nicely kept in tiny capsules) in an easily usable form (like powder) for a long time. In this context Sipri

Report says that microbial pesticide research 'provides information on the feasibility of disseminating micro encapsulated BW agents'. The report says that micro-encapsulation can be used to increase the performance of pesticides in the same way it can be used to enhance the effectiveness of CBW agents. The important point to note in the Sipri Report is the statement that 'the objectives, the types of protection sought (with the microcapsules) and the technologies are closely related'. The report clearly says that 'pesticide research is likely to continue providing impetus to CB weapon programme'. Spri also says that 'the possibilities of spin off into CB technology from such activities are obvious enough'.

Encapsulated germs in powder form would look hardly different from DDT or other pesticides. In other words the hardware for dispersing pesticides is also similar to the hardware developed for BW agents. Pesticides are meant to destroy agricultural pests and BW agents are meant to kill humans, animals or plants. With the exception of their ultimate target organisms, Sipri report says, 'there is not a great deal of difference between methods for applying pesticides and those for CBW agents'.

The Sipri report continues: 'The hardware, the meteorological and topographical considerations and even the mode of action of some of the chemicals have many similarities so that improvements in pesticide techniques may mean potential improvements in CBW techniques'. The report goes on to say that the 'manufacturing facilities set up to produce pesticidal agents and hardware might in the future be more adaptable to CB weapons supply than they are today'.

It is in this connection the WHO-Health Ministry experiment on the control of urban malaria at Jodhpur must be seen. There an Ultra Low Volume (ULV) spray machine obtained from the US is being used ostensibly to spray malathion insecticide to control malaria. It is important to note that ULV technique is an acknowledged method for spraying aerosels of BW agents. This has been so stated by Sipri experts in their report. It says: 'The comparatively recent insecticide technique known as ULV spraying has led to hardware design specifications that

make agricultural spray systems much more like military ones'.

WHO started introducing the ULV technique in Asia first at Bangkok in 1971 but the operation was terminated for reasons not known. Then it moved to Jodhpur, a town that has low priority for malaria. But according to meteorologists Jodhpur is one of few towns in India that experiences some climatic extremes—lowest humidity, highest temperature, calm winds and so on. The study of BW dispersal under such climatic conditions will find an important place in any BW research programme and in fact, according to Sipri, 'improvements in agent dissemination technology have a high, perhaps the highest priority in CBW weapon program' in the US. The report goes on to say 'Weather is critical to the performance of many types of CB weapons. Maximum effectiveness thus depends on ability to predict or measure prefailing weather conditions and to exploit the air streams occurring over the target. The particle size in which the payload of the CB weapon is disseminated is also critical. Efforts to improve aerosol generating techniques are presumably a prominent feature of the large area incapacitating weapon systems'. Elsewhere the Spiri report says that 'climatological surveys have also been completed which indicate that the predictable sympotic systems occur over all of the large land masses of the world that would lend themselves to the transport of particulates materials to the distance of thousands of miles'.

Weather determines how aerosolized BW agents would disperse. But solar radiation, temperature, humidity and other factors determine whether the agents would survive long enough to find the target and potent enough to kill. For instance, the Sipri report says that BW agents after aerosolization are exposed 'to an environment that is actively hostile to them. Solar radiation, particularly in the shorter wavelights may be quickly lethal (to the agents themselves). So may be the atmospheric humidity that may be too high or too low or changing too swiftly'. These survival periods are crucially important to the operational possibilities of BW weapons.

It is very likely the WHO-PL-480 ULV experiment at Jodhpur would provide some information on the aerobiology of

BW agents under extreme climatic conditions existing in Jodhpur. According to Sipri one of the objectives of projects currently implemented by the US biological warfare laboratories is 'to isolate and or adapt bacteria and viruses to growth at elevated temperatures to improve resistance to thermal and aerosolstresses'. This has also been mentioned in the report to U Thant by CBW expert committee. It says that most pathogenic agents are highly vulnerable to environmental stress such as temperature, solar radiation, humidity, etc. The inactivation process of BW agents which is governed by several (environmental) factors are now the subject of aerobiological research'."

5.1.2. On the place of the ULV Spray Project in biological warfare, Dr. Jayaraman stated during evidence:

"The study on the survival of biological warfare agents is something that was conducted at Jodhpur. A Meteorologist told me that Jodhpur is one of the few towns in India that experiences some climatic extremes—lowest humidity, highest temperature, calm winds and so on. There are no mosquitoes there, but the meteorological conditions are very suitable for studying the survival of BW agents, Jodhpur was chosen perhaps for this purpose. These are the conditions that exist there. In dispersal again one has to study the behaviour of Aedes Aegypti mosquitoes. Then they have to study encapsulated virus released by aerosol methods. This is what they studied in Jodhpur. This will give us the data in regard to the survival of BW agents under these conditions."

5.1.3. The Committee desired to know the reasons for selecting Jodhpur for urban malaria control using the ULV spray technique. In a note the Ministry of Health stated:

"Jodhpur town had recorded large number of malaria cases and the State Government had agreed to provide the man-power and transport facilities."

5.1.4. To a quesion when the project started, the Ministry replied:

"Preliminary data was collected from June 1972 onwards, trial round of applications were made during March 1973 and first regular application was made on 18th April, 1973."

5.1.5. Asked about the priority rating of Jodhpur in comparison to other urban centres with malaria, the Ministry stated:

"Of the seven towns considered for the trial, Jodhpur had the

highest incidence of malaria. The incidence of malaria in those towns for 1970 and 1971 are given as follows:

| *State* | *Urban Area* | *Malaria positive cases in* | |
|---|---|---|---|
| | | 1970 | 1971 |
| Rajasthan | Jodhpur sub-unit | 17,178 | 16,205 |
| ,, | Kota sub-unit | 615 | 2,777 |
| ,, | Bikaner sub-unit | 2,521 | 2,998 |
| ,, | Ajmer | 697 | 1,467 |
| Gujarat | Baroda | 9,701 | 13,639 |
| ,, | Ahmedabad | 12,812 | 8,360 |
| ,, | Broach | 482 | 1,229" |

5.1.6. The Ministry furnished the following information on malaria incidence in urban Jodhpur for the last five years:

| Year | Malaria incidence in urban Jodhpur |
|---|---|
| 1970 | 16,460 cases |
| 1971 | 15,913 cases |
| 1972 | 5,308 cases |
| 1973 | 5,412 cases |
| 1974 | 3,082 cases (provisional)" |

5.1.7. The incidence of the disease in a few other urban centres with malaria nuisance, furnished by the Ministry was as follows:

| Year | Number of malaria cases in | | | | |
|---|---|---|---|---|---|
| | Bikaner | Bellary | Ajmer | Delhi | Ahmedabad |
| 1970 | 2521* | NA | 697* | 1322 | 12812* |
| 1971 | 2998* | NA | 1467 | 3852 | 8360* |
| 1972 | 2217 | NA | 352 | 3572 | 10616 |
| 1973 | 1493 | 96 | 407 | 3452 | 22155 |
| 1974 | 1247** | 201 | 864** | 12163 | 35979 |

*Figures for the town are not available. The data is for the sub-unit, which includes the town also.

**Provisional.

NA - Not available.

5.1.8. The Committee desired to know how the ULV project was evaluated. The Committee also desired to be furnished with copies of minutes of all meetings held in connection with the ULV experiment as well as interim and other progress reports giving all the technical information and also copies of all correspondence between the WHO and the Health Ministry on the ULV project. The Ministry of Health, in a written reply, stated:

> "The project is evaluated by assessing the populations of vector species and also the incidence of malaria cases. No formal meetings were held. Only informal discussions were held."

5.1.9. The Committee found from the correspondence that the following proposal put up by the Director, National Malaria Eradication Programme was approved by the Director General, Health Services in January 1972:

> "The scheme for carrying out Urban Malaria Control in 22 towns during 1971-72 has been sanctioned during November 1971 by the Government of India. The scheme envisages application of breeding surfaces with Paris Green or AGLF or oil according to the situation. These antilarval operations are to be supplemented by insecticidal spray in urban areas in localities, where positive incidence is more.
>
> During discussions with Dr. F. R. S. Kellett, Senior Malaria Adviser, WHO, New Delhi regarding the WHO assistance for NMEP in procuring different items (already approved by D.G. and Ministry of Health), the question of use of LECO ULV Fog Generator, which is a cold aerosol spray carried out from outside (not within the house) to control mosquito, has been discussed. It was observed that this LECO ULV studies were carried out successfully at the Aedues Research Unit, Bangkok. The aovantage of using this aerosol spray is reported to be (1) reduces air pollution (2) no insecticide waste (3) eliminates traffic hazards (4) reduces toxicity (5) eliminates fire hazard and (6) reduces cost on the insecticide.
>
> Dr. Kellett has informed that the machine for the aerosol spray will be procured by the WHO and supplied for use under NMEP and he further observed that the insecticide Malathion, which is used in concentrate form, will also be

supplied by the WHO and for this, a Pilot Project is proposed to be undertaken in any urban area, where urban malaria is a great problem. I was assured that there would be no financial commitment on the part of the Government of India in this regard. The WHO will meet the cost of the equipment, procure the insecticide for for 1971-72, 1972-73 and if necessary for the succeeding years from the amount provided for assistance to NMEP from WHO funds.

Since the aerosol spray has been proved to be successful at Bangkok and no toxic hazards have been recorded and since no financial commitment is involved on the part of the Government of India, it is recommended that a field trial may be taken up in part of Jodhpur town in Rajasthan, where malaria incidence is highest as can be observed from the following statement:

| State | Urban Area | Malaria positive cases in | | Positive cases for the whole unit area | | |
|---|---|---|---|---|---|---|
| | | 1970 | 1971 | 1969 | 1970 | 1971 |
| Rajasthan | Jodhpur sub-unit | 17178 | 16205 | 3231 | 28048 (Jodhpur) | 17670 |
| ,, | Kota sub-unit | 615 | 2777 | 1722 | 1166 (Kota) | 4936 |
| ,, | Bikaner sub-unit | 2521 | 2998 | 137 | 7860 (Bikaner) | 5780 |
| ,, | Ajmer | 697 | 1467 | 449 | 3570 (Ajmer) | 3406 |
| Gujarat | Baroda | 9701 | 13639 | 4772 | 16147 (Baroda) | 21947 |
| ,, | Ahmedabad | 12812 | 8360 | 4364 | 30908 (Ahmedabad) | 16473 |
| ,, | Broach | 482 | 1229 | 1296 | 3264 (Broach) | 20673 |

It is only in part of the Jodhpur town will be taken up for field experiment and the rest of the towns will be taken up with the orthodox control of antilarval operations etc. The WHO will assist in carrying out the Pilot Project with the technical staff and if Addl. D.G./D.G. approve of the proposal, I can discuss further about the Pilot Project with WHO and start the work as early as possible, so that the efficacy of the aerosol spray, when compared to the orthodox methods of antilarval operations in con-

trolling urban malaria, can be studied and if the aerosol spray is found satisfactory and the results are encouraging, further equipments can be purchased through WHO assistance for use in other States like Gujarat etc."

5.1.10 In a note on the ultra low volume (ULV) insecticidal application technique for malaria control in urban areas of Jodhpur (Rajasthan) prepared by the Assistant Director (UM) on 17th February, 1975, the following programme of the project has been reported

"With a view to study the efficiency of ULV application (Malathion technical @ 415 ml/hectare), Jodhpur sub-unit was selected in view of the high positive incidence of malaria reported in that area. Under this method technical malathion is sprayed with a LECO machine as a cold aerosol from outside the houses, not within the houses.

During 1973, LECO machine was received and work on ULV applications of technical malathion was initiated. Trial rounds were made towards the end of March and early April 1973. The first regular application was made on 18.4.73. Thereafter, fortnightly applications were given during 1973. The applications were continued during 1974, except after monsoon, when the frequency of the applications were reduced from a fortnight to ten days.

The area which was selected for the study was Soorsagar area in Jodhpur town, about two third of sq. kilometre population 7314. A similar area to serve as control, Mandore area, population 100351, was selected on the other end of the town. During early 1972, the breeding sources in the houses and outside were surveyed and enumerated and adult collections of the vectors were initiated. The area was divided into four sections. On the basis of the data obtained, 20 fixed stations (5 stations in each section) for adult mosquitoes were fixed. In addition random collections were made from one house near a fixed catching station. The collections of adult mosquitoes were made periodically, particularly before and after the applications. The data in regard to the adult collections of the vectors, i.e. A. culicifacies, A. stephensi, and C. fatigans was collected.

From epidemiological point of view in addition to malaria incidence in Test and Control Areas, positives detected

through active case detection, mass blood surveys were carried out before and after the transmission period during 1972, and before and after transmission period 1973 and 1974.

While in the test area, ULV applications were made, in the control area conventional methods of control by way of focal spray with residual insecticide and anti-larval operations were carried out. No insecticide other than ULV or any larvicides was used in the test area.

During the year 1973, unprecedented heavy rainfall was recorded in Jodhpur area whereas during 1974, the rainfall has been normal.

**RESULTS**

From the results obtained it can be inferred that during 1973, the fortnightly applications were effective in keeping the density of A. stephensi under control. However, when the monsoon set in and rainfall was heavy there was sudden rise of A. culicifacies population. Further, due to heavy rainfall in the surrounding areas there was infilteration of this vector and the impact could not be felt in the test area which was only two third of a sq. kilometre.

In view of the experience gained in 1973, during the period of high density of A. culicifacies the frequency of applications was reduced from 15 days to 10 days following on set of rains. So that the transmission due to A. culicifacies was also interrupted resulting in the low incidence of malaria in the test area.

**FUTURE PROSPECTS**

The population of the test area has been exposed to the technical malathion for nearly two years. The ULV applications were stopped from January 1975. It is proposed that the ULV applications project for control of urban malaria may be shifted from Jodhpur.

At present nearly 10 barrels of technical malathion out of 15 barrels (3000 litres) supplied by WHO are available. Also in addition to the LECO machine that has been in use in Jodhpur, another LECO machine has also been made available.

The Director of Health Services in his letter No. MAL/ULV/75/49 dated 1-2-1975, addressed to the Director General of Health Services, New Delhi has requested for shifting the project from Jodhpur to Ajmer. The preliminary data from Ajmer has been received and if approved we may carry out further preliminary studies for shifting this project to Ajmer."

5.1.11. The Committee asked whether the ULV spray technique could not have been used for aero-biological research, the Director General, Health Services replied:

"Theoretically, the possibility of using the Ultra Low Volume machine for purposes other than the spraying of insecticides, for which it is primarily meant, as an aerosol for spreading virus or bactorial infection is definitely 'yes'. But the machine that has been imported is under very strict supervision of the entomologists of the National Malaria Eradication Programme. All along it has been used for the spraying of insecticides for the control of mosquitoes in houses and elsewhere."

5.1.12. In reply to a question on Indian staff working the machine, the witness stated:

"Whenever this apparatus works, there is a set of about six people to see how the machine operates. Theoretically, I agreewith you, instead of insecticides one can certainly put in a bottle of broth containing organisms and it can also spread the organism with the same facility and ease as it can spread insecticide. That is absolutely correct. But the supervision and control and how it is being used are the only guarantees that it is being put to proper use."

The witness added:

"With regard to the operation of this machine, it is entirely done by Indians and one officer of WHO is associated with it. He is an officer of the Regional headquarters here."

5.1.13. To another question whether the officer of the WHO was a foreigner, the witness replied that he was an Egyptian. When asked about the rank of the Indian officers, the witness replied:

"The person from the NMEP is of the rank of Asstt. Director. The person from the State of Rajasthan who also takes part in this operation is also of the rank of Deputy Director. They are scientists. The third category is insect collectors."

5.1.14. According to paragraph 7.7.1. of the report of the Consultative Committee of Experts to determine alternative strageties under NMEP furnished to the Committee, the experiments on the ULV technique to control urban malaria had been carried out in Jodhpur after dusk. The Committee desired to know the reasons for conducting these experiments after dusk. In a written reply, the Ministry of Health stated:

> "The activity of mosquitoes from the breeding and resting sites starts at dusk and reaches its peak around 9.00 P.M. to midnight. Therefore, application of the insecticides was made after dusk to ensure maximum contact with the adult population."

5.1.15. The Committee desired to know whether any other institution, besides Pantnagar Agricultural University, was associated with PL-480 or other US financed projects on microbial pesticide. In a written reply, the Ministry of Health stated:

> "The Secretary, Department of Agricultural Research and Education, Ministry of Agriculture, Government of India, who was consulted in the matter has replied as follows:
>
> 'So far, chemical insecticies were generally being used widely for the control of insect pests; of late, the emphasis has shifted to integrated pest control involving an appropriate combination of genetic, agronomic, chemical and biological methods of control. In view of this, biological control for eliminating insect pests through parasites and predaters is being studied more intensively. Research on bacteria and pretezoa as parasites is being carried out at several institutions. There is, however, only one PL-480 project entitled 'Studies on Microbial Insecticies' (FG-IN-525) at G.B. Pant University of Agriculture and Technology, Pantnagar under Dr. K. G. Gallakota, Dean, School of Basic Sciences and Humanities'."

5.1.16. The Committee desired to know whether the microencapculation technique developed for such pesticides closely related to the technology used for encapsuling biological agents for effective dissemination. In a written reply, the Ministry of Health have

stated:

"The Secretary, Department of Agricultural Research and Education, Ministry of Agriculture who was consulted in the matter has stated that they have no information on the subject."

5.1.17. The Committee desired to know the names of the US Department of Agriculture scientist working at Pantnagar University on the microbial pesticide project and the American scientists associated with similar PL-480 projects in other institutions in India.

In a written reply, the Ministry of Health have stated:

"Secretary, Department of Agricultural Research and Education, Ministry of Agriculture, who was consulted in the matter, has replied as follows:

'According to the present policy, foreign scientists do not work in the Indian Institutions on the research project which is financed out of PL-480 funds. But a corresponding scientist of USA is associated with each project, who studies the work carried out on the project through the progress reports which are sent to him by ARS of USDA. In the Pantnagar project, Dr. J. V. Maddox was appointed as correspondent scientist by USA who was working at Illionois Natural Survey of Urbana, Illinois, USA in 1971'."

5.1.18 An extract from a note furnished by Shri Raghavan, Editor-in-Chief, Press Trust of India, to the Committee on the role of the United States Department of Agriculture in chemical and biological warfare is reproduced below:

"It is an USDA expert (Dr. Heimpal) who is working at the pesticide project at Pant Nagar. But according to Sipri report, the USDA has certain chemical and biological assignments in addition to its role in the herbicide warfare programme. It says that since 1954 USDA has had responsibility for research and development on defensive aspects in anti-crop and anti-animal CBW areas."

## CHAPTER VI

## RESEARCH CENTRES OF JOHN HOPKINS UNIVERSITY

**6.1.1. On the part played by John Hopkins University of the United States of America, Shri Raghavan, Editor-in-Chief, Press Trust of India stated in a written note furnished to the Committee:**

> **"The Health Ministry had also given permission in the late 1960s for the John Hopkins University of the U.S. to set up research centres in Calcutta and later at Narangwal in Punjab. John Hopkins, according to the 1968 London Conference on CBW, was one of the universities in the U.S. that were involved in CBW research. It was stated in the Conference that one of John Hopkins CBW projects was: 'Disease of potential BW significant agents and evolution of certain clinical and immunilogical responses to certain toxoids and vaccines'."**

6.1.2. At the instance of the Committee, the Department of Health furnished written information about the centres set up by the John Hopkins University. In December 1959, the John Hopkins University, Baltimore, approached the Government of India for permission to set up centres for scientific research in India. The Ministry of Health & Family Planning, by exchange of letters, agreed in April 1963 to the proposal for the University starting Research Training Centres in collaboration with medical and scientific institutions in Calcutta and other studies in India. These centres were located at Calcutta and Narangwal.

6.1.3. The projects carried out by the centres before 1970 are indicated below:

*Narangwal*:

1. A study of Intra-Uterine Devices in Rural Health Centres.
2. Rural Health Services and Family Planning Utilisation (Phase II of the Project at No. 1 above).
3. A study of interaction of Nutrition and Infection, and
4. Functional analysis of Public Health Services.

*Calcutta*:

1. Medical Zoology.
2. Virology.
3. Parasitology
4. Cholera
5. Entomology
6. Filariasis
7. Meningitis
8. Leprosy.

**6.1.4. The names of 30 American Scientists/Administrators who were working in the above projects, furnihsed to the Committee are given in Appndix VII. The background of these Americans is not available.**

**6.1.5. Subsequently, an Agreement dated the 10th September 1970 initially intended for a period of 5 years was entered into between the Ministry of Health and John Hopkins University under which the collaboration scientific research schemes to be undertaken are to be scrutinised and recommended by an Advisory Committee to be appointed by the Ministry. On the recommendation of the Advisory Committee, the Ministry will process and approve the research schemes.**

6.1.6. To a question why the John Hopkins wound up the work before the expiry of the agreement, the Ministry replied that the research schemes were concluded by the John Hopkins University, CMRT, Calcutta on the expiry of the specified periods for which they were undertaken and that no fresh Research Schemes had been approved by the Government of India.

6.1.7. Details of all the projects referred to the ICMR for scrutiny after 1970, those schemes which were technically approved and those which were not approved, furnished to the Committee by the Department of Health are indicated below:

*Schemes referred to the Council for Technical Comments*

| | Name of the Project | Remarks |
|---|---|---|
| 1. | Osmolar regulation of intestinal fluids in cholera patients and patients with similar diarrhoeal diseases: Dr. David R. Nalin and Dr. D. Mahalanabis, Calcutta. | This Scheme was technicayll approved. |
| 2. | A proposal to study acute undifferentiated diarrhoea: Dr. Jack D. Mc. Cue and K.N. Neogy and Dr. B.D. Chatterjee, Calcutta. | This scheme was technically approved. |
| 3. | The specific anaemia of protein calorie malnutrition: Dr. W. Adams and Dr. J.B. Chatterjee, Calcutta. | This scheme was technically approved. |
| 4. | Ecology and behaviour of mammals in West Bengal: Dr. D.W. Parrack, Calcutta. | This scheme was technically approved. |
| 5. | The use of lymphocyte (T and B cell) function in evaluation of treatment of children with Kwashiorkar and Marasmus : Dr. K.L. Mukherjee and Dr. Edith E Munro, Calcutta. | This scheme was technically approved. |
| 6. | Psychological correlates in malnutrition: Dr. Peikko Graves, Calcutta. | This scheme was technically approved. |
| 7. | Depression of cell mediated immunity by malnutrition and vitamin-A deficiency and recovery of immune response with nutrition therapy : Dr. F. B. Bang and Dr. K.L. Mukherjee, Calcutta. | This scheme was technically approved. |
| 8. | Ecology of infectious diseases in Calcutta busttees: Dr. J.R. Oppenheimer, Calcutta. | This scheme was technically approved after modification to concentrate on the carriage of human pathogenes (virus and bacteriaj) by fresh water fish in ponds in West Bengal. |

## CHAPTER VII

## CONCLUSION AND RECOMMENDATIONS

**7.1.1. The examination by the Committee of some of the research projects in the country conducted in collaboration with foreign organisations raises a number of interesting questions. The Committee find that the Genetic Control of Mosquitoes Unit Project, the bird migration and arbovirus studies at the Bombay Natural History Society, the Ultra Low Volume Spray experiments for Urban malaria control at Jodhpur, the Pantnagar Microbial Pesticides Project and some of the research projects undertaken in West Bengal and Narangwal in collaboration with the John Hopkins University establish beyond doubt a definite pattern. This is that agencies of foreign governments, in some cases explicitly military agencies of those governments, (as in the case of the collaboration between the Bombay Natural History Society and the Migratory Animal Pathological Survey—MAPS—of the United States Armed Forces Institute of Pathology), have been conducting basic research through Indian scientists and Indian scientific organisations. Even in cases where such research is carried out in collaboration with philanthropic civilian organisations from abroad, the Committee find that some of these 'civilian' organisations also have active liaison and communication at several levels with military agencies. No doubt, some of these research programmes have been shown as 'developmental' or 'basic research'. These projects, however, have been closely concerned with the collection of vital virological, epidemiological or ecological data, which are well capable of being used against the security of the country and that of our neighbouring countries. The utility of some of these projects to India, especially the Genetic Control of Mosquitoes Unit Project, seems to be only doubtful or potential, whereas the primary data obtained from these projects are likely to be of vital importance to foreign governments interested in developing techniques of chemical, biological, bacteriological, herbicidal and anti-subversive warfare.**

**7.1.2. As the evidence placed before the Committee, which has been discussed in the succeeding paragraphs, would reveal, it would appear that these projects are not isolated instances of errors of judgement where, due to inaccurate assessment or a certain naivete**

on the part of officials and scientists, the Ministry of Health and its agencies initiated and approved projects which could be greatly inimical and extremely hazardous to the nation's well-being and security. What causes surprise to the Committee, and this ought to be a matter of grave public concern also, is the lack of security consciousness in the Indian agencies involved in these projects and the casual attitude and indifference towards foreign supported research in India. The Committee also find that scientific projects in the country are dealt with by various Ministries and organisations and that there is little or no coordination between different wings of Government in this regard.

7.1.3. The unsatisfactory features of some of the individual projects that have come to the notice of the Committee have been discussed in the succeeding paragraphs.

7.1.4. The Committee are unable to understand why the Ministry of Health and the Indian Council of Medical Research agreed to the administrative and technical control of the GCMU Project vesting in the Project Leader appointed by the World Health Organisation. What is even more intriguing is the fact that according to the agreement entered into between the World Health Organisation and the United States of America, as represented by the National Communicable Diseases Centre, Bureau of Disease Prevention and Environmental Control, Public Health Service, Department of Health, Education and Welfare, Atlanta, Georgia, USA, for the provision of PL-480 funds for the GCMU Project, changes or substitutions of the Principal Investigators of the Project are to be made only with the written approval from the National Communicable Diseases Centre. It would be evident from this that the Project had been supported by the World Health Organisation only in a formal sense and the Project was ultimately controlled by an institution of the United States Government, who had financed it.

7.1.5. The Committee find that the agreement between the Government of India and the World Health Organisation also provided for the appointment of a national counterpart to be nominated by the Government of India. Though the Director General of the Indian Council of Medical Research had been appointed as the Indian Counterpart Project Administrator, the Committee are surprised that the Director General apparently did not know that he was the national counterpart for the GCMU Project for he himself informed the Committee during evidence that Dr. T. Ramachandra Rao, an entomologist and former Director of the Virus Research Centre, Poona was

the Officer Incharge of the Programme in the ICMR. It was only subsequently that the Department of Health informed the Committee that Dr. Rao had not been appointed as the Indian Counterpart Project Administrator but only as an Officer on Special Duty in the ICMR and that, in that capacity, he was looking after all the technical work relating to the GCMU Project under PL-480 schemes. This is a measure of the indifference of the Ministry of Health to the activities of the GCMU and the extent to which the Ministry had given a free hand to the foreigner Project Leaders of the GCMU and the WHO consultants.

7.1.6 Apparently, there has also been a lack of purpose and seriousness on the part of the Ministry in appointing the Indian counterpart. The Committee understand that the present Director General of the ICMR is a nutritionist and the former Director General, a cancer specialist. One would have expected the Ministry to appoint someone with the kind of experience nearer to the project he was expected to oversee. It is indeed amazing that persons with no genetic experience should have been entrusted with the task of overseeing a complex genetic experiment and ensuring that a vital health and security interest of the people of India was properly protected.

7.1.7. On the other hand, a number of foreign experts and consultants had been inducted into the Project from time to time, despite the fact that, as has been admitted during evidence before the Committee, that the Indian scientists working in the Unit were some of the highest qualified and experienced people, on the ground that the Indian scientists did not have experience in genetic methods, although most of the techniques and instruments in the GCMU had been developed by Indian scientists. The Committee have also been informed that Indian entomologists are as good as any one else in the world.

7.1.8. Under these circumstances, the Committee find it difficult to appreciate the rationale for permitting a large number of foreigners not only to participate in the research but also to determine and dictate its policies and programmes. Of the seven Project Leaders appointed by the WHO between January, 1970 and July 1973, four were US nationols one a Japanese and the other a British national. Only one Indian, Dr. Rajendra Pal, had been appointed as an acting Project Leader from August, 1972 to November, 1972. Even he was an employee of the World Health Organisation. In addition, as many as 37 short-term consultants and temporary advisers, 20 of whom were US nationals, have visited the GCMU in New Delhi since its

**inception, who have apparently been given free access to the primary data collected by the Unit.**

**7.1.9. During evidence tendered before the Committee, Dr. Rao had justified the presence of foreign experts at the GCMU on the plea that though the Indian scientists had experience in one kind of mosquito research or the other, they did not have experience in genetic methods. The Committee, however, find that Dr. Gerald Dean Brooks, the present WHO Project Leader had obtained his Ph.D from North Carolina University only in 1973 when he joined the GCMU. Similarly Dr. Yasuno, who was acting Project Leader from November, 1972 to April 1973 was only an ecologist and not a geneticise. Dr. H. L. Mathis, one of the consultants had just a B.Sc. degree and Mr. J. E. Graham, another consultant, a M.S. degree. The Committee are, therefore, unable to accept the contention that the Indian scientists were not equipped to play the leading role in the project.**

**7.1.10. The Committee consider it regrettable that it was only after the publication of the PTI article, followed by the discussion in Parliament and the examination by the Public Accounts Committee, the Ministry of Health showed some awareness of the inadequacy of the existing administrative arrangements for the Project and set in motion a review of the technical and administrative control of the project by a Committee nominated for the purpose. This Committee met on the 15th October, 1974. tt was only at this meeting that it was decided to examine whether, in accordance with the existing provisions of the agreement with the World Health Organisation, the effective functioning of the national counterpart in respect of various aspects of the project could be ensured and normal checks could be exercised by him. The Group, after discussions, felt that even the existing agreement provided sufficient authority to the Director General, ICMR to exercise overall control on the project. The Director General, ICMR was also asked to request the Project Leader to forward to the ICMR, a fortnightly or monthly report about the work done in the Unit and also to ensure that all communications in the nature of reports in regard to the research activities in the Unit are cleared by the Project Leader with the Director General, ICMR, before general circulation or transmission to other agencies.**

**7.1.11. The Committee note that at this meeting it had also been agreed that efforts should be made to provide the following in the fresh agreement to be executed, after the expiry of the existing agreement in June 1975, at the time when proposals for the extensions of the project come up for consideration:**

(i) the Director General, ICMR should be made over-all incharge of the Unit and the Unit functions under his administrative control and guidance;

(ii) the project leader should be appointed with the specific approval of the Government of India; and

(iii) the provisions of the agreement should be made more specific to remove any ambiguities.

7.1.12. It is clear that the Indian Counterpart Administrator had hitherto exercised no control over the project; It is also evident that the ICMR had earlier been virtually at the mercy of the WHO Project Leader. That this should have been so, despite a clear provision in the agreement that the broad lines of policy upon which the work of the project would be based would be agreed upon between the representatives of the Government of India and the World Health Organisation, causes concern to the Committee. It would also appear that the Director General, ICMR had failed to exercise the authority vested in him for the overall control of the project.

7.1.13. It is not clear to the Committee how far this provision of the agreement that the broad lines of policy of the project would be agreed upon between the representatives of the Government of India and the World Health Organisation was actually observed and implemented.

7.1.14. In this comments on the WHO Project furnished as early as 1968, the then Director, National Institute of Communicable Diseases had pointed out the need for a constant, concurrent evaluation of the programme and decision-making on the spot and follow-up thereafter and had emphasised that the authority for the responsibility must vest in a local organisation. Yet, strangely enough, the Ministry of Health had agreed to this authority vesting in the United States Public Health Service with which its military organisations were closely connected through the World Health Organisation. The Committee would very much like to know what considerations weighed with the Ministry in overlooking the very valid comments in this regard of the Director, National Institute of Communicable Diseases.

7.1.15. Another distressing feature of the Project which has come to the notice of the Committee is the complacent attitude displayed by the Ministry of Health towards the agreement entered into between the World Health Organisation and the United States authorities for the provision of PL-480 funds for the Project. As late as January, 1975, the Ministry had been under the impression that there was

only one agreement between the WHO and the NCDC, which would expire on 31st December 1974, while the agreement between the Government of India and WHO was to expire on 30th June, 1975. It was only at the instance of the Committee that the Ministry made a reference to the World Health Organisation to ascertain the correct position of the agreement between the WHO and the US Government.

7.1.16. The Ministry have only now come to know that the initial agreement executed between the WHO and the US Government effective for a period of six years from 1st January, 1969 to 31st December, 1974 had actually been modified twice. The first modification was agreed upon on 3rd July 1969, which amended the effective period of the agreement to three years, commencing from 1st April, 1969. A third agreement signed on the 3rd June, 1969 further amended the period of the proposed project from 3rd July, 1969 to 30th June, 1975, so as to coincide with the expiry of the agreement between the World Health Organisation and the Government of India.

7.1.17. Surprisingly enough, even before fresh proposals for the continuance of the Project in India beyond 30th June, 1975 had been initiated by the World Health Organisation, the United States Government have already singed a fresh agreement with the World Health Organisation as early as 20th June 1974, extending the effective period of the GCMU Project upto 30th June, 1978. This, however, was not even known to the Health Secretary himself. This would only indicate the anxiety on the part of the US Government to continue the project beyond 30th June, 1975. The question that, therefore, arises is: what could have prompted the US Government to extend the project on their own?

7.1.18. It is also strange that the Ministry of Health should have been aware of the existence only of the original agreement between the WHO and the US authorities. The Committee have been informed by the Ministry that the modified agreement had not been forwarded by the WHO to the Government of India. The Committee, however, find, from the letter dated 23rd December, 1968 from the World Health Organisation to the Director General, Health Services, that the Government of India had been informed that the US Public Health Service had at that stage reserved funds only to support the first three years of work. This would imply that the Ministry of Health was aware at that time that while the agreement between the Government of India and the WHO covered the full six year period,

the agreement between the WHO and the Government of the United States of America would only cover the first three years of the six year period. The Committee are of the view that this letter from the WHO should have set the Ministry thinking. In case, there was still any doubt about the status of the agreement with the US authorities, the Ministry should have sought a clarification at that stage itself. If this was not done, the Committee would like to know the reasons therefor.

7.1.19. The Committee are also unable to understand the reluctance on the part of the WHO to make available the full texts of the agreements entered into with the US authorities and to keep the Government of India contemporaneously informed of the developments from time to time. The full texts of all the agreements entered into with the US authorities had been furnished by the WHO to the Government of India only on the 28th February, 1975. The Ministry of Health had taken action to obtain the copies of all these agreements only at the instance of the Committee. It would, therefore, appear that there has been a big communication gap between the WHO and the Government of India on the involvement of the United States of America in the GCMU Project.

7.1.20. The selection of Delhi for field studies on Culex Fatigans is also shrouded in mystery. The Committee find from the comments of the then Director, National Institute of Communicable Diseases, furnished in 1968, on the WHO proposal for the GCMU Project that the Director had observed that 'the criteria for the selection of the Delhi area are not known'. The officials who appeared before the Committee have also not been able to enlighten the Committee on the reasons for selecting the Delhi area for the experiments, though various theories and presumptions have been advanced by them in this regard. While the Director General, Health Services pleaded his ignorance about the reasons for selecting Delhi, the Director, National Institute of Communicable Diseases sought to justify the selection of Delhi on the ground of proximity to the ICMR and the NICD and the availability of the experts from elsewhere in Delhi. No convincing reason has, however, been furnished to the Committee for the selection of Delhi. The various reasons advanced during evidence can at best be considered hypothetical and obscure. The Committee consider it regrettable that the authorities in the Ministry of Health and the Indian Council of Medical Research had not been associated with such a question of broad policy and planning as the selection of site for the studies.

**7.1.21. The Committee find that in his comments on the WHO proposal, the then Director, National Institute of Communicable Diseases, had also suggested that 'with regard to site selection it would be preferable to consult local institutions like the NICD, VRC, etc. as they have rich local experience and abundant data in these contexts'. The Committee would like to be informed of the action then taken by the Ministry on this suggestion.**

**7.1.22. Equally intriguing is the selection of Sonepat for the field studies on aedes aegypti. The Committee find from the comments of the then Director, National Institute of Communicable Diseases that the WHO team had considered the Delhi area as unsuitable for field studies on aedes aegypti and had felt that an area in the east coast of South India would be more suitable. In his comments, Dr. Ramachandra Rao had also suggested that 'studies on aedes aegypti should be carried out in South India with VRC as the main participant'. He had also pointed out that 'the entomology staff of the VRC are fully conversant with the problems of aedes aegypti and can contribute significantly to the study when it is organised'. Again, Dr. Elmo M. McCray, Jr, one of the WHO consultants, had also undertaken a survey of areas around Madras and had concluded that an ample number of towns and villages within a 35—40 mile radius of Madras City would be suitable for further evaluation and possible use for field experiments**

**7.1.23. Yet, in disregard of all these suggestions, the Committee observe that Sonepat had been selected for the field experiments on aedes aegypti. What is even more interesting is the fact that according to conclusion No. 6 of the minutes of a meeting on the genetic control of culicine mosquitoes held on the 6th November 1968, it had been decided that besides the Government of India and the WHO, the Government of Haryana or any other State Government concerned would be a partner in the project. The Haryana State Malariologist was also present at the meeting. Since this meeting had been held a year before the GCMU Project took final shape, it raises a very interesting question: Was Sonepat premarked for aedes aegypti studies by the US-WHO even before the ICMR came on the scene?**

**7.1.24. The Ministry of Health have justified the mention of the State Government of Haryana by name even before site selection on the ground that the scientists of the WHO had visited the area around Delhi to survey mosquito populations and suitable test sites. Several villages and townships to the South of Delhi appear-**

ed satisfactory for the proposed studies on Culex fatigans. In view of this, the entire report of the World Health Organisation had been forwarded to the Government of Haryana in July 1968 for their comments. The Ministry have, therefore, stated that it had been mentioned in the minutes that the Government of Haryana or any other State Government, in which the experiments would be conducted, would be a partner in the Project.

7.1.25. This explanation, in the opinion of the Committee, does not, by itself, provide any convincing reasons for the selection of Sinepat for the field studies on aedes aegypti. The survey conducted by the WHO had only considered villages and townships to the South of Delhi as suitable for studies on Culex fatigans and not on aedes aegypti. In fact, as already pointed out in one of the proceeding paragraphs, the WHO scientists themselves had considered the Delhi area as unsuitable for field studies on aedes aegypti. No other State Governments had also apparently been addressed in this regard. Under the circumstances, the Committee are unable to accept the explanation offered by the Ministry.

7.1.26. The Committee, therefore, find a number of missing links in the selection of sites for the experiments which have not been explained satisfactorily. Considering the military potential of the studies on genetic control, the Committee would like to be satisfied that no extraneous considerations have influenced the selection of areas around the capital for the studies, both on culex fatigans and aedes aegypti. The Committee desire that the various circumstances leading to the selection of sites for the studies on genetic control should be immediately investigated in detail by an authority entirely independent of the Ministry of Health and its associate organisations. The Committee would await a further report in this regard.

7.1.27. The Committee view with serious concern the use of a hazardous chemical, thiotepa, to sterlise mosquitoes before releasing them in the environment without clearance from the Drug Controller. The Committee understand that thiotepa produces mutations, cancer and foetal deformities. According to a report of the Research Unit on the Genetic Control of Mosquitoes, published data had shown that spiders fed on thiotepa-treated mosquitoes have reduced fertility. The Committee also understand that the Canadian Government had decided that chemosterilants for the sterilisation of native population should not be used on large scale until less hazardous chemicals are produced or safer techniques are developed, while the United States Government have prohibited the use of thiotepa in field experiments. Dr. Ramachandra Rao has

also informed the Committee that no government organisation has permitted this chemical to be used openly in nature except for experimental purposes. A number of experts have also warned against the use of thiotepa.

7.1.28. Though the use of thiotepa in the GOMU experiments was considered to be absolutely safe for human beings by the WHO Expert Committee in November 1972, because of the manner in which it was being used, the Committee are not happy with the way in which this chemical had been used in wells in Delhi, thereby posing a potential health hazard. In fact, in India itself, Defence Scientists, who had also conducted mosquito control experiments and carried out a careful scrutiny of the relative merits and demerits of various genetic control methods, had come to the conclusion that hazardous chemicals like thiotepa, which is cytotoxic, used for chemosterilisation pose the danger of polluting the environment. They had also held that chemosterilisation does not completely sterilise the female mosquitoes, thus leaving such females released in the field to produce mutant progenies which could also be dangerous.

7.1.29. Under these circumstances, the Committee cannot understand the reasons for the GOMU using thiotepa as a chemosterilant. The clearance of the Drug Controller had also not been obtained by the Unit on the ground that the public health hazard involved was considered to be negligible or non-existent. The Committee deprecate such a casual approach to this question and desire that the circumstances leading to the use of thiotepa in the GOMU should be thoroughly investigated. Responsibility for permitting such use of a potentially dangerous chemical in the environment without clearance from the Drug Controller should also be fixed. Such negligence in matters affecting the health of the people, in the opinion of the Committee, deserves the most stringent punishment.

7.1.30. It is also not clear to the Committee whether any independent examination of the use of thiotepa had taken place in the Ministry of Health. In view of the fact that the use of this chemical for field experiments is banned in other countries, the Committee desire that the Ministry of Health should examine this in detail, in all its aspects, also taking the benefit of the advice of the Defence scientists. Till such time as the theories about the use of thiotepa are proved wrong scientifically, the Committee would recommend that this potentially dangerous method of sterilisation of mosquitoes may be discontinued.

**7.1.31. The Committee are also surprised that the Ministry of Health should have been ignorant of the work done in this field by a Defence organisation and should have got to know of it only after the Committee raised the point. Such lack of coordination on important projects between different wings of Government is regrettable.**

7.1.32. The Committee also note with concern the hazards involved in the release of incompatible strains of mosquitoes in the field. It has been confirmed by Dr. Ramachandra Rao himself that a possible consequence of the release of genetic strains is that there is always a danger of replacement of the existing strains of mosquitoes with a new strain which may be more dangerous. The Expert Group of the Indian Council of Medical Research, which met in October 1974, had also come to the conclusion that the possibility, however remote, that the genetic manipulation might result in strain of mosquitoes with increased competence to transmit other diseases, should be taken into account. The Group had pointed out that before releasing genetically manipulated mosquitoes, it would be essential to have data on some important aspects in order to ensure that such mosquitoes have not developed increased comptence for transmission of other diseases.

7.1.33. There is also considerable published scientific evidence on the dangers of a new colony of mosquitoes being established as a result of genetic experiments The Defence scientists had also pointed out that the use of cytoplasmic incompatible strains involves 'the introduction of alien strains of the species into the country giving rise to the danger of opening avenues of new diseases into the country with potential uncertainty and serious risk'. In the face of such unknown hazards, the Committee are doubtful whether the decision to release genetic strains of mosquitoes in the environment was justified scientifically.

7.1.34. The Committee are also unable to appreciate the preoccupation of the GOMU Project with the aedes aegypti species of mosquitoes. Aedes aegypti is said to be a vector of yellow fever and dengue. While the occasional outbreaks of dengue in haemorrhagic form in one or two cities in the country is, in the opinion of the Committee, fairly insignificant, yellow fever is a disease which is non-existant in India. From the summary of recorded outbreaks of dengue in the country furnished by the Ministry of Health, the Committee find that only sporadic or a small percentage of cases had haemorrhagic manifestations. The Committee are, therefore, not convinced with the explanation furnished by the Ministry that the appearance of dengue in a haemorrhagic form in Calcutta and Kan-

pur had increased the importance of a study of aedes aegypti. It is also of interest to note that even the WHO had not stated, in their seminars held at Manilla and Bangkok, that the eradication of dengue haemorrhagic fever could be achieved by the elimination of aedes aegypti by genetic control methods.

7.1.35. On the other hand, the Committee find that the use of genetic techniques for anopheles stephansi, the malarial mosquito, has been given a lower priority in the GOMU, because of the limitations of man-power, finance, etc. Dr. Ramachandra Rao also justified the lesser emphasis laid on research on anopheles stephansi on the ground that, in 1967-68, when these ideas were developed, malaria had practically disappeared from the country and the urgency with regard to the malarial mosquito was not of that high order. The Ministry have also stated that while considerable research data was available in respect of culex fatigans and aedes aegypti, such data was lacking in the case of anopheles stephansi.

7.1.36. These arguments are, to say the least, unconvincing. Considering the fact that malaria is resurging in every part of the country, the Committee cannot but view with serious concern, the misplaced emphasis of the GOMU experiments on aedes aegypti. The justification furnished by Dr. Ramachandra Rao is also not borne out by facts. According to the Report of the Consultative Committee of Experts to determine alternative strategies under the National Malaria Eradication Programme, which met at New Delhi from 17th to 20th August 1974, large scale outbreaks of malaria which could not be liquidated by routine measures were detected during 1965 and 1966 and 12 million and 17 million people respectively were victims of the disease. After 1966, focal outbreaks, continued to occur in extending areas with consequent rise in the incidence of malaria in consolidation and maintenance areas. During 1968, areas having a population of 91 million had been reverted to attack phase from consolidation and maintenance phases.

7.1.37. The incidence of malaria has also been steadily on the increase since 1965. From 1.00 lakh cases in 1965, it increased to 2.79 lakh cases and 2.75 lakh cases respectively in 1968 and 1969. The incidence from 1969 to 1973 was respectively 3.49 lakh cases, 6.95 lakh cases, 13.23 lakh cases, 13.63 lakh cases and 14.98 lakh cases. The Consultative Committee, in their Report, had also noted the fact that research in malaria and its various aspects had not received adequate attention during the last ten years.

7.1.38. In view of the above facts, the Committee are distressed at the indifference of the Ministry of Health towards a major health

problem. If the GOMU was really justified, the Committee feel that the highest priority should have been accorded to work on the malarial mosquito. If the intention of the project was indeed to devise ways and means to eradicate mosquitoes, the very fact that adequate research data on anopheles stephansi was not available should have pointed to the importance and urgency of research efforts on this species and should have prompted the GOMU to pursue research on this species. Even if, as claimed by the Ministry, genetic strains of anopheles stephansi were not available, the Committee would like to know why chemosterilisation should not have been tried, especially since such a method was being tried in of been tried, especially since such a method was being tried in of work started on colonising anopheles stephansi and working on genetic strains. the Sonepat experiments on aedes aegypti.

7.1.39. What causes even greater concern to the Committee, in regard to the experiments on aedes aegypti, is the fact that the Minsitry of Health have shown utter disregard to the warnings of eminent authorities on yellow fever on the dangers of eliminating dengue. There is enough published evidence to show that dengue offers protection against the more fatal yellow fever. In the first Gharpure Memorial Oration held as early as May 1971, Dr. C. G. Pandit, who is one of the foremost authorities on yellow fever in the country, while discussing the causes for the absence of yellow fever in India had raised the question whether we would lose the 'umbrella of protection' against yellow fever by succeeding in eradicating dengue. Dr. Pandit had further stated that 'previous exposure to the dengue fever virus, affords a varying degree of protection against Japanese B encephalitis, Murray Valley encephalitis, St. Louis encephelitis and probably against West Nile Virus infections'. Dr. Pandit, in other words, had warned that eradication of aedes aegypti might not eradicate the vector of yellow fever but only the beneficial dengue fever and once this natural protection is lost, it is not unlikely that other species of the aedes family like aedes albopictus and aedes vittatus might take up the role of spreading the yellow fever virus. Dr. Pandit had also pointed out that, in the event of eradication of aedes aegypti, even culex fatigans could assume the role of transmitter of the infection.

7.1.40. The attention of the Committee has also been drawn by Shri Raghavan, Editor-in-Chief, Press Trust of India to even more authoritative and important evidence on cross protection offered by Dr. Max Theiler, a Nobel laureate for his work on yellow fever, after exhaustive study in the Carribeans and Trinidad. According to Dr. Theiler ('Arthropod Borne Viruses in Vertebrates', 1973), there is experimental evidence to show that dengue fever offers protec-

tion against yellow fever. Dr. Theiler observes: 'The conclusion is inevitable that all group B infections (dengue belongs to Group B) in man lead to the development to a greater or lesser extent of antibodies capable of neutralising yellow fever'. Dr. Theiler further says: 'It has been shown conclusively that dengue immune sera have the capacity of neutralising yellow fever virus. It has been shown that all human sera containing group B antibodies from West Africa, Tanzania, Malawi, Sudan, Egpt, India, Malaya and Hongkong are all capable of neutralising yellow fever virus. It seems a general law that any group B infection in man leads to the development of antibodies capable of neutralising yellow fever virus.'

7.1.41. The Committee regard both Dr. Pandit's views and Dr. Theiler's findings as extremely important for any programme for the control or eradication of aedes aegypti and dengue fever. The Committee are concerned to observe that while launching a major programme against aedes aegypti, no serious consideration appears to have been given by the Ministry of Health or the Indian Council of Medical Research for more than three years to the questions posed by Dr. Pandit on the eradication of aedes aegypti. What is even more distressing is the fact that Dr. Pandit's views had been dismissed as 'thoughts' 'raised in a lecture' and no attempts had been made by the Ministry to Seriously examine this aspect. Such a casual approach to scientific problems is, in the opinion of the Committee a matter of serious concern.

7.1.42. Though the Director General, Health Services stated during evidence that, this subject had been discussed at length between various virologists, immunologists and Public health workers and he himself had discussed it with Dr. Pandit a number of times, the Committee have not been furnished with any documentary evidence to support this contention. In fact, the Ministry of Health themselves have admitted in a written note submitted to the Committee that consultation with other experts had not been considered as , the thoughts raised by Dr. Pandit in his lecture were not to be construed as a warning against the programme.

7.1.43. There is also no evidence on record that Dr. Pandit's views were duly considered by the GCMU. The minutes of the review contain no reference to this aspect. Even presuming that the 'cross protection' theory was only a hypothesis, the Committee feel that both the Indian Council of Medical Research and the Ministry of Health ought to have examined this in detail before proceeding with the field studies on aedes aegypti. That this was not done would lead the Committee to the conclusion that the approach to the eades aelgypti experiments were not scientific.

**7.1.44. A more serious question which arises out of the Genetic Control experiments is whether the GCMU Project itself is only a covert attempt by a foreign government to conduct research on techniques of biological warfare. The Unit has been primarily interested in the collection of data on the ecology and dispersal of Indian mosquitoes, particularly aedes aegypti, which is stated to be a vector of yellow fever. Enough published evidence exists to show that some of the methods tried out by the GCMU have definite implications in biological warfare.**

**7.1.45. For instance, the Committee find from the Report of the Hearings of the US Congress House Committee on Foreign Affairs, which has been published under the title 'Chemical—Biological Warfare: US Policies and International Effects', that 'mosquitoes and ticks are transmitters of disease and as vectors have to be looked upon as having potential military significance.' About the advantage of vector or entomological warfare, the Report says that 'unless transmitted by insects, bacteriological agents have little power to penetrate the intact skin.'**

**7.1.46. The Committee also find a number of references to the use of mosquitoes in biological warfare in a report submitted to the United Nations Secretary General, U Thant, in 1969 by a specially constituted group of consultant experts on chemical and biological warfare. This report points out that 'any country which resorted to bacteriological (biological) warfare would try to infect, with a single blow, a large proportion of an enemy population with an exotic agent to which they had not become immune through previous exposure. Such exotic agents would lead to the appearance of diseases which normally had not occurred before in a given geographical area, either because of the organism involved (e.g. Japanese or Venezuelan encephalitis in Europe, Rocky Mountain Spotted fever in many countries). In addition, a disease which had been controlled or eradicated from any area (e.g. urban or classical yellow fever from many tropical and sub-tropical countries epidemic typhus from developed countries) might be reintroduced as a result of bacteriological (biological) warfare'.**

**7.1.47. The same report of the consultant experts further states that 'the gravity of these risks (from biological warfare) would depend on the extent to which the community or the species in the country attacked contained animals which were not only susceptible to infection but were living in so close a relationship to each other that the infection could become established. For example, not all mosquito species can be infected with yellow fever virus and if the disease is to become established those which can become vectors**

must feed frequently on mammals such as monkeys which are sufficiently susceptible to the infection. A natural focus of yellow fever is, therefore, very unlikely to become established in any area lacking an adequate population of suitable mosquitoes and monkeys'.

7.1.48. The Committee observe that India has the desired combination of suitable aedes aegypti mosquitoes and monkeys. This would be too irresistable a combination for anyone who might want to introduce the virus of yellow fever into the country. The Director General, Health Services had also admitted that it was possible to spread a disease in virgin soil or in a country where the people had not been immunised. The Committee also find that despite the ideal conditions that exist in India, yellow fever has not struck India, probably because of the cross protection afforded by dengue. Under these circumstances, the experiments with aedes aegypti in Sonepat assume a menacing significance and cause serious concern to the Committee.

7.1.49. There is also considerable published information on the interest of the United States of America in the yellow fever virus as a potential biological weapon. The Committee learn from the Report of the Stockholm International Peace Research Institute (SIPRI) on chemical and biological weapons, that the US Biological Warfare Laboratories had examined about 200 pathogens but the 'greatest BW interest has so far been attached to a few pathogens that include yellow fever virus'. The report points out that this virus is a standardised BW Agent' and is known as 'Agent O.J.'

7.1.50. The Committee have been informed as follows: (a) there are several advantages in the use of arthropods like mosquitoes as carriers of biological warfare agents like viruses; (b) biological warfare agent can be sprayed from aircraft but they have to be inhaled to effective; (c) again, these agents may be destroyed by heat, rain and the sun's ultra-violet radiation and winds may throw them off target. These drawbacks, the Committee understand, can be remedied by using mosquitoes and other insects as carriers. The Committee also learn that as long as the virus is carried by the mosquito, heat or rain will not affect it; secondly, that as mosquitoes bite, the biological agent is capable of being inducted directly into the blood through the skin. The SIPRI Report also points out that 'the use of anthropod disease vectors such as infected mosquitoes' is one way of securing 'percutaneous effectiveness from bulk-dissemination of BW weapons'. According to this Report, arthropod disease vectors in biological warfare can increase area coverage because each 'infected arthropod is a minute self-dispersing weapon'.

7.1.51. The Committee also find from the Report of the UN Consultant Experts that 'extraneous factors influence the behaviour of CB weapons to a far greater extent than they do any other kind of armament. Some such factors are wind and rain but these to an extent can be evaluated quantitatively. Others which reflect the general econological situation and the living conditions of physiological state of the population exposed to the effects of the weapons are more difficult to define. This limitation applies particularly to bacteriological weapons. The natural course of infectious diseases shows they are governed by so many uncontrollable factors that the way they develop cannot as a rule be foreseen. This would also be probably true of pathogenic agents which were deliberately dispersed. On the other hand the knowledge gained through the study of the epidemiology and in the study of artificial despersions of bacteriological agents both in the laboratory and in the field had shed some light on some of the factors concerned.'

7.1.52. Since the use of mosquitoes in biological warfare would be possible only if their behaviour, habits, dispersal and ecology are known beforehand, the Committee are of the opinion that it is precisely this information that is becoming available to the US Government from the GCMU experiments. This has also been clearly brought out in the Report of the UN Consultant Experts. The Director General, Health Services has also admitted during evidence that 'the possibility is definitely there that the knowledge gained by genetic control—control how the release takes place, how far the mosquitoes go, how long they survive, what is their biological behaviour—this knowledge can certainly be used for putting virus into these mosquitoes and starting a focus of disease like yellow fever in that area.

7.1.53. From the foregoing paragraphs, it would be evident that there is sufficient substance in the suspicions first raised by the PTI new item and the subsequent fears expressed in Parliament. The Committee feel that the connection between mosquito dispersal and biological warfare is far too obvious to be ignored.

7. 1.54. No doubt, it can be argued that the results of any scientific experiment can be used for both good and bad purposes. In reality, however, the Committee find no evidence to show that the Ministry of Health or the Indian Council of Medical Research had taken all precautions to prevent the possible misuse of the GCMU experiments. The Committee are extremely distressed to find that the yellow fever threat and the biological warfare implications of the GCMU Project had been realised by the Ministry of Health only after the enquiry by the Committee was set in motion. All the safeguards now proposed, like the establishment of an independent moni-

toring body, transfer of the administrative control of the project to the Director General, Indian Council of Medical Research, the appointment of the Project Leader only with the approval of the Government of India, etc. is tantamount to locking the stable after the horse has been stolen! The fact remains that, under the agreement, during the six years when the project has been in existence, valuable primary data on the ecology and behaviour of mosquitoes have passed on to the United States.

7.1.55. A further argument that could, perhaps, be advanced by the votaries of the Project, is that the GCMU experiment has been, conducted only in collaboration with a premier international health organisation and the civilian Public Health Service of the United States. The Committee, however, are unable to accept this contention. As has been already pointed out earlier, the World Health Organisation was the collaborator only in a formal sense and the entire project has been financed by the United States of America. According to the agreement between the WHO and the National Communicable Diseases Centre of the United States Public Health Service, the patent rights of inventions or improvements arising out of the Project are to rest with the United States.

7.1.56. There is also enough published evidence on the link between the United States Public Health Service and the US Biological Warfare Research Centre at Fort Detrick. According to the information furnished to the Committee by Shri Raghavan, the United States Public Health Service-the prime collaborator in the GCMU Project-Cooperated in a study of experimental epidemiology of coccidioidomycossis, an infectious fungal disease. The USPHS is also stated to have received more than 380,000 dollars in funds transferred from the Army General Corps which, according to the SIPRI Report, has the responsibility for coordinating the chemical and biological warfare programme of the US Navy, Army and the Air Force. The Committee have also been informed by Shri Raghavan that the London Conference on CBW, in 1968, revealed that the USPHS maintains a close liaison with Fort Detrick. Under these circumstances, it is likely that the ultimate and only beneficiary of the GCMU experiments is the US' military machine.

7.1.57. The Committee cannot but feel that the entire GCMU Project has been ill-conceived and is of no utility whatsoever to India. The benefits, if any, that are likely to occur to India are also not immediate but only potential. On the contrary, the project is of far greater importance to any country which might want to develop an effective Biological Warfare system. As has been pointed out by an

entomologist, who wishes to remain anonymous, genetic control is not an alternative to insecticidal control of vectors. The entomologist also points out that the applicability of the genetic method is limited as it can work only against an isolated mosquito population. Dr. Rajendra Pal, the WHO Vector Biologist, himself has pointed out in an article that the genetic method will only be 'as an adjunct to other methods, e.g. to eliminate the few insects that remain after insecticidal application'.

7.1.58: The opinions expressed by other experts in this regard are revealing. Dr. G. Davidson, in his book on 'Genetic Control of Insect Pests' (1974) states: 'Passing from small pilot project to large scale application is largely wandering into the realms of the unknown at this stage in the development of genetic control methods.... To many people the extension of such techniques to the control of insects with a known high rate of increase is inconceivable especially where such insects are spatially continuous over large areas.'

7.1.59. According to Dr. R. G. Scholtens, 'we now know that field trials which test the effect of genetic factors on natural populations can be conducted only in isolated ecological localities if they are to provide data on the effect of releases on population densities. And we know that the value of genetic control of mosquitoes is large but still only potential'.

7.1.60. The Committee observe that Dr. Ramachandra Rao himself has demolished the much publicised thesis behind the Sonepat experiment of the GCMU for the control of aedes aegypti. Dr. Rao had stated during evidence that 'if we develop a genetic control technique specifically for an island, it has no practical importance' and that 'if genetic control is to be applicable, to India', it should not be done in 'isolated islands': The fact, however, remains that Sonepat is an 'isolated island' since the Committee have been informed that aedes aegypti from Sonepat do not leave the town nor are there surrounding colonies of aedes that can migrate to Sonepat. This isolation of the species was the reasons given by the GCMU for the choice of Sonepat. The Committee, therefore, find that by Dr. Rao's own yardstick, the Sonepat experiment will not be applicable to India as a whole.

7.1.61. The Committee note that Dr. Rao had also stated that the specific details of work in connection with the particular species (aedes aegypti) cannot be applied to another species. He had also stated that the findings of a study on how a mosquito behaves in one locality cannot be used for areas just 15 miles away. Under these circumstances, the Committee are unable to understand the rationale

for the genetic control experiments in India. What causes greater concern to the Committee is the fact that the Ministry of Health and the Indian Council of Medical Research should be expending their energies in a project of little or no utility, disregarding the more urgent problem of controlling malaria, whose incidence is once again alarmingly on the increase, and filaria, in respect of which even surveys have not been completed during the past 19 years, by more practical measures.

7.1.62. The final picture that emerges from the foregoing narration is frightening in its implications. The Committee view with serious concern the fact that India had been chosen for experiments that have a vital and direct bearing on biological warfare, which have been banned in other countries. The Committee find that small scale studies on genetic control of mosquitoes in an isolated small village, Okpa, in Burma had been discontinued. The Committee also understand that a similar unit on aedes aegypti had been expelled from Tanzania within a few months. The Committee are unable to understand why the Ministry did not investigate the reasons for the discontinuance of the project in these places.

7.1.63. The Committee find that Dr. Ramachandra Rao, who initially voiced his concern over the administrative and technical aspects of the GCMU changed his view on being appointed as WHO consultant. The Committee note that Dr. Rao had been paid a tax-free salary of US dollors 1200 per month plus a daily allowance of US dollars 20 for the first 60 days and about Rs. 107 per day subsequently, during his tenure as a WHO short-term consultant. It is also significant to note that no other officer had been appointed as Officer on Special Duty after Dr. Rao.

7.1.64. The Committee are also surprised to note that expenditure on the meeting of a Consultative Committee appointed by the Government of India to consider revised strategies in the malaria programme had been incurred by the World Health Organisation. The Committee are unable to accept the explanation offered by the Ministry for the WHO financing the conference and consider this an unhealthy practice in view of the fact that it might place Indian officials in an embarrassing and compromising position and show them in a poor light. The Committee desire that this should be discontinued forthwith.

7.1.65. After an examination of various aspects of the GCMU Project, the Committee cannot help coming to the conclusion that the manner in which the entire project has been handled by the Indian authorities is thoroughly unsatisfactory. As has been recommended in a subsequent paragraph, the Committee desire that the part played

by the various officials in the administration of the Project should be thoroughly investigated by an independent commission.

7.1.66. The Committee are of the view that the answers to a number of intriguing questions about the GCMU Project could, perhaps, be available with Dr. Rajendra Pal of the World Health Organisation who has been associated with the Project since its inception. It is surprising that the Government of India are not aware how he had been selected for the WHO assignment. Yet his appointment in the WHO had been approved by the Government. The Committee also understand that his lien in the Government of India had also been retained for as long as twelve years. Since the placement of Indian Government officials in foreign organisations must be governed by well-defined rules and policies, if there had been any deviations in the case of Dr. Rajendra Pal, the Committee would like to know the detailed justification therefor. What is even more distressing to the Committee is the information given by Shri Raghavan that Dr. Pal had been permitted to resign his Government of India post in October 1974. The Ministry have neither confirmed nor denied this. The Committee would await a further detailed report in this regard.

7.1.67. In view of the far-reaching implications of the Genetic Control of Mosquitoes Project and the number of interesting possibilities that have been opened during the course of examination by the Committee, the Committee recommend that the Government should appoint a Commission, consisting of experts drawn from various scientific fields, unconnected either with the Ministry of Health or the Indian Council of Medical Research, to enquire immediately into the working and objectives of the GCMU. Officials of military intelligence should also be associated with the enquiry: Meanwhile, the project should be held in abeyance. In any case, the agreement that expires on 30th June 1975 should not be renewed.

7.1.68. Yet another research project that has caused a serious concern to the Committee is the study on the possibilities of dissemination of arthropod borne viruses by migratory birds conducted by the Bomay Natural History Society in collaboration with an explicitly military organisation of the United States of America, the Migratory Animal Pathological Survey (MAPS) and the Smithsonian Institution, which has also worked for the US Army in identifying suitable areas for chemical and biological warfare tests.

7.1.69. The implications of the ENHS Bird Migration Study for the development of a biological warfare system are far more direct and evident than the GCMU. In this case, the Committee find that the Bombay Natural History Society had directly signed an agree-

ment with MAPS, a wing of the US Army. It has also been admitted by the Ministry of Health that blood smears on slides had been sent by the Society to MAPS in Bangkok during 1967-68. The Committee also find, from the Interim Report on the activities of the Bombay Natural History Society's Bird Migration Study Project from 1969 to 1972, that the majority of blood samples and ectoparasites were sent to MAPS for study. In one of his letters dated 17th October 1969 to Dr. Ramachandra Rao of the Virus Research Centre, Poona, Dr. Salim Ali of the BNHS had also admitted that the technical results of the work conducted in collaboration with MAPS were not available with the Society and that in so far as the Society was concerned, once the ectoparasites collected from birds had been sent to MAPS, it was 'usually the last' they 'hear of the material'. This, in the opinion of the Committee, is a shocking state of affairs in view of the far-reaching implications of the Bird Migration Study for biological warfare.

7.1.70. Dr. Jayaraman of the Press Trust of India informed the Committee the military significance of migratory birds lies in the fact that they take predictable routes and arrived at predictable times at predictable places, and that birds can carry viruses in their blood or on the mites and ticks that harbour themselves on the birds.

7.1.71. The Committee also observe from the SIPRI Report that 'the various Army and medical research units of the Navy studying bird migrations and local infectious diseases in the Middle East and Far East' have contributed to the chemical and biological warfare research and development programme. The SIPRI Report also points out that when the US Army tested their BW weapons in the Pacific in the 1950s, the Army conducted, with the help of Fort Detrick, preliminary studies to find out if migratory birds would carry the BW agents away from the test zones into populated areas.

7.1.72. Earlier colloborations between the Bombay Natural History Society and the World Health Organisation, Virus Research Centre, Poona and the Smithsonian Institution give rise to serious doubts about the objectives of such research sponsored by foreign institutions. The Bird Migration project had been carried out in collaboration with the World Health Organisation from 1959 to 1967. The Committee learn from Shri Raghavan of the Press Trust of India that the World Health Organisation had sent four copies of the BNHS-WHO report on the bird migration studies to MAPS. It has also been stated that Dr. Jayaraman himself had seen a copy of a letter addressed in this regard by the Geneva headquarters of the

**WHO to Elliot Mclure of MAPS. The Ministry of Health have also admitted that they do not have a copy of the BNHS-WHO study.**

**7.1.73. Even though there were military overtones in the BNHS project were explicit, the Committee are concerned to note that the Ministry of Defence had clared the collaborative project with MAPS in 1967 merely on a 'technical point' and had not considered it necessary to examine and evaluate why the US Army and its wing MAPS were interested in the bird migration project. Apparently, the Ministry had not realised that any grant from any wing of the US Department of Defence is always provided only with a military objective. This is evident from the Mansfield Amendment to Section 203 of the Act on 'Military Appropriation for Research and Development', according to which 'none of the funds authorised by this Act may be used to carry out any research project or study unless such project or study has a direct and apparent relationship to a specific military function or operation'. The Committee consider it rather strange that the Ministry of Defence had also not considered it necessary to obtain a copy of the report of the BNHS-MAPS study. Apparently the Ministry of Defence also came to know of the analysis of the blood samples in US laboratories abroad only after the discussion in Parliament.**

7.1.74. The Committee therefore desire that the existing procedures should be thoroughly reviewed and tightened up with a view to ensuring that all such projects which are conducted in collaboration with foreign military or para military organisations are thoroughly evaluated, and screened for possible threats to the country's security before they are cleared.

7.1.75. The Committee also observe that according to an understanding with several governmental agencies at the time the BNHS-MAPS Project was cleared by the Ministry of Defence, any project which had any defence sensitivity should be channelled through the Ministry of Defence. The understanding in this particular case was that any project that was referred from the United States ARPA—Advanced Research Projects Agency—of the United States should go through. The Committee would like to know if this arrangement still continues. ARPA, according to 'New Scientist' (August 8, 1974) is 'an elite group of civilian scientists conducting high risk research and development of a revolutionary nature in areas where defence technology in the US appears to be falling behind or in areas where the

US cannot afford the risk of falling behind'. The Committee, therefore, desire that the Ministry of Defence should review whether any risks are involved in the projects being routed through ARPA. The Committee consider this to be important since they understand that ARPA had financed a GOMU-like Project in Burma in 1967 and had been responsible for evolving a herbicide warfare programme under the guise of food technology research. The Committee have also been informed that within ARPA is a project called 'AGILE', which is a counter-insurgency research programme responsible for opening up limited warfare technologies.

7.1.76. In view of the biological warfare implications of the bird migration studies brought out in the foregoing paragraphs and considering the fact that a similar MAPS-sponsored bird migration study in Brazil had been brought to an end by exposure in the American press, the Committee desire that the Ministry of Defence should investigate this project in detail immediately with a view to ensuring that no malafides are involved.

7.1.77. The Committee also note that blood samples of migratory birds had also been sent by the BNHS to the Institute of Diseases with National Foci, Omsk. USSR, upto 1966. The Committee would like to know whether the results of the study of the blood samples had been made available to the Government of India and the nature of the collaboration betwen the BNHS and the IDNF, Omsk and its objectives.

7.1.78. Two other foreign-sponsored projects which have come to the notice of the Committee also merit notice in view of their importance in biological warfare techniques. The first is the WHO sponsored Ultra Low Volume (ULV) Spray experiments for urban malaria control being conducted at Jodhpur and the second is the PL-480 financed study on Microbial Insecticides at the G. B. Pant University of Agriculture and Technology, Pantnagar.

7.1.79. The Committee find that an ULV Spray machine obtained from the US under PL-480 funds is being used to spray malathion insecticide for malaria control. The Committee understand that the ULV technique is an acknowledged method of spraying acrosols of biological warfare agents. According to the SIPRI Report, 'improvements in agent dissemination technology have a high, perhaps the highest priority in CBW programme.'

7.1.80. The SIPRI Report goes on to say that 'weather is critical to the performance of many types of CB weapons. Maximum effec-

tiveness thus depends on ability to predict or measure prevailing weather conditions and to exploit the air streams occurring over the target. The particle size in which the payload of the CB weapon is disseminated is also critical. Efforts to improve acrosol generating techniques are presumably a prominent feature of the large area incapacitating weapon systems'. The Committee find that the UN Consultant experts on CBW had also observed that most pathogenic agents are highly vulnerable to environmental stress such as temperature, solar radiation, humidity, etc. and that 'the inactivation process of BW agents which is governed by several factors are now the subject of aerobiological research'.

7.1.81. The Director General, Health Services had stated during evidence that 'theoretically the possibility of using the ULV machine for purposes other than the spraying of insecticides, for which it is primarily meant, as an aerosol for spreading virus or bacterial infection is definitely yes'. The Committee, therefore, desire that, in view of the possibility of the misuse of the experiments, the project should be critically scrutinised and evaluated in all its aspects and necessary safeguards adopted.

7.1.82. The Committee also find that Jodhpur had been selected for the ULV spray experiments out of Kota. Bikaner, Ajmer, Jodhpur, Ahmedabad, Baroda and Broach considered for trial, as it had the highest incidence of malaria and the State Government had also agreed to provide the man-power and transport facilities. It is not, however, clear to the Committee why only seven towns in Gujarat and Rajasthan had been considered for the trials. The Committee would like to know whether other state governments had been approached for affording the facilities.

7.1.83. The Committee have been informed that it is now proposed to shift the experiments from Jodhpur to Ajmer. The Committee are unable to understand the rationale for this especially in view of the fact that the incidence of malaria in Ajmer in 1974 was only 864 cases as against 35,979 cases in Ahmedabad. The Committee would, therefore, like to be informed of the circumstances leading to the selection of Ajmer for the experiment and on what considerations this decision has been taken.

7.1.84. The object of the studies on microbial pesticides at Pantnagar is to experiment on biological control of insects and pests through parasites and predators. The Committee understand that the microbial pesticides require microcapsules for encapsulating the viruses and, according to the SIPRI Reprt, micro-encapsulation is a technique for wrapping micsroscopic particles in individual protec-

tive coatings. This technique is used by garm warfare experts to protect the BW agents from sunlight, etc. and to preserve the viruses in an easily usable form for a long time. In this context, the SIPRI Report points out that microbial pesticide research 'provides information on the feasibility of disseminating microencapsulated BW agents'. The Report states that 'pesticide research is likely to continue providing impetus to the CB weapon programme' and adds that 'the possibilities of spin of into CB technology from such activities are obvious enough.'

The Committee desire that this project should also be evaluated immediately by an expert body. Such an evaluation, in the opinion of the Committee, is absolutely necessary in view of the revelations brought out in the GOMU Project and the BNHS Bird migration studies.

7.1.85 From the information furnished by the Ministry of Health, the Committee find that the Indian Council of Medical Research has two other projects—'Human Biology Studies on Differential Tissue' and 'Conducted Study on Infective Hepetitis in India'—which have again been sponsored by the Office of Naval Research, USA. Similarly, a grant for the purchase of equipment and laboratory supplies, which are not available in India, for a project on 'the Relative Role of Cardiac Effects in the Regulation of Cardiovascular Functions' in the Vallabhai Patel Chest Institute, has been given by the US Air Force, through the European office of the Aerospace Research, Brussels, Belgium. The Committee fail to understand why such collaborations with the US Navy and Air Force in these studies and have been permitted.

7.1.86. The various projects that have been examined by the Committee in the foregoing paragraphs raise the basic question about the way scientific activities and related research are sponsored and run in the country. What causes great concern to the Committee is the absence of any explicit policy frame and a well-defined institutional mechanism within the Government for reviewing projects, in sensitive areas and filds, of high scientific or technological content, promoted and/or actively participated in by foreign agencies. The Committee use the term 'sensitive areas or fields' not merely in the narrow sense involving military installations or military information, but in an all-embracing sense. The Committee, therefore, recommend that the following urgent steps should be taken by Government:

7.1.87. Government should identify a set of scientific or operational areas in which investigations by foreigners or by foreign

assisted programmes should be subjected to the most careful and comprehensive scrutiny on a case-by-case basis before government approval is given for the initiation of the project. The scientific areas selected at a particular point of time would need to be defined in the context of the prevalent international situation and advances in science and technology.

7.1.88. To start with the Committee would suggest the following areas:

(a) any and all aspects of oceaonography and research related to ocean resources, and our coastal areas;

(b) any and all aspects relating to meteorology and weather, specially weather modification projects;

(c) remote sensing by aircraft and satellites, particularly for the assessment of natural resources;

(d) areas in biology, such as microbiology, epidimeology (how diseases arise, are propagated and diffused), ecology and virology;

(e) all aspects of toxicology, whether of drugs, pesticides and other chemicals;

(f) the propagation of radio waves, including studies aimed at collecting information about the ionosphere and other upper atmospheric layers over our country;

(g) any and all scientific investigations in border areas such as "Himalayan Geology".

7.1.89. Government should decide that all proposals for scientific investigations proposed to be undertaken in these defined areas with the help of or in any association with foreign organisations or with foreign monies from any source should be sent by the Ministry, Agency, Laboratory or private institution concerned to a nodal point within the government for a comprehensive review and clearance. This nodal point should be a high power Committee of Scientists headed by the Scientific Adviser to the Ministry of Defence but can include, and perhaps ought to include, other high security agencies of Government. The Committee desire that once this mechanism has been set up, it should also review all existing projects of the types mentioned in the preceeding paragraph.

7.1.90. The Committee would like to place on record their deep appreciation of the signal service rendered by Shri Raghavan,

Editor-in-Chief and Dr. Jayaraman, Science Correspondent, Press Trust of India by drawing attention to the potential danger to the security and health of the country inherent in research projects carried out in the country in which foreign institutions, especially foreign military organisations, have evinced substantial interest. The Committee are happy to find that both Dr. Jayaraman, who wrote the article on foreign participation in research projects in India, and Shri Raghavan have displayed exemplary courage and dedication to the interests of the country in exposing the possible intentions of the collaborating agencies in these research projects, which are capable of causing havoc by their relentless work. The Committee have also been informed that it was Dr. Jayaraman who had written the article on the import of worm-infested hop plants, which had been examined by the Public Accounts Committee in their 136th Report (Fifth Lok Sabha), and brought into focus the defects in the licensing procedure for the import of plant materials.

7.1.91. Equally praiseworthy is the contribution of the 'Scientific Worker' who wrote the first article in the National Herald, in February 1972, on the Genetic Control of Mosquitoes Unit Project. The Committee congratulate the writer of this article also for his fearness reporting on issues which are vitally important to the country. The Committee also appreciate the foresight of the Editor of National Herald in allowing publication of such a vital information.

7.1.92. What causes deep concern to the Committee is the alleged uncooperative attitude displayed by the Ministry of Health, Indian Council of Medical Research, Director of Malaria Eradication Programme and the representative of the World Health Organisation, Dr. Rajendra Pal, who considered the project 'sensitive to the Indian Press', towards the investigations of Dr. Jayaraman and their reluctance to give an opportunity to the Press Trust of India to clear their doubts and suspicions arising out of the information gathered by them on various research projects of doubtful utility conducted in the country under the aegis of foreign organisations. After an examination of the mass of material made available both by the Ministry and the Press Trust of India, the Committee find that Dr. Jayaraman's article was not a figment of his imagination, but the result of a pains-taking research and intensive study of authoritative published works, reports, etc. In fact, it is also significant that it was the publication of this article which set in motion the discussions on the subject in Parliament and galvanised the Government into action to evaluate the Genetic Control of Mosquitoes Unit Project and consider suitable safeguards.

**7.1.93. The Committee also note with interest the view expressed by Shri Raghavan that even after twenty eight years of independence, 'any person with a brown or black skin gets nowhere', but 'a white skin has an automatic "entre".' If this is true, it is indeed a sad comment. The Committee are also surprised to find that while there had been a refusal to discuss the project with the Indian press, the Director General of the Indian Council of Medical Research had all the same talked to a correspondent of the 'Washington Post'. The Committee hope that all authorities concerned would extent proper cooperation to the Fourth Estate in such vital issues in future.**

New Delhi;
April 28, 1975
Vaisakha 8, 1897 (S)

JYOTIRMOY BOSU,
Chairman,
Public Accounts Committee.

## APPENDIX I

(*Vide Para* 3.2.1)

***An Agreement for a Collaborative Research Project on the Genetic Control of Mosquitos between the World Health Organization and the Government of India***

The Government of India (hereinafter called "the Government") and the World Health Organization (hereinafter called "WHO"),

Recognizing that the preliminary experiments on the genetic control of mosquitos have shown promise and that if advanced experiments are successful these methods would have significance not only in India but for the rest of the world.

Recognizing also that genetic control methods do not require a recurrent outlay of foreign exchange to purchase supplies and equipment from outside the country.

Desiring therefore to obtain agreement for the establishment in India of a collaborative research project for experiments on the genetic control of mosquitos, particularly with reference to the purpose of the project and the responsibilities which shall be assumed by each of the parties.

Declaring that these responsibilities will be fulfilled in spirit of friendly co-operation.

HAVE AGREED AS FOLLOWS:

*Part I*

*Basis of Relationship*

The basic agreement concluded between WHO and the Government of India on 16 July 1952 provides the basis for relationship between the Government and WHO in this research project and the articles of this Agreement are to be interpreted in the light of the Basic Agreement insofar as they may be applicable to research activities of WHO.

The project will be a collaborative one between the Government and WHO supported from PL-480 funds to be provided by the Department of Health, Education and Welfare of the US Government. These funds will be placed at the disposal of WHO by an agreement

between the US Government and WHO. In addition WHO will provide funds from its regular budget for the recruitment of a Project Leader and other professional staff and for the purchase of certain supplies and equipment not available in India. That detailed project with cost estimates pertaining to PL 480 funds will be prepared in consultation with the Government before the project is initiated.

## *PART II*

### *Area of Operations for the Research Project*

The area of operations for the research project will be selected by WHO in collaboration and consultation with the Government and the Indian State concerned.

## *PART III*

### *Research Programme*

In the initial phase of the research project a study of the ecology and biology of *Culex fatigans*, *Aedes aegypti* and *Anopheles* stephensi particularly with regard to the dynamics of mosquito populations and absolute density of these species in the experimental area will be performed.

Experiments will be simultaneously initiated to develop suitable strains of these mosquitoes for genetic control. Bio-engineering studies will be carried out to set up insectaries for the production of large numbers of healthy males of these strains and to develop the most economical procedures to produce these strains. Techniques for the separation of sexes will have to be perfected.

The performance of released males will be studied under laboratory, cage and field conditions and computer models will be developed to determine the best ratio of released males to natural males.

The method of assessment of results will be perfected and pilot experiments will be carried out to demonstrate the feasibility and practicability of this method.

In the terminal phase of the project investigations will be continued in the experimental areas to study the build-up of mosquito uensities and the extent of the number of releases required to maintain the area mosquito-free.

The broad lines of policy upon which the work of the project will be based will be agreed upon between representatives of the Government of India and WHO. The technical implementation of the programme of the project, review of the progress and periodic assessment of the programme will be performed in accordance with—protocols established by a meeting of investigators comprising representatives from the Indian Council of Medical Research (ICMR), National Institute of Communicable Diseases (NICD), United States Public Health Service (USPHS) and WHO. All meetings will be convened by WHO.

Further research may be performed on completion of these initial objectives in terms of Part VII of this Agreement.

## *PART IV*

### *Administration and assignment of responsibility*

The research projects will be conducted under the technical and administrative responsibility of WHO in collaboration with the Government, through a Research Unit to be established by WHO in India on the gentic control of mosquitoes.

The Project Leader appointed by WHO shall undertake the technical and operational direction of the project in accordance with the research protocols referred to in Part III of this Agreement and in consultation with a national counterpart nominated by the Government.

The administration of the project shall be the responsibility of the WHO Project Leader who shall control finance, discipline and other administrative matters related to the project.

The WHO Project Leader shall have full powers to act in collaboration with the national counterpart to meet any operational agency that may arise and take immediate decisions for remedial action.

The required reports will be drawn up by the WHO Project Leader in consultation with the national counterpart.

The Government agrees to assist in every possible manner in the proper functioning of the project.

## *PART V*

### *WHO Commitments*

Subject to the availability of funds WHO shall provide:

1. *Personal*

1 Project Leader and 2 professional staff.

Additional staff and short-term consultants as required.

2. *Payment for contractual services*

WHO shall reimburse to ICMR the cost, in addition to a service fee, of national staff recruited and provided to the Research Unit.

The selection of the national staff and the necessary arrangements relating thereto shall be the subject of an agreement to be concluded between the ICMR and WHO.

3. *Premises, Equipment and Supplies*

3.1. *Office and Laboratory Space*

Laboratory and office premises will be rented and equipped by WHO and paid for from the funds of the project.

3.2 *Vehicles*

As required by the Research Unit in terms of the agreed protocols.

3.3. *Scientific Equipment and Supplies*

Scientific equipment including air conditioners and humidifiers and supplies for the project will be provided in an amount determined by the protocols referred to in Part III of this Agreement.

4. *Operating Expenses*

WHO shall bear all costs of the routing operation of the research activity in terms of the objectives and technical protocols referred to in Part III, including liability insurance for the vehicles, the provision of fuel and oil and the maintenance of vehicles and other equipment.

5. *General*

All vehicles, air conditioning equipment, scientific equipment and supplies provided by WHO shall remain the property of WHO during the course of the project and may be freely moved within the country.

Those residual values of equipment and unconsumed supplies and materials remaining at the completion of, or termination of, the project will be made over to the agency continuing or entrusted with this or allied work.

## PART VI

*Government Commitments*

In support of this research project the Government shall facilitate the procurement of material and equipment and other facilities.

The Government shall provide assistance to acquaint the people in the operational area with the objectives of the project and to secure their goodwill and cooperation.

The Government shall facilitate visits by WHO staff and consultants to the Research Unit as required in the course of the investigations. WHO shall notify the Government in advance of such visits.

The Government shall be responsible for dealing with any claims which may be brought by third parties against WHO, its advisers, agents and employees and shall hold harmless WHO, its advisers, agents and employees in case of any claims or liabilities resulting from operations under this agreement (other than third party claims relating to the use of the motor vehicles provided by WHO for the project), except where it is agreed by the Government and WHO that such claims or liabilities arise from the gross negligence or wilful misconduct of such advisers, agents or employees. Notwithstanding the full powers extended to the WHO Project Leader under the provisions of Part IV of this Agreement, he shall be considered for the purpose of this paragraph as acting at all times as an official of WHO.

## PART VII

*Final Provisions*

1. This Agreement shall enter into force upon signature by the duly authorised representatives of WHO and the Government.

2. Subject to the availability of funds this Agreement shall be effective initially for six years, after which the WHO in consultation with the Government shall review the progress of the project and need for further research. The Agreement may be extended for a further period of time mutually agreed upon after this review.

3. This Agreement may be modified by the parties, each of which shall give full and sympathetic considerations to any request by the other for such modification.

IN WITNESS WHEREOF the undersigned, being duly authorized, have signed this Agreement.

DONE in three copies in English.

At New Delhi
On 16th June, 1969.

Signed
For Government of India

At Geneva

On 16th May, 1969.

Signed
Deputy Director-General.
For the World Health Organization

## APPENDIX II

(*Vide* Paragraph 3.2.3)

Telephone: 621736 Telegrams: "SCIENTIFIC'

*INDIAN COUNCIL OF MEDICAL RESEARCH MEDICAL ENCLAVE (ANSARI NAGAR) POST BOX* 4508, *NEW DELHI*-110016

P-18(26)/62-R(Pt.III) Dated 19th August, 1970

SUBJECT.—*ICMR Headquarters Office—WHO Genetic Control Project—Staff of—*

*MEMORANDUM*

The Governing Body of the Council sanctions creation, with effect from 25th August, 1970 for a period of one year in the first instance of a post of Officer-on-Special Duty in the Headquarters Office of the Council for work relating to the Genetic Control Project and PL-480 schemes, in the pay scale of Rs. 1600—100—2000.

The Governing Body of the Council also sanctions the appointment, on re-employment basis, of Dr. T. Ramachandra Rao as Officer-on-Special Duty at the Headquarters Office of the Council, for a period of one year, in the first instace, from the date he takes over charge. Dr. Rao will draw a pay of Rs. 2,000/- p.m., minus pension and pension requivalent of retirement benefits, plus usual allowances admissible under the rules. The appointment will be on the following terms:—

1. Dr. T. Ramachandra Rao will be eligible to subscribe to the ICMR Contributory Provident Fund. He will, however, be entitled to receive the Council's contribution according to the rules of re-employment personnel.

2. No travelling allowance for joining duty or on termination of his appointment under the Council will be admissible.

3. The appointment will be subject to the other usual conditions of service under the Council.

Sd/- T.. D. Joshi,
for Director General.

Dr. T. Ramachandra Rao,
5, VIII Main Road, Malleswaran,
BANGALORE—3.

Copy to:—

1. Accounts Section, I.C.M.R. The expenditure on this account will be met from the budget of the WHO Genetic Control Project for staff at the Headquarters Office for the year 1970-71.
2. Division of PL-480 and WHO Genetic Control Projects.
3. Cashier, I.C.M.R.
4. Shri M. L. Khurana.
5. Shri G. B. Bhatt.
6. Stores.

Sd/- T. D. Joshi,
for Director General.

## Appendix III

(*vide* Paragraph 3-2-26)

*List of W.H.O. Consultants & Temporary Advisers*

| | | | | |
|---|---|---|---|---|
| 1. | Dr I.H.Gilbert (USA) | Sept.Oct.1969 WHO Consultant | 1941-42 Complete class work for Ph.D., Chio State University. | Entomologist, US Deptt. of Agriculture. |
| 2. | Dr.J.E. Graham (USA) | Sept.Oct.1969 WHO Consultant | M.S.—Entomology University of Utah Mosquito Control Specialist. | Director of the Salt Lake County Mosquito Abatement District, Midvale, Utah (USA) |
| 3. | Dr. G.W. Pearce (USA) | March 1970 | Ph.D. Chemistry. | Chief Technical Development Laboratories, NCDC USPHS, Savannah, (USA). |
| 4. | Dr. C. B. Craig (USA) | March 1970 | Head Deptt. Biology. | University of Notre Dame, Indiana |
| 5. | Dr. H. Laven (German) | Man. 70, Apr. 71 Apr. 72, Sept.-Nov. 72, Mar. 73, July-Oct.73 | Insect Geneticist. | Institute of Genetics, Mains. |
| 6. | Dr.W.W.Macdonald (British) | Mar.70, Aug.72 Apr-July 73.Nov. 73-Apr.74(Consultant Project Leader) | Research Entomologist Glasgow. | Entomologist, Deptt, of Parasitology and Entomology, School of Tropical Medicine, Pembroke Palace, Liverpool, 3 U.K. |
| 7. | Dr.E.M.C.Cray (USA) | March 1970 (WHO Consultant) | Research Biologist | Technical Development Laboratories, NCDC, US PHS Savannah Ga. U.S. |
| 8. | Dr.D.E.Weidhass (USA) | March 70 Apr.71, April 72 Nov. 72. Apr. 73 Nov. 73 | Research Biologist. | Biologist, Investigations Leader, Entomology Research Division, USDA Agricultural Research Divisi n Gainesville, Florida, USA. |
| 9. | Dr. H.F. Schoof (USA) | Nov.70 Apr. 71 Apr. 72, Nov.73 | Research Biologist. | Biologist, Chief, Technical Development Laboratories, USPHS Centre for Disease Control, Savarnah, Georgia, USA. |

| | | | | |
|---|---|---|---|---|
| 10. | Mr. R. Ford (USA) | Apr.-May 70 (WHO Consultant) | Engineering Carnegie Institute of Technology. | USDA, Gaineeville, Florida. |
| 11. | Dr. L.E. Lachance (USA) | Apr.71 | Investigations Leader, Radiation Biology and Insect Genetics. | Food and Agricultural Organisation International Atomic Energy Agency, Austria. |
| 12. | Dr. E. Boesiger (Swiss) | Apr. 71 | Geneticist | Laboratories de Genetic Experimentale des populations. |
| 13. | Dr. G. Davindson (British) | Apr. 71 | Entomologist | Ross Institute London School of Hygiene and Tropical Medicine, U.K. |
| 14. | Dr. K.S. Rai (Indian) | Apr. Aug, 71 Nov.72 July 73 Apr. 73, Nov.73 Apr. 74. | Insect Genetist. | Professor of Biology and Director Mosquito Biology Training Programme, University of Notre Dame, Notre Deme Indiana, USA. |
| 15. | Dr. M.J. Whitten (Austrial) | Apr. 71 | Insect Genetist. | Commonwealth Scientific and Industrial Research Organisation, Canberra City, Australia. |
| 16. | Dr. C.M. Smith (U.S.A.) | Apr. 71 | Ph. D. (Entomology) 1941 | Director of the Research Laboratory on Insects Affecting Man at Orlando and Gainesville, Florida. |
| 17. | Dr. G. Pichon (French) | Apr. 71 | | Institute de Recherches "Louis Molande" Papectee, Tahiti. |
| 18. | Dr. D. Eliason (USA) | Nov. 71 Apr. 73 | DPH, University of North Carolina 1971. | Acting Chief of Biology, Technical Development Laboratories NCDC USPHS. |
| 19. | Dr. H, L. Mathis USA) | Jan. 72 | B.Sc. Entomology and Parasitology. | Scientist in *Aedes* Research Unit, Bangkok. |
| 20. | Dr. C.F. Curtis (British) | Apr. 72 | Ph. D. University of Edinborough. | Genetics Specialist in Genetic methods of pest control, University of Bristal, Tsetse, Research Laboratory, Deptt. of Veterinary Medicine, Bristol BS 18 7 DU, England. |
| 21. | Dr. K. Dietz. (Germany) | Apr.72-Nov 72 Apr. 73-Nov. 73 | Statistician. | Vector Biology Control, W.H.O. Headquarters, Geneva. |
| 22. | Miss V. Kerdpibule (Thai) | July 72 | M.Sc. 1970 Univ. of Thailand | Scientist Faculty of Tropical Medicine, Mehidol University, Thailand. |

| | | | |
|---|---|---|---|
| 23. Dr. N.G.S. Raghavan (Indian) | July Aug. 72 | M.D. Ph. D. | Ex-Director, National Institute of Communicable Diseases, New Delhi, India. |
| 24. Dr. G.D. Brooks (USA) | Nov. 72 | M.S. Univ. Utah. 1955<br>M. P. H. Tulane Univ. 65<br>DPH Univ. North Barolina. 1973. | Scientist, Malaria Programme, Centre for Disease Control, Atlanta, Georgia, U.S.A. |
| 25. Dr. D.A. Blackwell (USA) | Nov. 72 -Nov.73 | Head Insect and Pest Control Section (Entomology) | International Atomic Energy Agency, Vierna Austria. |
| 26. Dr. N.G. Gratz. (USA) | Nov. 72 | Entomologist. | Vector Biology and Control Unit of W.H.O. Headquarters, Geneva. |
| 27. Dr. (Mrs.) V. Thomas (Malaysian) (Nationality at birth Indian) | Mr.-May 75 | M.D. Medical Entomology. | Lecturer/Principal, Deptt. of Parasitology University of Melaya, Kuala Lumpur. |
| 28. Miss J. Ohnenn (German) | Mr.-Nov. 73 | Ph. D. candidate Insect Genetics. | Research Associate. Johannes-Gutenberg. University Mainz Federal Republic of Germany. |
| 29. Mrs N. Lorimer (USA) | Apr.-Dec. 73 | Ph. D. candidate Univ. Notre Dame Insect Genetics. | Research Associate. University of Notre Dame, Norte Dame, Indiana, USA. |
| 30. Rev. E. Hallinan (USA) | Apr. Sept 73 | Professor of Biology Ph.D. candidate Univ. Notre Dame. Insect Geneticist. | Research Associate, University of Notre Dame, Notre Dame, Indianana,USA. |
| 31. Dr. R. Scholten (USA) | Nov. 73 Apr. 74 | Veteranarian. | Deputy Director, Bureau Tropical Diseases. |
| 32. Dr. T.R. Rao (Indian) | Sept. Dec. 73<br>Jan.—Apr. 74 | Research Scientist | Ex-Director. Virus Research Centre, Poona. India. |
| 33. Dr. Sarat Chandra (Indian) | April, 74. | Genetisist. | Prof. of Theoritical Sciences, Indian Institute of Sciences, Bangalore. |

| | | | | |
|---|---|---|---|---|
| 34. | Dr. A. Hess (USA) | April, 74. | Ph. D.<br>Research Entomologist/Ecologist. | Centre for Disease Control USPHS. |
| 35. | Dr. E.A. Smith (USA) | April, 74. | Ph. D.<br>Entomologist/Malaria Specialist. | US Agency for International Development. |
| 36. | Dr. J. Seawright (USA) | April, 74. | Ph. D.<br>Entomologist/Biochemist. | Agricultural Research Service, USDA, Gainesville, USA. |
| 37. | Dr. S. J. Pati (Indian) | July, 74. | Bio-Statistician. | WHO Consultant (Retired) Madras, India. |

## APPENDIX III-A

(*Vide para* 3.3.8)

New Delhi,
31st January, 1975.

Dear Mrs. Gandhi,

The G.C.M.U. Programme has given rise to serious suspicion in my mind. I have tried to collect information from various unconnected sources and I have come to the conclusion that this programme has been financed by P.L. 480 for execution through W.H.O. and is primarily meant for the three things mentioned below:

(1) To carry on certain experiments in India which are harmful to the population and which are not allowed to be done in their own country i.e. U.S.A.

(2) They are experimenting and keeping things in readiness in case the U.S.A. Government ever wanted to wage a chemical, bacteriological or virus warfare against this country.

(3) To prepare themselves to wage a chemical, bacteriological or virus warfare against another country keeping India as base.

The agreement between P.L. 480 Fund Administrator and W.H.O. has expired on 31st December, 1974. Inspite of that this is continuing and out of these experiments all the results and findings will be the property of U.S. Government. To make sure that this does not progress any more, I am writing this because I am very apprehensive of this programme and I am doing in the best interests of my country and the people.

I earnestly suggest that a thorough probe should be done by the most competent Intelligence Agency at your command.

Yours sincerely,
(Jyotirmoy Bosu).

Mrs. Indira Gandhi,
Prime Minister of India,
New Delhi.

## APPENDIX IV

*(Vide Paragraph 3.3.11)*

*MOST IMMEDIATES*

No. V.25011/111/74-RISM

Government of India

Ministry of Health and Family Planning

(Department of Health)

New Delhi, dt. 10th Feb..1975

To

The Director-General,

World Health Organisation,

Geneva, (Switzerland).

SUBJECT.- *Extension of Agreement with the United States Government for financing the scheme of Genetic Control of Mosquitoes in India.*

Sir,

I am directed to refer to your telex message dated the 15th January, 1975 regarding the agreement signed by the WHO with the United States Government and to say that on examination of the aforesaid agreement it is seen that even though it was intended originally that the effective period of agreement had to commence on the 1st of January 1969 and to extend for a period of 6 years, the final agreement signed by the WHO was far a period of 3 years only from the date of final signature of the agreement, namely the 3rd July, 1969, by the Director-General of the World Health Organisation. However, in the text of the agreement, under Section III--"Period of Performance", it has been stated that the "work described in Section II of the agreement shall begin on the 1st April, 1969 and shall not extend beyond 31st March, 1972, unless provided for by amendment to this agreement". This may kindly be clarified.

2. Even though in your telex message it was stated that only two modification had been made in the original agreement, there

are other modifications which indicate clearly that the intention was to enter into two agreements, one for the first 3 years of the project and then for the next 3 years, after the results of the first 3 years' work were assessed. This had not been brought to the notice of the Government of India, with the result that they had all along been under the impression that only one agreement for the entire period of the Project, namely six years had been entered into by the WHO with the United States Government, which was due to expire on 31st December, 1974. The Government of India request you kindly to let them know how this was not intimated to them earlier.

3. Subsequently, another agreement had been entered into by the WHO with the U.S. Government. It is seen therefrom that the United States Government officials has signed this agreement on June 3, 1971, but the date on which the Director-General, World Health Organisation had signed the agreement is not indicated. In para 6, under Section II in the text of the agreement "Period of agreement", it has been stated that the agreement shall become effective at the time of final signature and shall not extend beyond the 30th June, 1975, unless provided for by amendment to this agreement. The date on which the Director-General, World Health Organisation had signed this agreement may kindly be intimated to the Government of India for their information. A copy of the agreement as signed by both parties may kindly be supplied to the Government of India at an early date.

4. It is understood that the United States Department of Health, Education and Welfare (Public Health Services), has agreed to extend the WHO|ICMR Research Unit on Genetic Control of Mosquitoes in New Delhi for a further period of three years. The Government of India may kindly be informed whether another agreement has since been entered into by the World Health Organisation with the United States Government and if so, a copy of the agreement as finally signed may kindly be furnished to them urgently.

Yours faithfully,

Sd/-

(V. RAMACHANDRAN),

*Under Secretary.*

No. V.25011|11|74-RISM

GOVERNMENT OF INDIA

MINISTRY OF HEALTH AND FAMILY PLANNING

(DEPARTMENT OF HEALTH)

*New Delhi, the 27th February, 1975.*

To

The Regional Director,
World Health Organisation,
Regional Office for South East Asia,
World Health House, Indraprastha Estate,
New Delhi.

(*Attention Dr. F. Loven, Director, Health Services*)

SUBJECT.—*Extension of the agreement with the United States Government for financing the scheme of Genetic Control of Mosquitoes in India.*

Sir,

With reference to your letter No. IR 0529, dated the 26th February, 1975, addressed to Mr. V. Ramachandran, Under Secretary, I am directed to say that copies of the agreements concluded in 1971 as well as in 1974 stated to have been attached with your letter have not been attached. Only the first page of the agreement has been attached. I am to request that the full text of both the agreements may kindly be furnished to us at very early date.

2. I am also to request that the clarifications sought for in paragraphs 1 and 2 of this Ministry's letter No. V.25011|11|74-RISM, dated the 10th February, 1975 may also kindly be furnished at a very early date.

Yours faithfully,
Sd/-
(V. P. HARIHARASANKARAN),
*Deputy Secretary to the Government of India.*

**Copy of the letter No. IR 0529, dated 26th February, 1975 from Dr. F. Loven Director, Health Services, WHO, SEARO, New Delhi addressed to Mr. V. Ramachandran, Under Secy., Ministry of Health & Family Planning, New Delhi.**

SUBJECT.—*Extension of the agreement with the United States Government for financing the scheme for Genetic Control of Mosquitoes in India.*

This has reference to your letter ref. V. 25011|111|74-RISM of 10th February, 1975 on the above subject, addressed to the Director-General, WHO, Geneva.

1. It was originally intended that the project would start operating from 1st January, 1969, but the finalization of the agreement between the various parties concerned took some time. In fact, the agreement with the Government of India was signed only on 16th June, 1969; after conclusion of this agreement, the agreement with the U.S. Public Health Service was signed with an effective starting date of 3rd July, 1969. The project was therefore started from 1st July, 1969 for a period of six years (*i.e.* up to 30th June, 1975), as was agreed to in Part VII, Paragraph 2 of the Agreement with the Government of India.

2. The US Public Health Service were able to provide funds in two instalments for a period of three years each. The agreement covering the first of these instalments is that referred to in paragraph No. 1 above. The agreement extending the first one and thus providing for the second allotment of funds was signed by US Public Health Service in June 1971 and by WHO on 26th October, 1971. The Director-General of the Indian Council of Medical Research was informed of this at the time of the Fourth Technical Planning and Review Group meeting held in November 1971.

3. A copy of the agreement concluded in 1971 is attached.

4. A copy of the Agreement signed for the US Public Health Services on 20th June, 1974 and for WHO on 2nd July, 1974 for the further extension of US PHS support to the project from 1st July 1975 to 30th June, 1978 is attached, which re-amended the original 1969 Agreement to a total period of nine years, namely 3rd July, 1969 to 30th June, 1978.

I hope that the above points answer the queries raised by you in your above mentioned letter; should you need any additional information, please write to me at your convenience.

Agreement No. 01-325-2

## U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE PUBLIC HEALTH SERVICE

An Agreement Providing for the Conduct of Research Under Section 104 (b) (3) of the Public Law 480, 83rd Congress and Public Law 86-610, Section 3.

*Parties to the Agreement:*

1. The U.S. Department of Health, Education, and Welfare, Center for Disease Control.

2. World Health Organisation, Geneva, Switzerland.

*Descriptive of Work to be Carried Out:*

Feasibility Studies on the Genetic Control of Mosquitoes in India

*Type of Agreement:*

Amendment (No. 2).

*Effective Period of Agreement:*

7-3-69 to 6-3-78

*Total Funds to be Provided During Period of Amendment:*

16,756,179 Indian Rupees

| Public Health Service | Collaborating Institution |
|---|---|
| Agency : Center for Disease Control Programs Bureau of Tropical Diseases. | World Health Organisation Geneva, Switzerland. |
| Project Officer and Title Dr. R. G. Sholtens Chief, Vector Biology and Control Division | Principal Investigator and Address Dr. R. Pal (Geneva) C/o S. E. Asia Regional Office, WHO New Delhi, India. |
| Authorising Signature . | Authorising Signature . |
| Sd./- Charles C. Edwards, M. D. Assistant Secretary for Health | Sd./- Halfdan Mahler, M.D. Director-General, World Health Organization |
| Date . June 20, 1974 | Date : 2 July 1974 |

# U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
# PUBLIC HEALTH SERVICE

Project No. 01—325

An Agreement Providing for the conduct of a Project described hereinunder Section 104(b)(3) of Public Law 83.43 amended, between the United States of America as represented by *Health Service and Mental Health* PHS, DHEW authorised by the Signatures below, and *World Health Organisation, Geneva, Switzerland*, authorised by the signature below

SHORT DESCRIPTIVE TITLE : Feasibility Studies on the Genetic Control of Mosquitoes in India

PERIOD OF AGREEMENT six Years

AGREEMENT AMOUNT (in local currency)

PROPOSED PROJECT PERIOD : 7-3-69 to 6-3-75

PROJECT Rs. 5,942,500
INT'L TRAVEL ———————

AUDIT ———————

TOTAL Rs. 5,942,500

NEW (X) AMENDMENT No. 1
(X) SUPPLEMENT
(X) CONTINUATION

AMOUNT OF INCREASE OR DECREASE
PROJECT Rs. 8,646,000

INT'L TRAVEL 0

PUBLIC HEALTH SERVICE

SUB-TOTAL Rs. 8,646,000

AGENCY : Health Services and Mental Health Administration.

Revised Total . Rs. 14,588,500

PROGRAM : Centre for Disease Control

COLLABORATIVE INSTITUTION
World Health Organisation .

PROJECT OFFICER & TITLE

PRINCIPAL INVESTIGATOR AND PLACE OF WORK .

H. F. Schoof, Ph. D. Technical Development laboratories Laboratory Division Savannah Georgia.

Mr. J. W. Wright (Geneva) C/o. S. E. Asia Regional Office, WHO New Delhi, India

Authorizing Signatures :

Sd./- David L. Seucer, M.D.

Director Center for Disease Control

Date. June 3, 1971

TITLE :

Authorizing Signatures :

Sd./- M. G. CANDAU

Director General World Health Organisation.

TITLE

Sd./- William, H. Cope, M.D.

Assistant Director for International Affairs OPPE, HSMHA

———————

———————

TITLE . Date TITLE :

*For Administraive Use only* *Payee or Financial Officer*

ORIGINAL . 781907·89 Name . W. W. Firth

INC. OR DEER 1,137631·53 TITLE : Assistant Director-General

TOTAL . 1919539·47 ADDRESS World Health Organisation Geneva, Switzerland

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 083780 | 01000 | 325 | 1 | 199 | 5101 | 25 | 31 |
| PPU | Country PROJ | | PY | CAN | | O. | C. |

Effective month of obligation———————

WORLD HEALH ORGANISATION

World Health House,

Indraprastha Estate, Ring Road,

New Delhi-1, India.

In reply please refer to IR. 0529, 28th February, 1975

Dear Mr. Hariharasankaran,

SUBJECT.—*Extension of the agreement with the United States Government for financing the scheme of Genetic Control of Mosquitoes in India.*

With reference to the first paragraph of your letter No. V.25011|111|74-RISM, dated 27th February, 1975, we regret to oversight by which the full text of both the Agreements was not attached to my letter of 26th February. The full texts are now enclosed.

With reference to your request in the second paragraph for further clarification of questions raised in paragraphs 1 and 2 of your Ministry's letter of 10th February, 1975, I have the following comments:

1. The reason for the 6-year project starting from the beginning of July, 1969 is that stated in paragraph numbered 1 of my letter of 26th February, namely that there was a considerable delay in finalizing the agreement with the

Government of India, which was in fact a pre-requisite to the agreement with the US Public Health Service. The copies of letters referred to in (2) below are also relevant to this point, i.e. to the delay of the starting date first from 1st January, 1969 to 1st April, 1969 and subsequently to the beginning of July 1969. These delays did not affect the total of the originally foreseen period of six years with the result that the ending date of the WHO's agreement with the Government of India became 30th June, 1975 instead of 31st December, 1974. I trust that this clarifies your query.

2. With regard to the impression which had been gained by the Government of India that the original agreement between WHO and the US Government was due to expire on 31st December, 1974, a part of the explanation is given in (1) above namely that the starting date was unavoidably postponed by six months. As regards the first agreement with the US Government covering only three years, this information was contained in the second paragraph of the letter of 23rd December, 1968 (ref. V2 445'12(a) (India) from Assistant Director-General of WHO, Dr. A. M. M. Paye, addressed to Dr. P. K. Duraiswami, DGHS, Government of India (copy attached). From this you will clearly see that the Government was informed that the US Public Health Service had at that stage reserved funds to support the first three years of work. In a further letter of 13th May, 1969 (copy attached) from Director-General of WHO Dr. M. G. Candau, to the Minister of Health and Family Planning and Works, Housing and Urban Development, there was a further reference to the urgency of finalizing the agreement between WHO and the Government of India. As already stated in my letter of 26th February, this agreement was actually signed on 16th June, 1969 only.

I believe these two letters, and particularly the first, show that in fact the Government of India was aware at the time that while the agreement between the Government and WHO covered the full six year period, the first agreement with the Government of the United States would only cover the first three full years of the total six year period. I can assure you that there was not at any time any intension to conceal from the Government of India

that the support to the project provided by the US Government would be in the first instance cover the first three years.

I trust that the above comments sufficiently clarify further the first two queries in your Ministry's letter of 10th February, 1975.

Yours sincerely,
Sd/-
for F. Loven
Director, Health Services.

Mr. P. V. Hariharasankaran,
Deputy Secretary to the Government of India,
Ministry of Health and Family Planning
Nirman Bhavan,
New Delhi

Encls 2 agreements (full texts)
Copy of letter dt. 23-12-1968.
Copy of letter dt. 13-5-1969.
cc: The WHO Representative, New Delhi.

WORLD HEALTH ORGANISATION 121 Geneva 27
In reply please refer to V2/445/12(a) India

23rd December, 1968

Dear Dr. Duraiswami,

I have pleasure in sending under cover of this letter three copies of a draft agreement for a collaborative research project on the genetic control of mosquitos between the World Health Organisation and the Government of India. I understand that this agreement has been drawn up in terms of the discussions that were held between Mr. Narain, yourself and members of your staff during Mr. Wright's visit to Delhi from 4 to 6 November 1968. I would be grateful to have your comments on this draft so that a final document can be drawn up for submission to the Government of India for formal approval.

An element of urgency is now entering into our negotiations for the financing of this project. We have been informed by the United States Public Health Service that funds have been reserved to support the first three years of work but that these can be held only until the end of April 1969. In the circumstances, it would be most important for the Government of India and the World Health Organization to reach agreement as to how this project should be conducted

no later than the end of March, this will allow us to finalise the agreement for the funds with the United States Government during April 1969.

I am sure that you will agree that this project is of the greatest importance not only to India but countries throughout the world where genetic manipulation might be a solution to their national problems involving vector control. I therefore look forward to your collaboration in reaching a speedy decision on this agreement.

Yours sincerely
Dr. A. M. M. Payne
Assistant Director General

Dr P. K. Duraiswami
Director-General of Health Services
Government of India
New Delhi
India

...ENCLS: (3)

WORLD HEALTH ORGANISATION 1211 Geneva 27
In reply please refer to V2/445.12(a) India

Sir,

In have the honour to refer to your letter F.18-41/69-RISM dated 23 April 1969 and would like to express my appreciation of your comments on the draft agreement for a collaborative research project on the genetic control of mosquitos between the World Health Organization and the Government of India.

The first and the last points are acceptable to the Organization. The last paragraph in Part I (page 2) and paragraph 6 in Part II (page 2) have been amended as proposed by you. However, regarding the question raised on the disposal of equipment at the termination of the project, the Government will be aware that this is negotiated in all cases by the Government of the United States of America and the collaborating institutions. We have therefore included the standing clause used in all PL-480 agreements in Part V, under paragraph 5 (page 4).

There is some degree of urgency in finalizing the agreement between WHO and the Government of India as we have been informed by the Government of the United States of America that the PL480

funds allocated for 1969 will be retained by them only until the middle of May 1969. I am enclosing two copies of the signed agreement and should be grateful if you would be kind enough to sign both copies, retain one, and return the other to me as soon as possible.

I have the honour to be

Sir

Your obedient Servant

M. G. Candau, M.D.

Director-General.

The Minister of Health and Family Planning
and Works, Housing and Urban Development
Government of India
New Delhi
India

ENCL: Signed Agreement (2 copies)

cc. The Minister of External Affairs of India, New Delhi The Permanent Representative of India to the United Nations Office and other International Organization at Geneva.

SEARO

## APPENDIX V

**(*Vide* Paragraph 3.7.8)**

***Minutes of the Meeting that took place in the Health Secretary's room at 10 A.M. on 6.11.1968 regarding the "Genetic Control of the Culicine Mosquitoes".***

The following were present:—

| | | |
|---|---|---|
| 1. | Mr. Govind Narain, Health Secretary. | Ministry of Health, FP&UD, Government of India. |
| 2. | Mr. G. Pimputkar, Addl. Secretary. | |
| 3. | Mr. R. N. Mathur, Joint Secretary. | |
| 4. | Mr. A. S. Brwa, Deputy Secretary. | |
| 5. | Dr. J.W. Wright | W.H.O. GENEVA |
| 6. | Dr. B. Ignjatovic | W.H.O. SEARO. |
| 7. | Dr. S. P. Ramkrishana | |
| 8. | Dr. P.K. Daraiswami, Director General | D.G.H.S. |
| 9. | Dr. J.B. Srivastav, Addl. Director General. | |
| 10. | Dr. B.L. Taneja, Director General. | I.C.M.R. |
| 11. | Dr. N.G.S. Raghavan, Director. | N.I.C.D. |
| 12. | Dr. Mitra, State Malariologist, Haryana. | |

---

The Secretary welcomed Mr. J. W. Wright and the others and requested Mr. Wright to explain the concept of the WHO global Research Programme and the place of the proposed Project in India Mr. Wright thanked the Secretary for his kind words and the Government of India for their collaboration in the development of this important Project of "Genetic Control of Culicine Mosquitoes in India". He stated that the Project would have significance not only for India but for the rest of the world. The Project would be a collaborative one between the Government of India and the World Health Organisation supported from P.L. 480 funds to be provided by the Government of United State. These funds would come from the 10 per cent P.L. 480 funds at the disposal of the Govt. of United States. They would be in Indian rupees equivalent to 2 million United States Dollars. The funds would be paid to W.H.O. under an agreement between the United States Government and W.H.O. A second agreement regarding the collaboration between the Government of India and the World Health Organisation would also be necessary for the implementation of the project. The purpose of this meeting was to arrive at an understanding on the basis of such an agreement. WHO would establish a Unit from the regular budget of the Organisation consisting of 3 WHO staff members. Certain dollar funds would be available for the payment of salaries of WHO consultants and also for certain items of equipment which could not be procure within India. One of these three WHO staff members would be the WHO Project Leader. He would be responsible for the admi-

nistration of the Project in collaboration with the international Indian counterpart. WHO would seek to engage experts in the Project.

The subject was discussed in detail and the following agreed conclusions were reached:—

1. The Project should be flexible enough to embrace research not only on the *Culex Fatigans* and *Aedes Egypti* but also *A. Stephensi* which was of special interest for India.
2. There would be a planning Committee at the highest level which would have on it representatives from the Government of India, and the W.H.O. The function of this Committee would be to lay down the broad lines of policy and its implementation.
3. A second Committee consisting of representatives from the Government of India and W.H.O. which would draw up the detailed programme operations.
4. The Government of India would nominate a Project Leader who would be the national counterpart of the WHO Project Leader and the Project would be carried out by these two in consultation with each other.
5. The Title of the Project with the following wording—
   "A collaborative Research Project of the Government of India and W.H.O. on the Genetic Control of Mosquitoes"
   Would reflect the spirit of collaboration between the Government of India and W.H.O.
6. That besides the Government of India and W.H.O., the Government of Haryana or any other State Government concerned would be a partner in the Project.
7. Full powers would be given to the WHO Project Leader to act in collaboration with the National counterpart to meet any emergency that may arise and take immediate decisions and remedial actions.
8. The national staff will be recruited by I.C.M.R. and provided to the Project. For the duration of the Project, W.H.O. would reimburse the cost to the ICMR in addition to a service fee.
9. The budget of the Project would be drawn up jointly by the Government of India and W.H.O.
10. The administration of the Project would be the responsibility of the WHO Project Leader who would control finances, discipline and other matters related to the Project.
11. The procurement of supplies and equipment would be arranged by the WHO Project Leader in consultation with his national counterpart.

12. **Laboratories premises may be rented by W.H.O. and paid for from the funds of the Project.**

13. **REPORTS: The required reports will be drawn up by the project Leader in consultation with the National counterpart.**

...

**In conclusion, Secretary observed that a draft agreement on the above lines could be drawn up for further consideration by the parties.**

*Comments of the Director National Institute of Communicable Diseases*

SUBJECT.—W.H.O. Restricted document "Report to the Director-General Informal consultations on the proposal for a project on the Genetic Control of Culicine mosquitoes in *India, Geneva, 30th April- 2nd May, 1968*".

The following comments are offered for favour of information and necessary action:—

1. *General.*

1.1. This project represents an entirely new approach to the control of mosquitoes and thereby eventually, the control eradication of mosquito borne diseases. For the present the project does not include *Anopheles sp.* though we are concerned equally, if not urgently, about *A. stephensi* transmitted malaria particularly in urban areas in the context of the N.M.E.P. (Neighbouring countries like Iran are also facing similar situation with regard to insecticide resistance of *A. stephensi*).

1.2. The need for such studies of newer approaches or techniques, has been accentuated by the development of resistance by culicine mosquitoes, thereby stalling or threatening to do so attempts at control of filaria and haemorrhagic fever transmitted by *C. Fatigans* and *Aedes aegypti* respectively. The experiences in such studies even globally (Genetic manipulation of mosquitoes) so far has been negligible or very little. The numerous lacunae in the understanding and studies in vector biology and behaviour, genetics of mosquitoes, of technical and technological know-how of bio-engineering, radioactive biology etc. and above all the prohibitive finances needed for such studies have stood in the way of any country embarking on the same and studies even by the WHO have been very restricted. These facts have been amply brought out in the project now under consideration. However, with regard to C. fatigans, the small scale study in this direction by WHO, Geneva, in an isolated village *OKPA* near Rangoon. Burma have stimulated further activities in this field and hence this document. It is, however, to be noted that even the small scale studies in the isolated small village of *OKPA* are *NOT*, it is learnt, continuing. For these reasons the need for such a study has to be accepted.

However, the scanty knowledge, the numberous lacunae and difficult problems are so manifest that they have been summarised succinctly in the cautiously worded statement in the document under consideration on page 8 which runs as follows: *Although limited results to date are promising, and the concept seems sound in theory, success or failure cannot be predicted at this stage. There are many problems to be resolved. Some of these are sequential, each step depending upon the results achieved in the previous step. Should the experiment on operational feasibility of genetic control be a success, the project would have achieved a major break-through in public health. Even if the operational experiment is a failure, the understanding of biology and behaviour of insect populations would be greatly advanced, opening up new vistas to applied biologist.* This implies *inter alia* a constant concurrent evaluation of the programme, decision making on the spot and follow up thereafter (i.e.) the *Authority* for the *Responsibility* must vest in a local organization.

It would be pertinent to note that a small village experience of *OKPA* (1000 persons) is to be expanded to a larger area. This is noted at pages 19 and 20 which indicates the final operational experimental urban area with 4000 houses (i.e.) about 20000—25000 population.

2. *Technical Considerations*:

2.1. An important point, though touched briefly, yet needs to be spelt out even at this stage. This is the problem of possibility of another mosquito species coming to occupy the niche of the vaccum as may be created by the attempts currently contemplated (i.e.) of a species suppression. This warning is by Dr. Laven (Nature, Vol. 216 pp. 383-384 of October, 1967). Dr. Laven is a WHO Consultant to the Vector Biology Control Unit WHO Geneva. The document no doubt has stated on page 23 that studies will be extended for evaluation after release experiments are terminated, for a period of 3 to 6 months to note possible invasion of the breeding niche previously occupied by *C. fatigans*. The remedial measure in the event of such a possibility has however, not been spelt out Such invasion, as Dr. Laven has pointed out, can be by an equally efficient vector (or by a more potential vector as has been observed by NICD in limited studies in the context of insecticidal application and withdrawal under NMEP in some areas on the Delhi-UP border). This fact was discussed with the WHO/USPHS team. Dr. Laven has hence pointed out the need for a strain of *C. fatigans* unable to transmit filariasis or even a strain which do not bite man could be developed and liberated to fill the empty niche. It is posible that WHO, Geneva has plans

with Dr. Laven or someone to have such "special mosquito species' (These have to be for not only *C. fatigans* but also *Aedes aegypti*). The point is there is no mention about provision (Plan, personnel or fiscal) for such mass culture, mass release etc. of the "empty niche filling types to be put in". *This is an important point which omission needs correction.*

2. 2.2. Search for incompatible strain of *C. fatigans*. This has been spelt out in some detail. In this context a suggestion is made that it would be preferable for the development of incompatible strains not to be confined to the project team alone as has been shown under programme for year 1 item 3 (i.e.) search for an development of incompatible strains (*C. fatigans*). It is felt that it would be better if additionally research in supported stimulated in other institutions in the country, as it would be agreed that this process is unpredictable and time consuming.

2.3. *Sociological aspects*:

The "acceptability factor" by the people is a vital matter for the success of the project. Probably the Health Educator (Social Scientist) could be more profitably be engaged an year earlier than suggested.

2.4. *Site selection for C. fatigans and Aedes aegypti*:

The Delhi area has been chosen for the *C. fatigans* studies and for *Aedes aegypti*, the team seems to consider this area as *NOT* suitable. They seem to think an area in the east coast of South India would be more suitable.

The criteria for the selection of the Delhi area are not known.

From the criteria set out on page 24 of the document under (a) items 2 and 4, however, it is stated with regard to site selection for Aedes aegypti.

"Villages must be linked by a network of all weather roads".

"Proximity to a metropolitan area for housing, supply and air transportation". Presumably these criteria also weighed for *C. fatigans* studies to be located near about Delhi. The point to note would be that the neighbourhood of Delhi is a non-endemic area for filariasis. It is suggested that the vectoral states of *C. fatigans* in the selected areas to W. bancrofti should be predetermined before final selection.

**With regard to site selection it would be preferable to consult local institutions like the N.I.C.D., V.R.C. etc. as they have rich local experience and abundant data in these contexts.**

2.5 Technical rquorements for gentic control of Aedes aegypti:

On page 26 of the document it is stated "In the present project, the sterile male technique, using radiation or chemosterilants will be re-evaluated. Several other genetic mechanisms which are now available will also be evaluated. Other self propogating deleterious factors will certainly be discovered during the course of the project." This study is unlike that proposed for *C. fatigans* where only cytoplasmic incompatibility technique is to be deployed. This does *NOT* involve Radio active treatment of *C. fatigans*. The field of Radio biology is a complex but important field. The point to consider is the likely risk or otherwise of such use of millions of radio active sterilised males in the context of possible upset of balance of nature vis-a-vis other insects.

3 *Other points:*

The encouraging statement on page 5 of the documents under 2.2 (Manpower and facilities) that there are available in India a number of trained Indian personnel who may be able to participate in the Research Project is noteworthy. The impression gained during the informal meetings as well as the formal meeting with the D.G., ICMR on 6th April, 1968, was that the Project will be executed under the auspices of the ICMR with National Institutions collaborting. In this context, attention is drawn to the minutes of the meeting of April 6, 1968 at page 6 of the document which states "He (Dr. R. Pal) further gave informatin that under this Project WHO proposes to establish an International Research Unit with International staff as well as local staff under the auspices of ICMR". The statement on page 11 states "WHO will have all operational and technical responsibilities for the conduct of the Project" and the Appendix 'A' on page 12 (i.e.) Agreement with the U.S. Govt. shows the WHO, Geneva as a collaborating institution, Mr. J. W. Wright as Principal Investigator (stationed at Geneva), the address where the work will be performed as SEARO, WHO, New Delhi etc. These facts with the policy of funding of PL 480 funds need to be looked into.

## APPENDIX VII

(*Vide* Para 6.1.4)

*Names of American Scientists/Administrator who were working at the John Hopkins Projects in India*

*At Narangwal*:

1. Dr. C. E. Taylor
2. Dr. Colin Mc Cord

*At Calcutta*

1. Dr. George B. Schaller
2. Dr. F. B. Bang
3. Dr. H. Hulemann
4. Dr. W. Kloene
5. Miss E. P. Elliston
6. Dr. G. A. Schad
7. Dr. D. E. Schafer
8. Dr. G. W. Lewis
9. Dr. R. Bloom
10. Dr. C. H. Southwick
11. Dr. F. B. Huges
12. Dr. M. Bertrand
13. Dr. J. J. Spillet
14. Dr. W. K. Ota
15. Dr. L. E. Rozeboom
16. Dr. M. Foard
17. Dr. C. J. Michell
18. Dr. C. K. Wallace
19. Dr. B. W. Parrack
20. Dr. J. G. Banwell
21. Mr. J. A. Miller
22. Dr. N. F. Pierce

23. Dr. G. I. Higashi
24. Dr. G. F. Thornton
25. Dr. R. D. O'Tolle
26. Dr. S. Redinovisky
27. Dr. M. Ota
28. Dr. C. D. Louch

## APPENDIX VII

*Summary of Conclusions and Recommendations*

| . No. | | Para No | Ministry Deptt. | Conclusion Recommendation |
|---|---|---|---|---|
| 1 | 2 | 3 | | 4 |
| 1 | 7.1 1 | | Ministry of Health & Family Planning (Deptt. of Health | The examination by the Committee of some of the research projects in the country conducted in collaboration with foreign organisations raises a number of interesting questions. The Committee find that the Genetic Control of Mosquitoes Unit Project, the bird migration and arbovirus studies at the Bombay Natural History Society, the Ultra Low Volume Spray experiments for urban malaria control at Jodhpur, the Pantnagar Microbial Pesticides Project and some of the research projects undertaken in West Bengal and Narangwal in collaboration with the John Hopkins University establish beyond doubt a definite pattern. This is that agencies of foreign governments, in some cases explicitly military agencies of those governments, (as in the case of the collaboration between the Bombay Natural History Society and the Migratory Animal Pathological Survey— |

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| | | | MAPS—of the United States Armed Forces Institute of Pathology), have been conducting basic research through Indian scientists and Indian scientific organisations. Even in cases where such research is carried out in collaboration with philanthropic civilian organisations from abroad, the Committee find that some of these civilian organisations also have active liaison and communication at several levels with military agencies. No doubt, some of these research programmes have been shown as 'developmental' or 'basic research'. These projects, however, have been closely concerned with the collection of vital virological, epidemiological or ecological data, which are well capable of being used against the security of the country and that of our neighbouring countries. The utility of some of these projects to India, especially the Genetic Control of Mosquitoes Unit Project, seems to be only doubtful or potential, whereas the primary data obtained from these projects are likely to be of vital importance to foreign governments interested in developing techniques of chemical, biological, bacteriological, and anti-subversive warfare. |
| 2 | 7.1.2 | Ministry of Health and Family Planning (Deptt. of Health) | As the the evidence placed before the Committee, which has been discussed in the succeeding paragraphs, would reveal, it would appear that these projects are not isolated instances of errors of judgement where, due to inaccurate assessment or a certain naivete on the part of officials and scientists, the Ministry of Health and its |

| | | | |
|---|---|---|---|
| | | | agencies initiated and approved projects which could be greatly inimical and extremely hazardous to the nation's well-being and security. What causes surprise to the Committee, and this ought to be a matter of grave public concern also, is the lack of security consciousness in the Indian agencies involved in these projects and the casual attitude and indifference towards foreign supported research in India. The Committee also find that scientific projects in the country are dealt with by various Ministries and organisations and that there is little or no coordination between different wings of Government in this regard. |
| 3 | 7.1.3 | -do- | The unsatisfactory features of some of the individual projects that have come to the notice of the Committee have been discussed in the succeeding paragraphs. |
| 4 | 7.1.4 | -do- | The Committee are unable to understand why the Ministry of Health and the Indian Council of Medical Research agreed to the administrative and technical control of the GCMU Project vesting in the Project Leader appointed by the World Health Organisation. What is even more intriguing is the fact that according to the agreement entered into between the World Health Organisaion and the United States of America, as represented by the National Communicable Diseases Centre, Bureau of Disease Prevention and Environmental Control, Public Health Service, Department of Health, Education and Welfare, Atlanta, Georgia, USA, for the provision of PL-480 |

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| | | | funds for the GCMU Project, changes or substitutions of the Principal Investigators of the Project are to be made only with the written approval from the National Communicable Diseases Centre. It would be evident from this that the Project had been supported by the World Health Organisation only in a formal sense and the Project was ultimately controlled by an institution of the United States Government, who had financed it. |
| 5 | 7.1.5 | -do- | The Committee find that the agreement between the Government of India and the World Health Organisation also provided for the appointment of a national counterpart to be nominated by the Government of India. Though the Director General of the Indian Council of Medical Research had been appointed as the Indian Counterpart Project Administrator, the Committee are surprised that the Director General apparently did not know that he was the national counterpart for the GCMU Project for he himself informed the Committee during evidence that Dr. T. Ramachandra Rao, an entomologist and former Director of the Virus Research Centre, Poona was the Officer Incharge of the Programme in the ICMR. It was only subsequently that the Department of Health informed the Committee that Dr. Rao had not been appointed as the Indian Counterpart Project Administrator but only as an Officer on Special Duty in the ICMR and that, in that capacity, he was looking after all the technical work |

| | | | |
|---|---|---|---|
| | | | relating to the GCMU Project under PL-480 schemes. This is a measure of the indifference of the Ministry of Health to the activities of the GCMU and the extent to which the Ministry had given a free hand to the foreigner Project Leaders of the GCMU and the WHO consultants. |
| 6 | 7.1.6 | -do- | Apparently, there has also been a lack of purpose and seriousness on the part of the Ministry in appointing the Indian counterpart. The Committee understand that the present Director General of the ICMR is a nutritionist and the former Director General, a cancer specialist. One would have expected the Ministry to appoint someone with the kind of experience nearer to the project he was expected to oversee. It is indeed amazing that persons with no genetic experience should have been entrusted with the task of overseeing a complex genetic experiment and ensuring that a vital health and security interest of the people of India was properly protected. |
| 7 | 7.1.7 | -do- | On the other hand, a number of foreign experts and consultants had been inducted into the Project from time to time, despite the fact that, as has been admitted during evidence before the Committee, that the Indian scientists working in the Unit were some of the highest qualified and experienced people. on the ground that the Indian scientists did not have experience in genetic methods. although most of the techniques and instruments in the GCMU had been developed by Indian scientists. The Committee have also been informed that Indian entomologists are as good as any one else in the world. |

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| 8 | 7.1.8 | -do- | Under these circumstances, the Committee find it difficult to appreciate the rationale for permitting a large number of foreigners not only to participate in the research but also to determine and dictate its policies and programmes. Of the seven Project Leaders appointed by the WHO between January, 1970 and July 1973, four were US nationals one a Japanese and the other a British national. Only one Indian, Dr. Rajendra Pal, had been appointed as an acting Project Leader from August, 1972 to November, 1972. Even he was an employee of the World Health Organisation. In addition, as many as 37 short-term consultants and temporary advisers, 20 of whom were US nationals, have visited the GCMU in New Delhi since its inception, who have apparently been given free access to the primary data collected by the Unit. |
| 9 | 7.1.9 | -do- | During evidence tendered before the Committee, Dr. Rao had justified the presence of foreign experts at the GCMU on the plea that though the Indian scientists had experience in one kind of mosquito research or the other, they did not have experience in genetic methods. The Committee, however, find that Dr. Gerald Dean Brooks, the present WHO Project Leader had obtained his Ph.D from North Carolina University only in 1973 when he joined the GCMU. Similarly Dr. Yasuno, who was acting Project Leader from November, 1972 to April 1973 was only an ecologist and not a geneticise. Dr. H. L. Mathis, one of the consultants had just a B.Sc. degree and Mr. J. E. Graham, |

| | | | |
|---|---|---|---|
| | | | another consultant, a M.S. degree. The Committee are, therefore, unable to accept the contention that the Indian scientists were not equipped to play the leading role in the project. |
| 10 | 7.1.10 | -do- | The Committee consider it regrettable that it was only after the publication of the PTI article, followed by the discussions in Parliament and the examination by the Public Accounts Committee, the Ministry of Health showed some awareness of the inadequacy of the existing administrative arrangements for the project and set in motion a review of the technical and administrative control of the project by a Committee nominated for the purpose. This Committee met on the 15th October, 1974. It was only at this meeting that it was decided to examine whether, in accordance with the existing provisions of the agreement with the World Health Organisation, the effective functioning of the national counterpart in respect of various aspects of the project could be ensured and normal checks could be exercised by him. The Group, after discussions, felt that even the existing agreement provided sufficient authority to the Director General, ICMR, to exercise overall control on the project. The Director General, ICMR was also asked to request the Project Leader to forward to the ICMR, a fortnightly or monthly report about the work done in the Unit and also to ensure that all communications in the nature of reports in regard to the research activities in the Unit are cleared by the Project Leader with the Director General, ICMR, before general circulation or transmission to other agencies. |

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| 11 | 7.1.11 | -do- | The Committee note that at this meeting it had also been agreed that efforts should be made to provide the following in the fresh agreement to be executed after the expiry of the existing agreement in June 1975, at the time when proposals for the extension of the project come up for consideration:<br>(i) the Director General, ICMR should be made overall in-charge of the Unit and the Unit functions under his administrative control and guidance;<br>(ii) the project leader should be appointed with the specific approval of the Government of India; and<br>(iii) the provisions of the agreement should be made more specific to remove any ambiguities. |
| 12 | 7.1.12 | -do- | It is clear the Indian Counterpart Administrator had hitherto exercised no control over the project. It is also evident that the ICMR had earlier been virtually at the mercy of the WHO Project Leader. That this should have been so, despite a clear provision in the agreement that the broad lines of policy upon which the work of the project would be based would be agreed upon between the representatives of the Government of India and the World Health Organisation, causes concern to the Committee. It would also appear that |

| | | | |
|---|---|---|---|
| | | | the Director General, ICMR had failed to exercise the authority vested in him for the overall control the project. |
| 13 | 7.1.13 | -do- | It is not clear to the Committee how far this provision of the agreement that the broad lines of policy of the project would be agreed upon between the representatives of the Government of India and the World Health Organisation was actually observed and implemented. |
| 14 | 7.1.14 | -do- | In his comments on the WHO Project furnished as early as 1968, the then Director, National Institute of Communicable Diseases had pointed out the need for a constant, concurrent evaluation of the programme and decision-making on the spot and follow-up thereafter and had emphasised that the authority for the responsibility must vest in a local organisation. Yet, strangely enough, the Ministry of Health had agreed to this authority vesting in the United States Public Health Service (with which its military organisations were closely connected) through the World Health Organisation. The Committee would very much like to know what considerations weighed with the Ministry in overlooking the very valid comments in this regard of the Director, National Institute of Communicable Diseases. |
| 15 | 7.1.15 | -do- | Another distressing feature of the project which has come to the notice of the Committee is the complacent attitude displayed by the Ministry of Health towards the agreement entered into between the World Health Organisation and the United States authorities for the provision of PL-480 funds for the project. As late as January, |

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| | | | 1975, the Ministry had been under the impression that there was only one agreement between the WHO and the NCDC, which would expire on 31st December 1974, while the agreement between the Government of India and WHO was to expire on 30th June, 1975. It was only at the instance of the Committee that the Ministry made a reference to the World Health Organisation to ascertain the correct position of the agreement between the WHO and the US Government. |
| 16 | 7.1.16 | -do- | The Ministry have only now come to know that the initial agreement executed between the WHO and the US Government effective for a period of six years from 1st January, 1969 to 31st December, 1974 had actually been modified twice. The first modification was agreed upon on 3rd July, 1969, which amended the effective period of the agreement to three years, commencing from 1st April, 1969. A third agreement signed on the 3rd June, 1969 further amended the period of the proposed project from 3rd July, 1969 to 30th June, 1975, so as to coincide with the expiry of the agreement between the World Health Organisation and the Government of India. |
| 17 | 7.1.17 | -do- | Surprisingly enough, even before fresh proposals for the continuance of the project in India beyond 30th June, 1975 had been initiated by the World Health Organisation, the United States Government have already signed a fresh agreement with the World Health Organisation as early as 20th June, 1974, extending the effective |

| | | | |
|---|---|---|---|
| | | | period of the GCMU Project upto 30th June, 1978. This, however, was not even known to the Health Secretary himself. This would only indicate the anxiety on the part of the US Government to continue the project beyond 30th June, 1975. The question that, therefore, arises is: what could have prompted the US Government to extend the project on their own? |
| 18 | 7.1.18 | -do- | It is also strange that the Ministry of Health should have been aware of the existence only of the original agreement between the WHO and the US authorities. The Committee have been informed by the Ministry that the modified agreement had not been forwarded by the WHO to the Government of India. The Committee, however, find, from the letter dated 23rd December, 1968 from the World Health Organisation to the Director General, Health Services, that the Government of India had been informed that the US Public Health Service had at that stage reserved funds only to support the first three years of work. This would imply that the Ministry of Health was aware at that time that while the agreement between the Government of India and the WHO covered the full six year period, the agreement between the WHO and the Government of the United States of America would only cover the first three years of the six year period. The Committee are of the view that this letter from the WHO should have set the Ministry thinking. In case, there was still any doubt about the status of the agreement with the US authorities, the Ministry should have sought a clarification at that stage itself. If this was not done, the Committee would like to know the |

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| | | | reasons therefor. The Committee also desire that responsibility for this lapse should be fixed for appropriate action. |
| 19 | 7.1.19 | -do- | The Committee are also unable to understand the reluctance on the part of the WHO to make available the full texts of the agreements entered into with the US authorities and to keep the Government of India contemporaneously informed of the developments from time to time. The full texts of all the agreements entered into with the US authorities had been furnished by the WHO to the Government of India only on the 28th February, 1975. The Ministry of Health had taken action to obtain the copies of all these agreements only at the instance of the Committee. It would, therefore, appear that there has been a big communication gap between the WHO and the Government of India on the involvement of the United States of America in the GCMU Project. |
| 20 | 7.1.20 | -do- | The selection of Delhi for field studies on Culex Fatigans is also shrouded in mystery. The Committee find from the comments of the then Director, National Institute of Communicable Diseases, furnished in 1968, on the WHO proposal for the GCMU Project that the Director had observed that 'the criteria for the selection of the Delhi area are not known'. The officials who appeared before the Committee have also not been able to enlighten the Committee on the |

reasons for selecting the Delhi area for the experiments, though various theories and presumptions have been advanced by them in this regard. While the Director General, Health Services pleaded his ignorance about the reasons for selecting Delhi, the Director, National Institute of Communicable Diseases sought to justify the selection of Delhi on the ground of proximity to the ICMR and the NICD and the availability of the experts from elsewhere in Delhi. No convincing reason has, however, been furnished to the Committee for the selection of Delhi. The various reasons advanced during evidence can at best be considered hypothetical and obsure. The Committee consider it regrettable that the authorities in the Ministry of Health and the Indian Council of Medical Research had not been associated with such a question of broad policy and planning as the selection of site for the studies.



| | | |
|---|---|---|
| 21 | 7.1.21 | -do- |

The Committee find that in his comments on the WHO proposal, the then Director, National Institute of Communicable Diseases, had also suggested that 'with regard to site selection it would be preferable to consult local institutions like the NICD, VRC, etc. as they have rich local experience and abundant data in these contexts. The Committee would like to be informed of the action taken by the Ministry on this suggestion.

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| 22 | 7.1.22 | -do- | Equally intriguing is the selection of Sonepat for the field studies on aedes aegypti. The Committee find from the comments of the then Director, National Institute of Communicable Diseases that the WHO team had considered the Delhi area as unsuitable for field studies on aedes aegypti and had felt that an area in the east coast of South India would be more suitable. In his comments, Dr. Ramachandra Rao had also suggested that 'studies on aedes aegypti should be carried out in South India with VRC as the main participant'. He had also pointed out that 'the entomology staff of the VRC are fully conversant with the problems of *aedes aegypti* and can contribute significantly to the study when it is organised'. Again, Dr. Elmo M. McCray, Jr. one of the WHO consultants, had also undertaken a survey of areas around Madras and had concluded that an ample number of towns and villages within a 35—40 mile radius of Madras City would be suitable for further evaluation and possible use for field experiments. |
| 23 | 7.1.23 | -do- | Yet, in disregard of all these suggestions, the Committee observe that Sonepat had been selected for the field experiments on aedes aegypti. What is even more interesting is the fact that according to conclusion No. 6 of the minutes of a meeting on the genetic control of culicine mosquitoes held on the 6th November 1968, it had been decided that besides the Government of India and the WHO, the Government of Haryana or any other State Government concerned would be a partner in the project. The |

| | | | |
|---|---|---|---|
| | | | Haryana State Malariologist was also present at the meeting. Since this meeting had been held a year before the GCMU Project took final shape, it raises a very interesting question: Was Sonepat premarked for *aedes aegypti* studies by the US—WHO even before the ICMR came on the scene? |
| 24 | 7.1.24 | -do- | The Ministry of Health have justified the mention of the State Government of Haryana by name even before site selection on the ground that the scientists of the WHO had visited the area around Delhi to survey mosquito populations and suitable test sites. Several villages and townships to the South of Delhi appeared satisfactory for the proposed studies on *Culex fatigans*. In view of this, the entire report of the World Health Organisation had been forwarded to the Government of Haryana in July 1968 for their comments. The Ministry have, therefore, stated that it had been mentioned in the minutes that the Government of Haryana or any other State Government, in which the experiments would be conducted, would be a partner in the Project. |
| 25 | 7.1.25 | -do- | This explanation, in the opinion of the Committee, does not, by itself, provide any convincing reasons for the selection of Sonepat for the field studies on *aedes aegypti*. The survey conducted by the WHO had only considered villages and townships to the South of Delhi as suitable for studies on *Culex fatigans* and not on *aedes aegypti*. In fact, as already pointed out in one of the preceding paragraphs, the WHO scientists themselves had considered the Delhi area as unsuitable for field studies on *aedes aegypti*. |

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| | | | No other State Governments had also apparently been addressed in this regard. Under the circumstances, the Committee are unable to accept the explanation offered by the Ministry. |
| 26 | 7.1.26 | -do- | The Committee, therefore, find a number of missing links in the selection of sites for the experiments which have not been explained satisfactorily. Considering the military potential of the studies on genetic control, the Committee would like to be satisfied that no extraneous considerations have influenced the selection of areas around the capital for the studies, both on *culex fatigans* and *aedes aegypti*. The Committee desire that the various circumstances leading to the selection of sites for the studies on genetic control should be immediately investigated in detail by an authority entirely independent of the Ministry of Health and its associate organisations. |
| 27 | 7.1.27 | -do- | The Committee view with serious concern the use of a hazardous chemical, thiotepa, to sterilise mosquitoes before releasing them in the environment without clearance from the Drug Controller. The Committee understand that thiotepa produces mutations, cancer and foctal deformities. According to a report of the Research Unit on the Genetic Control of Mosquitoes, published data had shown that spiders fed on thiotepa-treated mosquitoes have reduced fertility. The Committee also understand that the Canadian Government had decided that chemosterilants for the sterili- |

| | | | |
|---|---|---|---|
| | | | sation of native population should not be used on large scale until less hazardous chemicals are produced or safer techniques are developed, while the United States Government have prohibited the use of thiotepa in field experiments. Dr. Ramachandra Rao has also informed the Committee that no government organisation has permitted this chemical to be used openly in nature except for experimental purposes. A number of experts have also warned against the use of thiotepa. |
| 28 | 7.1.28 | -do- | Though the use of thiotepa in the GCMU experiments was considered to be absolutely safe for human beings by the WHO Expert Committee in November 1972, because of the manner in which it was being used, the Committee are not happy with the way in which this chemical had been used in wells in Delhi, thereby posing a potential health hazard. In fact, in India itself, Defence Scientists, who had also conducted mosquito control experiments and carried out a careful scrutiny of the relative merits and demerits of various genetic control methods, had come to the conclusion that hazardous chemicals like thiotepa, which is cytotoxic, used for chemosterilisation pose the danger of polluting the environment. They had also held that chemosterilisation does not completely sterilise the female mosquitoes, thus leaving such females released in the field to produce mutant progenies which could also be dangerous. |
| 29 | 7.1.29 | -do- | Under these circumstances, the Committee cannot understand the reasons for the GCMU using thiotepa as a chemosterilant. The clearance of the Drug Controller had also not been obtained |

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| | | | by the Unit on the ground that the public health hazard involved was considered to be negligible or non-existent. The Committee deprecate such a casual approach to this question and desire that the circumstances leading to the use of thiotepa in the GCMU should be thoroughly investigated. Responsibility for permitting such use of a potentially dangerous chemical in the environment without clearance from the Drug Controller should also be fixed. Such negligence in matters affecting the health of the people, in the opinion of the Committee, deserves the most stringent punishment. |
| 30 | 7.1.30 | -do- | It is also not clear to the Committee whether any independent examination of the use of thiotepa had taken place in the Ministry of Health. In view of the fact that the use of this chemical for field experiments is banned in other countries, the Committee desire that the Ministry of Health should examine this in detail, in all its aspects, also taking the benefit of the advice of the Defence scientists. Till such time as the theories about the use of thiotepa are proved wrong scientifically, the Committee would recommend that this potentially dangerous method of sterilisation of mosquitoes may be discontinued. |
| 31 | 7.1.31 | -do- | The Committee are also surprised that the Ministry of Health should have been ignorant of the work done in this field by a Defence organisation and should have got to know of it only after the Committee raised the point. Such lack of coordination on im- |

portant projects between different wings of Government is regrettable.

| | | | |
|---|---|---|---|
| 32 | 7.1.32 | -do- | The Committee also note with concern the hazards involved in the release of incompatible strains of mosquitoes in the field. It has been confirmed by Dr. Ramachandra Rao himself that a possible consequence of the release of genetic strains is that there is always a danger of replacement of the existing strains of mosquitoes with a new strain which may be more dangerous. The Expert Group of the Indian Council of Medical Research, which met in October 1974, had also come to the conclusion that the possibility, however remote, that the genetic manipulation might result in strains of mosquitoes with increased competence to transmit other diseases, should be taken into account. The Group had pointed out that before releasing genetically manipulated mosquitoes, it would be essential to have data on some important aspects in order to ensure that such mosquitoes have not developed increased competence for transmission of other diseases. |
| 33 | 7.1.33 | -do' | There is also considerable published scientific evidence on the dangers of a new colony of mosquitoes being established as a result of genetic experiments. The Defence scientists had also pointed out that the use of cytoplasmic incompatible strains involves 'the introduction of alien strains of the species into the country giving rise to the danger of opening avenues of new diseases into the country with potential uncertainty and serious risk'. In the face of such unknown hazards, the Committee are doubtful whether the decision to release genetic strains of mosquitoes in the environment was justified scientifically. |

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| 34 | 7.1.35 | -do- | The Committee are also unable to appreciate the preoccupation of the GCMU Project with the aedes aegypti species of mosquitoes. Aedes aegypti is said to be a vector of yellow fever and dengue. While the occasional outbreaks of dengue in haemorrhagic form in one or two cities in the country is, in the opinion of the Committee, fairly insignificant, yellow fever is a disease which is non-existant in India. From the summary of recorded outbreaks of dengue in the country furnished by the Ministry of Health, the Committee find that only sporadic or a small percentage of cases had haemorrhagic manifestations. The Committee are, therefore, not convinced with the explanation furnished by the Ministry that the appearance of dengue in a daemorrhagic form in Calcutta and Kanpur had increased the importance of a study of aedes aegypti. It is also of interest to note that even the WHO had not stated, in their seminars held at Manilla and Bangkok, that the eradication of dengue haemorrhagic fever could be achieved by the elimination of aedes aegypti by genetic control methods. |
| 35 | 7.1.35 | -do- | On the other hand, the Committee find that the use of genetic techniques for anopheles stephansi, the malarial mosquito, has been given a lower priority in the GCMU, because of the limitations of man-power, finance, etc. Dr. Ramachandra Rao also justified the lesser emphasis laid on research on anopheles stephansi on the ground that, in 1967-68, when these ideas were developed, malaria had practically disappeared from the country and the urgency with regard to |

| | | | |
|---|---|---|---|
| | | | the malarial mosquito was not of that high order. The Ministry have also stated that while considerable research data was available in respect of culex fatigans and aedes aegypti, such data was lacking in the case of anopheles stephansi |
| 36 | 7.1.36 | -do- | These arguments are, to say the least, unconvincing. Considering the fact that malaria is resurging in every part of the country, the Committee cannot but view with serious concern, the misplaced emphasis of the GCMU experiments on aedes aegypti. The justification furnished by Dr. Ramachandra Rao is also not borne out by facts. According to the Report of the Consultative Committee of Experts to determine alternative strategies under the National Malaria Eradication Programme, which met at New Delhi from 17th to 20th August 1974, large scale outbreaks of malaria which could not be liquidated by routine measures were detected during 1965 and 1966 and 12 million and 17 million people respectively were victims of the disease. After 1966, focal outbreaks, continued to occur in extending areas with consequent rise in the incidence of malaria in consolidation and maintenance areas. During 1968, areas having a population of 91 million had been reverted to attack phase from consolidation and maintenance phases. |
| 37 | 7.1.37 | -do- | The incidence of malaria has also been steadily on the increase since 1965. From 1.00 lakh cases in 1965, it increased to 2.79 lakh cases and 2.75 lakh cases respectively in 1969 and 1968. The incidence from 1969 to 1973 was respectively 3.49 lakh cases, 6.95 lakh cases, 13.23 lakh cases, 13.63 lakh cases and 14.98 lakh cases. |

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| | | | The Consultative Committee, in their Report, had also noted the fact that research in malaria and its various aspects had not received adequate attention during the last ten years. |
| 38 | 7.1.38 | -do- | In view of the above facts, the Committee are distressed at the indifference of the Ministry of Health towards a major health problem. If the GCMU was really justified, the Committee feel that the highest priority should have been accorded to work on the malarial mosquito. If the intention of the project was indeed to devise ways and means to eradicate mosquitoes, the very fact that adequate research data on anopheles stephansi was not available should have pointed to the importance and urgency of research efforts on this species and should have prompted the GCMU to pursue research on this species. Even if, as claimed by the Ministry, genetic strains of anopheles stephansi were not available, the Committee would like to know why chemosterilisation should not have been tried, especially since such a method was being tried in or work started on colonising anopheles stephansi and working on genetic strains |
| 39 | 7.1.39 | -do- | What causes even greater concern to the Committee, in regard to the experiments on aedes aegypti, is the fact that the Ministry of Health have shown utter disregard to the warnings of eminent authorities on yellow fever on the dangers of eliminating |

dengue. There is enough published evidence to show that dengue offers protection against the more fatal yellow fever. In the first Gharpure Memorial Oration held as early as May 1971, Dr. C. G. Pandit, who is one of the foremost authorities on yellow fever in the country, while discussing the causes for the absence of yellow fever in India had raised the question whether we would lose the 'umbrella of protection' against yellow fever by succeeding in eradicating dengue. Dr. Pandit had further stated that 'previous exposure to the dengue fever virus, affords a varying degree of protection against Japanese B encephalitis, Murray Valley encephalitis, St. Louis encephelitis and probably against West Nile Virus infections'. Dr. Pandit, in other words, had warned that eradication of aedes aegypti might not eradicate the vector of yellow fever but only the beneficial dengue fever and once this natural protection is lost, it is not unlikely that other species of the aedes family like aedes albopictus and aedes vittatus might take up the role of spreading the yellow fever virus. Dr. Pandit had also pointed out that, in the event of eradication of aedes aegypti, even culex fatigans could assume the role of transmitter of the infection.



40 7.1.40 -do- The attention of the Committee has also been drawn by Shri Raghavan, Editor-in-Chief, Press Trust of India to even more authoritative and important evidence on cross protection offered by Dr. Max Theiler, a Nobel laureate for his work on yellow fever, after exhaustive study in the Carribeans and Trinidad. According to Dr. Theiler ('Arthropod Borne Viruses in Vertebrates', 1973), there

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| | | | is experimental evidence to show that dengue fever offers protection against yellow fever. Dr. Theiler observes: 'The conclusion is inevitable that all group B infections (dengue belongs to Group B) in man lead to the development to a greater or lesser extent of antibodies capable of neutralising yellow fever'. Dr. Theiler further says: 'It has been shown conclusively that dengue immune sera have the capacity of neutralising yellow fever virus. It has been shown that all human sera containing group B antibodies from West Africa, Tanzania, Malawi, Sudan, Egypt, India, Malaya and Hongkong are all capable of neutralising yellow fever virus. It seems a general law that any group B infection in man leads to the development of antibodies capable of neutralising yellow fever virus.' |
| 41 | 7.1.41 | -do- | The Committee regard both Dr. Pandit's views and Dr. Theiler's findings as extremely important for any programme for the control or eradication of aedes aegypti and dengue fever. The Committee are concerned to observe that while launching a major programme against aedes aegypti, no serious consideration appears to have been given by the Ministry of Health or the Indian Council of Medical Research for more than three years to the questions posed by Dr. Pandit on the eradication of aedes aegypti. What is even more distressing is the fact that Dr. Pandit's views had been dismissed as 'thoughts' 'raised in a lecture' and no attempts had been made by the |

| | | | |
|---|---|---|---|
| | | | Ministry to seriously examine this aspect. Such a casual approach to scientific problems is, in the opinion of the Committee a matter of serious concern. |
| 42 | 7.1.42 | -do- | Though the Director General, Health Services stated during evidence that this subject had been discussed at length between various virologists, immunologists and Public health workers and he himself had discussed it with Dr. Pandit a number of times, the Committee have not been furnished with any documentary evidence to support this contention. In fact, the Ministry of Health themselves have admitted in a written note submitted to the Committee that consultation with other experts had not been considered as the thoughts raised by Dr. Pandit in his lecture were not to be construed as a warning against the programme. |
| 43 | 7.1.43 | -do- | There is also no evidence on record prove that Dr. Pandit's views were duly considered by the GCMU. The minutes of the review meetings contain no reference to this aspect. Even presuming that the 'cross protection' theory was only a hypothesis, the Committee feel that both the Indian Council of Medical Research and the Ministry of Health ought to have examined this in detail before proceeding with the field studies on aedes aegypti. That this was not done would lead the Committee to the conclusion that the approach to the eades aegypti experiments were not scientific. |
| 44 | 7.1.44 | -do- | A more serious question which arises out of the Genetic Control experiments is whether the GCMU Project itself is only a |

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| | | | covert attempt by a foreign government to conduct research on techniques of biological warfare. The Unit has been primarily interested in the collection of data on the ecology and dispersal of Indian mosquitoes, particularly aedes aegypti, which is stated to be a vector of yellow fever. Enough published evidence exists to show that some of the methods tried out by the GCMU have definite implications in biological warfare. |
| 45 | 7.1.45 | -do- | For instance, the Committee find from the Report of the Hearings of the US Congress House Committee on Foreign Affairs, which has been published under the title 'Chemical—Biological Warfare: US Policies and International Effects', that 'mosquitoes and ticks are transmitters of disease and as vectors have to be looked upon as having potential military significance'. About the advantage of vector or entomological warfare, the Report says that 'unless transmitted by insects, bacteriological agents have little power to penetrate the intact skin.' |
| 46 | 7.1.46 | -do- | The Committee also find a number of references to the use of mosquitoes in biological warfare in a report submitted to the United Nations Secretary General, U Thant, in 1969 by a specially constituted group of consultant experts on chemical and biological warfare. This report points out that 'any country which resorted to bacteriological (biological) warfare would try to infect, with a single blow, a large proportion of an enemy population with an |

| | | | |
|---|---|---|---|
| | | | exotic agent to which they had not become immune through previous exposure. Such exotic agents would lead to the appearance of diseases which normally had not occurred before in a given geographical area, either because of the organism involved (e.g. Japanese or Venezuelan encephalitis in Europe, Rocky Mountain Spotted fever in many countries). In addition, a disease which had been controlled or eradicated from any area (e.g. urban or classical yellow fever from many tropical and sub-tropical countries, epidemic typhus from developed countries) might be reintroduced as a result of bacteriological (biological) warfare'. |
| 47 | 7.1.47 | -do- | The report of the consultant experts further states that 'the gravity of these risks (from biological warfare) would depend on the extent to which the community or the species in the country attacked contained animals which were not only susceptible to infection but were living in so close a relationship to each other that the infection could become established. For example, not all mosquito species can be infected with yellow fever virus and if the disease is to become established those which can become vectors must feed frequently on mammals such as monkeys which are sufficiently susceptible to the infection. A natural focus of yellow fever is, therefore, very unlikely to become established in any area lacking an adequate population of suitable mosquitoes and monkeys' |
| 48 | 7.1.48 | -do- | The Committee observe that India has the desired combination of suitable aedes aegypti mosquitoes and monkeys. This would be too irresistable a combination for anyone who might want |

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| | | | to introduce the virus of yellow fever into the country. The Director General, Health Services had also admitted that it was possible to spread a disease in virgin soil or in a country where the people had not been immunised. The Committee also find that despite the ideal conditions that exist in India, yellow fever has not struck India, probably because of the cross protection afforded by dengue. Under these circumstances, the experiments with aedes aegypti in Sonepat assume a menacing significance and cause serious concern to the Committee. |
| 49 | 7.1.49 | -do- | There is also considerable published information on the interest of the United States of America in the yellow fever virus as a potential biological weapon. The Committee learn from the Report of the Stockholm International Peace Research Institute (SIPRI) on chemical and biological weapons, that the US Biological Warfare Laboratories had examined about 200 pathogens but the 'greatest BW interest has so far been attached to a few pathogens that include yellow fever virus'. The report points out that this virus is 'a standardised BW Agent' and is known as 'Agent OJ'. |
| 50 | 7.1.50 | -do- | The Committee have been informed as follows: (a) there are several advantages in the use of arthropods like mosquitoes as carriers of biological warfare agents like viruses; (b) biological warfare agents can be sprayed from aircraft but they have to be inhaled |

to be effective; (c) again, these agents may be destroyed by heat or rain and the sun's ultra-violet radiation and winds may throw them off target. These drawbacks, the Committee understand, can be remedied by using mosquitoes and other insects as carriers. The Committee also learn that as long as the virus is carried by the mosquito, heat or rain will not affect it; secondly, that as mosquitoes bite, the biological agent is capable of being inducted directly into the blood through the skin. The SIPRI Report also points out that 'the use of anthropod disease vectors such as infected mosquitoes' is one way of securing 'percutaneous effectiveness from bulk-dissemination of BW weapons'. According to this Report, arthropod disease vectors in biological warfare can increase area coverage because each 'infected arthropod is a minute self-dispersing weapon'.



| | | | |
|---|---|---|---|
| 51 | 7·1.51 | -do- | The Committee also find from the Report of the UN Consultant Experts that 'extraneous factors influence the behaviour of CB weapons to a far greater extent than they do any other kind of armament. Some such factors are wind and rain but these to an extent can be evaluated quantitatively. Others which reflect the general ecological situation and the living conditions of physiological state of the population exposed to the effects of the weapons are more difficult to define. This limitation applies particularly to bacteriological weapons. The natural course of infectious diseases shows they are governed by so many uncontrollable factors that the way they develop cannot as a rule be foreseen. This would also be probably true pathogenic agents which were deliberately dispersed. On the other hand the knowledge gained through the study of |

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| | | | the epidemiology and in the study of artificial dispersions of bacteriological agents both in the laboratory and in the field had shed some light on some of the factors concerned.' |
| 52 | 7.1.52 | -do- | Since the use of mosquitoes in biological warfare would be possible only if their behaviour, habits, dispersal and ecology are known beforehand, the Committee are of the opinion that it is precisely this information that is becoming available to the US Government from the GCMU experiments. This has also been clearly brought out in the Report of the UN Consultant Experts. The Director General, Health Services has also admitted during evidence that 'the possibility is definitely there that the knowledge gained by genetic control—how the lease takes place, how far the mosquitoes go, how long they survive, what is their biological behaviour—this knowledge can certainly be used for putting virus into these mosquitoes and starting a focus of disease like yellow fever in that area'. |
| 53 | 7.1.53 | -do- | From the foregoing paragraphs, it would be evident that there is sufficient substance in the suspicions first raised by the PTI new item and the subsequent fears expressed in Parliament. The Committee feel that the connection between mosquito dispersal and biological warfare is far too obvious to be ignored. |
| 54 | 7.1.54 | -do- | No doubt, it can be argued that the results of any scientific experiment can be used for both good and bad purposes. In rea- |

lity, however, the Committee find no evidence to show that the Ministry of Health or the Indian Council of Medical Research had taken all precautions to prevent the possible misuse of the GCMU experiments. The Committee are extremely distressed to find that the yellow fever threat and the biological warfare implications of the GCMU Project had been realised by the Ministry of Health only after the enquiry by the Committee was set in motion. All the safeguards now proposed, like the establishment of an independent monitoring body, transfer of the administrative control of the project to the Director General, Indian Council of Medical Research, the appointment of the Project Leader only with the approval of the Government of India, etc. is tant amount to locking the stable after the horse has been stolen! The fact remains that, under the agreement, during the six years when the project has been in existence, valuable primary data on the ecology and behaviour of mosquitoes have passed on to the United States.



| | | | |
|---|---|---|---|
| 55 | 7.1.55 | -do- | A further argument that could, perhaps, be advanced by the votaries of the Project, is that the GCMU experiment has been conducted only in collaboration with a premier international health organisation and the civilian Public Health Service of the United States. The Committee, however, are unable to accept this contention. As has been already pointed out earlier, the World Health Organisation was the collaborator only in a formal sense and the entire project has been financed by the United States of America. According to the agreement between the WHO and the National Communicable Diseases Centre of the United States Public Health Service, the |

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| | | | patent rights of inventions or improvements arising out of the Project are to rest with the United States. |
| 56 | 7.1.56 | -do- | There is also enough published evidence on the link between the United States Public Health Service and the US Biological Warfare Research Centre at Fort Detrick. According to the information furnished to the Committee by Shri Raghavan, the United States Public Health Service—the prime collaborator in the GCMU Project—Cooperated in a study of experimental epidemiology of coccidioidomycossis, an infectious fungal disease. The USPHS is also stated to have received more than 380,0000 dollars in funds transferred from the Army General Corps which, according to the SIPRI Report, has the responsibility for coordinating the chemical and biological warfare programme of the US Navy, Army and the Air Force. The Committee have also been informed by Shri Raghavan that the London Conference on CBW, in 1968, revealed that the USPHS maintains a close liaison with Fort Detrick. Under these circumstances, it is likely that the ultimate and only beneficiary of the GCMU experiments is the US' military machine. |
| 57 | 7.1.57 | -do- | The Committee cannot but feel that the entire GCMU Project has been ill-conceived and is of no utility whatsoever to India. The benefits, if any, that are likely to occur to India are also not immediate but only potential. On the contrary, the project is of far |

greater importance to any country which might want to develop an effective Biological Warfare system. As has been pointed out by an entomologist, who wishes to remain anonymous, genetic control is not an alternative to insecticidal control of vectors. The entomologist also points out that the applicability of the genetic method is limited as it can work only against an isolated mosquito population. Dr. Rajendra Pal, the WHO Vector Biologist, himself has pointed out in an article that the genetic method will only be 'as an adjunct to other methods, e.g. to eliminate the few insects that remain after insecticidal application'.

58 7.1.58 -do- The opinions expressed by other experts in this regard are also revealing. Dr. G. Davidson, in his book on 'Genetic Control of Insect Pests' (1974) states: 'Passing from small pilot project to large scale application is largely wandering into the realms of the unknown at this stage in the development of genetic control methods.... To many people the extension of such techniques to the control of insects with a known high rate of increase is inconceivable especially where such insects are spatially continuous over large areas.'

59 7.1.59 -do- According to Dr. R. G. Scholtens, 'we now know that field trials which test the effect of genetic factors on natural populations can be conducted only in isolated ecological localities if they are to provide data on the effect of releases on population densities. And we know that the value of genetic control of mosquitoes is large but still only potential'.

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| 60 | 7.1.60 | -do- | The Committee observe that Dr. Ramachandra Rao himself has demolished the much publicised thesis behind the Sonepat experiment of the GCMU for the control of aedes aegypti. Dr. Rao had stated during evidence that 'if we develop a genetic control technique specifically for an island, it has no practical importance' and that 'if genetic control is to be appliable to India', it should not be done in 'isolated islands'. The fact, however, remains that Sonepat is an 'islad inland' since the Committee have been informed in the sense that aedes aegypti from Sonepat do not leave the town nor are there surrounding colonies of aedes that can migrate to Sonepat. This isolation of the species was the reasons given by the GCMU for the choice of Sonepat. The Committee, therefore, find that by Dr. Rao's own yardstick, the Sonepat experiment will not be applicable to India as a whole. |
| 61 | 7.1 71 | -do- | The Committee note that Dr. Rao had also stated that the specific details of work in connection with the particular species (aedes aegypti) cannot be applied to another species. He had also stated that the findings of a study on how a mosquito behaves in one locality cannot be used for areas just 15 miles away. Under these circumstances, the Committee are unable to understand the rationale for the genetic control experiments in India. What causes greater concern to the Committee is the fact that the Ministry of Health and the Indian Council of Medical Research should be expending their |

| | | | |
|---|---|---|---|
| | | | energies in a project of little or no utility, disregarding the more urgent problem of controlling malaria, whose incidence is once again alarmingly on the increase, and filaria, in respect of which even surveys have not been completed during the past 19 years, by more practical measures. |
| 62 | 7.1.62 | -do- | The final picture that emerges from the foregoing narration is frightening in its implications. The Committee view with serious concern the fact that India had been chosen for experiments that have a vital and direct bearing on biological warfare, which have been banned in other countries. The Committee find that small scale studies on genetic control of mosquitoes in an isolated small village, Okpa, in Burma had been discontinued. The Committee also understand that a similar unit on aedes aegypti had been expelled from Tanzania within a few months. The Committee are unable to understand why the Ministry did not investigate the reasons for the discontinuance of the project in these places. |
| 63 | 7.1.63 | -do- | The Committee find that Dr. Ramachandra Rao, who initially voiced his concern over the administrative and technical aspects of the GCMU changed his view on being appointed as WHO consultant. The Committee note that Dr. Rao had been paid a tax-free salary of US dollars 1200 per month plus a daily allowance of US dollars 20 for the first 60 days and about Rs. 107 per day subsequently, during his tenure as a WHO short-term consultant. It is also sifinificant to note that no other officer had been appointed as Officer on Special Duty after Dr. Rao. |

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| 64 | 7.1.64 | -do- | The Committee are also surprised to note that expenditure on the meeting of a Consultative Committee appointed by the Government of India to consider revised strategies in the malaria programme had been incurred by the World Health Organisation. The Committee are unable to accept the explanation offered by the Ministry for the WHO financing the conference and consider this an unhealthy practice in view of the fact that it might place Indian officials in an embarrassing and compromising position and show them in a poor light. The Committee desire that this should be discontinued forthwith. |
| 65 | 7.1.65 | -do- | After an examination of various aspects of the GCMU Project, the Committee cannot help coming to the conclusion that the manner in which the entire project has been handled by the Indian authorities is thoroughly unsatisfactory. As has been recommended in a subsequent paragraph, the Committee desire that the part played by the various officials in the administration of the Project should be thoroughly investigated by an independent commission. |
| 66 | 7.1.66 | -do- | The Committee are of the view that the answers to a number of intriguing questions about the GCMU Project could, perhaps, be available with Dr. Rajendra Pal of the World Health Organisation who has been associated with the Project since its inception. It is surprising that the Government of India are not aware how |

| | | | |
|---|---|---|---|
| | | | he had been selected for the WHO assignment. Yet his appointment in the WHO had been approved by the Government. The Committee also understand that his lien in the Government of India had also been retained for as long as twelve years. Since the placement of Indian Government officials in foreign organisations must be governed by well-defined rules and policies, if there had been any deviations in the case of Dr. Rajendra Pal, the Committee would like to know the detailed justification therefor. What is even more distressing to the Committee is the information given by Shri Raghavan that Dr. Pal had been permitted to resign his Government of India post in October 1974. The Ministry have neither confirmed nor denied this. The Committee would await a further detailed report in this regard. |
| 67 | 7.1.67 | -do- | In view of the far-reaching implications of the Genetic Control of Mosquitoes Project and the number of interesting possibilities that have been opened during the course of examination by the Committee, the Committee recommend that the Government should appoint a Commission, consisting of experts drawn from various scientific fields, unconnected either with the Ministry of Health or the Indian Council of Medical Research, to enquire immediately into the working and objectives of the GCMU. Officials of military intelligence should also be associated with the enquiry. Meanwhile, the project should be held in abeyance. In any case, the agreement that expires on 30th June 1975 should not be renewed. |
| 68 | 7.1.68 | -do- | Yet another research project that has caused a serious concern to the Committee is the study on the possibilities of dissemina- |

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| | | | tion of arthropod borne viruses by migratory birds conducted by the Bombay Natural History Society in collaboration with an explicitly military organisation of the United States of America, the Migratory Animal Pathological Survey (MAPS) and the Smithsonian Institution, which has also worked for the US Army in identifying suitable areas for chemical and biological warfare tests. |
| 69 | 7.1.69 | -do- | The implications of the BNHS Bird Migration Study for the development of a biological warfare system are far more direct and evident than the GCMU. In this case, the Committee find that the Bombay Natural History Society had directly signed an agreement with MAPS, a wing of the US Army. It has also been admitted by the Ministry of Health that blood smears on slides had been sent by the Society to MAPS in Bangkok during 1967-68. The Committee also find, from the Interim Report on the activities of the Bombay Natural History Society's Bird Migration Study Project from 1959 to 1972, that the majority of blood samples and actoparasites were sent to MAPS for study. In one of his letters dated 17th October 1969 to Dr. Ramachandra Rao of the Virus Research Centre, Poona, Dr. Salim Ali of the BNHS had also admitted that the technical results of the work conducted in collaboration with MAPS were not available with the Society and that in so far as the Society was concerned, once the ectoparasites collected from birds had been sent to MAPS, it was 'usually the last' they 'hear of the material'. This, in the opinion of the Committee, is a shocking state of affairs |

| | | | |
|---|---|---|---|
| | | | in view of the far-reaching implications of the Bird Migration Study for biological warfare. |
| 70 | 7.1.70 | -do- | Dr. Jayaraman of the Press Trust of India informed the Committee that the military significance of migratory birds lies in the fact that they take predictable routes and arrived at predictable times at predictable places, and that birds can carry viruses in their blood or on the mites and ticks that harbour themselves on the birds. |
| 71 | 7.1.71 | -do- | The Committee also observe from the SIPRI Report that 'the various Army and medical research units of the Navy studying bird migrations and local infectious diseases in the Middle East and Far East' have contributed to the chemical and biological warfare research and development programme. The SIPRI Report also points out that when the US Army tested their BW weapons in the Pacific in the 1960s, the Army conducted, with the help of Fort Detrick, preliminary studies to find out if migratory birds would carry the BW agents away from the test zones into populated areas. |
| 72 | 7.1.72 | -do- | Earlier collaborations between the Bombay Natural History Society and the World Health Organisation, Virus Research Centre, Poona and the Smithsonian Institution give rise to serious doubts about the objectives of such research sponsored by foreign institutions. The Bird Migration Project had been carried out in collaboration with the World Health Organisation from 1959 to 1967. The Committee learn from Shri Raghavan of the Press Trust of India that the World Health Organisation had sent four copies of the |

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| | | | BNHS-WHO report on the bird migration studies to MAPS. It has also been stated that Dr. Jayaraman himself had seen a copy of a letter addressed in this regard by the Geneva headquarters of the WHO to Elliot Mclure of MAPS. The Ministry of Health have also admitted that they do not have a copy of the BNHS-WHO study. |
| 73 | 7.1.73 | Ministry of Health & Family Planning (Deptt. of Health)<br>Ministry of Defence | Even though there were military overtones in the BNHS project were explicit, the Committee are concerned to note that the Ministry of Defence had cleared the collaborative project with MAPS in 1967 merely on a 'technical point' had not considered it necessary to examine and evaluate why the US Army and its wing MAPS were interested in the bird migration project. Apparently, the Ministry had not realised that any grant from any Wing of the US Department of Defence is always provided only with a military objective. This policy has also been admitted by the United States Department of Defence itself as is evident from the Mansfield Amendment to Section 203 of the Act on 'Military Appropriation for Research and Development', according to which 'none of the funds authorised by this Act may be used to carry out any research project or study unless such project or study has a direct and apparent relationship to a specific military function or operation'. |

| | | | |
|---|---|---|---|
| 74 | 7.1.74 | Ministry of Health & Family Planning (Deptt. of Health) | The Committee therefore desire that the existing procedures should be thoroughly reviewed and tightened up with a view to ensuring that all such projects which are conducted in collaboration with foreign military or para military organisations are thoroughly evaluated, and screened for possible threats to the country's security before they are cleared. |
| 75 | 7.1.75 | -do- | The Committee also observe that according to an understanding with several governmental agencies at the time the BNHS-MAPs Project was cleared by the Ministry of Defence, any project which had any defence sensitivity should be channelled through the Ministry of Defence. The understanding in this particular case was that any project that was referred from the United States ARPA—Advanced Research Projects Agency—of the United States should go-through. The Committee would like to know if this arrangement still continues ARPA according to "New Scientists" (August 8, 1974). If so, in view of the fact that ARPA is an alite group of civilian scientists conducting high risk research and development of a revolutionary nature in areas where defence technology in the US appears to be falling behind or in areas where the US cannot afford the risk of falling behind'. The Committee therefore desire that the Ministry of Defence should review whether any risks are involved in the projects being routed through ARPA. The Committee consider this to be important since they understand that ARPA had financed a GOMU-like Project in Burma in 1967 and had been responsible for evolving a herbicide warfare programme under the guise of food technology research. The Com- |

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| | | | mittee have also been informed that within ARPA is a project called 'AGILE', which is a counter-insurgency research programme responsible for opening up limited warfare technologies. |
| 76 | | 7.1.76 | Ministry of Helh & Family Planning (Deptt. of Health) | In view of the biological warfare implications of the bird migration studies brought out in the foregoing paragraphs and considering the fact that a similar MAPS-sponsored bird migration study in Brazil had been brought to an end by exposure in the American press, the Committee desire that the Ministry of Defence should investigate this project in detail immediately with a view to ensuring that no malafides are involved. |
| 77 | | 7.1.77 | -do- | Te Committee also note that blood samples of migratory birds had also been sent by the BNHS to the Institute of Diseases with Natural Foci, Omsk, USSR, upto 1966. The Committee would like to know whether the results of the study of the blood samples had been made available to the Government of India and the nature of the collaboration between the BNHS and the IDNF, Omsk and its objectives. |
| 78 | | 7.1.78 | -do- | Two other foreign-sponsored projects which have come to the notice of the Committee alst merit notice in view of their importance in biological warfare techniques. The first is the WHO sponsored Ultra Low Volume (ULV) Spray experiments for urban malaria |

| | | | |
|---|---|---|---|
| | | | control being conducted at Jodhpur and the second is the PL 480 financed study on Microbial Insecticides at the G.B. Pant University of Agriculture and Technology, Pantnagar. |
| 79 | 7.1.79 | -do- | The Committee find that an ULV Spray machine obtained from the US under PL 480 funds is being used to spray malathion insecticide for malaria control. The Committee understand that the ULV technique is an acknowledged method of spraying acrosols of biological warfare agents. According to the SIPRI Report, 'improvements in agent dissemination technology have a high, perhaps the highest priority in CBW programme.' |
| 80 | 7.1.80 | -do- | The SIPRI Report goes on to say that 'weather is critical to the performance of many types of CB weapons. Maximum effectiveness thus depends on ability to predict or measure prevailing weather conditions and to exploit the air streams occurring over the targets. The particle size in which the payload of the CB weapon is disseminated is also critical. Efforts to improve aerosol generating techniques are presumably a prominent feature of the large area incapacitating weapon systems'. The Committee find that the UN Consultant experts on CBW had also observed that most pathogenic agents are highly vulnerable to environmental stress such as temperature, solar radiation, humidity, etc. and that 'the inactivation process of BW agents which is governed by several factors are now the subject of acrobiological research'. |
| 81 | 7.1.81 | -do- | In this context, the ULV spray experiment at Jodhpur raises the interesting question whether this is also only a covert |

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| | | | attempt at aerobiological research. The Director General, Health Services had also admitted during evidence that 'theoretically the possibility of using the ULV machine for purposes other than the spraying of insecticides, for which it is primarily meant, as an aerosol for spreading virus or bacterial infection is definitely yes'. The Committee, therefore, desire that, in view of the possibility of the misuse of the experiments, the project should critically scrutinised and evaluated in all its aspects and necessary safeguards adopted. |
| 82 | 7.1.82 | -do- | The Committee also find that Jodhpur had been selected for the ULV spray experiments out of Kota, Bikaner, Ajmer, Jodhpur, Ahmedabad, Baroda and Broach considered for trial, as it had the highest incidence of malaria and the State Government had also agreed to provide the man-power and transport facilities. It is not, however, clear to the Committee why only seven towns in Gujarat and Rajasthan had been considered for the trials. The Committee would like to know whether other state governments had been approached for affording the facilities. |
| 83 | 7.1.83 | -do- | The Committee have been informed that it is now proposed to shift the experiments from Jodhpur to Ajmer. The Committee are unable to understand the rationable for this especially in view of the fact that the incidence of malaria in Ajmer in 1974 was only 864 cases as against 35,979 cases in Ahmedabad. The Committee would, |

| | | | |
|---|---|---|---|
| | | | therefore, like to be informed of the circumstances leading to the selection of Ajmer for the experiment and on what considerations this decision has been taken. |
| 84 | 7.1.84 | -do- | The object of the studies on microbial pesticides at Pantnagar is to experiment on biological control of insects and pests through parasites and predators. The Committee understand that the microbial pesticides require microcapsules for encapsulating the viruses and according to the SIPRI Report, micro-encapsulation is a technique for wrapping microscopic particles in individual protective coatings. This technique is used by germ warfare experts to protect the BW agents from sunlight, etc. and to preserve the viruses in an easily usable form for a long time. In this context, the SIPRI Report points out that microbial pesticide research 'provides information on the feasibility of disseminating microencapsulated BW agents'. The Report states that 'pesticide research is likely to continue providing impetus to the CB weapon programme' and adds that 'the possibilities of spin off into CB technology from such activities are obvious enough.' The Committee desire that this project should also be evaluated immediately by an expert body. Such an evaluation, in the opinion of the Committee, is absolutely neecssary in view of the revelations brought out in the GOMU Project and the BNHS Bird migration studies. |
| 85 | 7.1.85 | -do- | From the information furnished by the Ministry of Health, the Committee find that the Indian Council of Medical Research has two other projects—'Human Biology Studies on Differential Tissue' |

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| | | | and 'Conducted Study on Infective Hepatitis in India'—which have again been sponsored by the Office of Naval Research, USA. Similarly, a grant for the purchase of equipment and laboratory supplies, which are not available in India, for a project on 'the Relative Role of Cardiac Effects in the Regulation of Cardio-vascular Functions' in the Vallabhbhai Patel Chest Institute, has been given by the US Air Force, through the European office of the Aerospace Research, Bhussels, Belgium. The Committee fail to understand the why such collaborations with the US Navy and Air Force in these studies and have been permitted. |
| 86 | | 7.1.86 | -do- The various projects that have been examined by the Committee in the foregoing paragraphs raise the basic question about the way scientific activities and related research are sponsored and run in the country. What causes great concern to the Committee is the absence of any explicit policy frame and a well-defined institutional mechanism within the Government for reviewing projects, in sensitive areas and fields, of high scientific or technological content, promoted and/or actively participated in by foreign agencies. The Committee use the term 'sensitive areas or fields' not merely in the narrow sense involving military installation or military information, but in an all-embracing sense. The Committee, therefore, recommended that the following urgent steps should be taken by Government: |