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SUMMARY REPORT OF THE INTERNATIONAL SYMPOSIUM ON VECTORS AND VECTOR-BORNE DISEASES

Vector-borne diseases constitute a formidable group among the communicable diseases. According to the latest report of the World Health Organisation[1] infectious and parasitic diseases accounted for about 32 per cent or over 16 million deaths in 1993. More significantly, in the developing countries they contribute to 41.5 per cent of mortality and to over 99 per cent of global deaths. Malaria is the third most important killer disease with over two million deaths while leishmaniasis, dengue/dengue haemorrhagic fever, Japanese encephalitis, lymphatic filariasis continue to be serious problems in the developing countries.

In India most of the vector-borne diseases remain endemic and are major public health concerns. Malaria is still rampant and is fast spreading with rapid deforestation and urbanisation which have resulted in a disturbance in ecological settings of the vector. Both dengue and dengue haemorrhagic fever have registered a rise in rural as well as in urban India. Leishmaniasis is a serious cause for concern, particularly in Bihar and parts of West Bengal, while the national programme for the control of filariásis has not yielded the desired results. The lack of effective drug(s) or a vaccine coupled with the increasing incidence of resistance shown by both the parasite and the vector, vector control is increasingly being recognised as the method of choice for the control of these killer diseases.

Recognising the need to critically look at the magnitude of the problem in a large country like India, the International Symposium on Vectors and Vector-borne Diseases was organised by the National Academy of Vector Borne Diseases at The Regional Medical Research Centre (RMRC), Bhubaneswar, during November 12-15, 1994. The major objectives of the symposium were : (i) to take stock of the ongoing research in all the major vector-borne diseases; (ii) critically look at the present strategies of control and evaluate their effectiveness; (iii) share experiences with other researchers working in various parts of India and abroad in these areas; and (iv) formulate meaningful and feasible recommendations for the control of the vector-borne diseases in India, and other developing countries.

Summary of Presentations

The four day symposium was attended by over 146 scientists from 40 different institutes in India and abroad. Papers presented at the symposium covered aspects such as epidemiology, chemotherapy, immunology, biotechnological considerations, vector biology and ecology, and control measures for malaria, filariasis, leishmaniasis, arboviral

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diseases, plague and other vector-borne diseases of man and animals.

Malaria

The symposium took note of the fact that malaria has returned as a major public health scourge causing enormous loss to the economy and health of people of India. Malaria was nearly controlled in the 1960s with DDT spraying. Now it remains endemic with as much as 9 per cent of the vector population refractory to insecticide spraying. There are persistent transmission foci of the disease all over India, particularly in the urban areas.

While there was a resurgence of malaria in the 1970s as evident by its appearance in areas at one time freed of the disease by the National Malaria Eradication Programme (NMEP), it was not given sufficient notice. In 1976 an epidemic situation resulted with the disease returning with over 6.5 million cases. In 1977, the eradication strategy was replaced by control under the modified plan of operation, prioritizing control objectives. In high risk areas spraying was restarted resulting in an initial decline in the incidence of malaria stabilizing at about two million cases. Forty per cent of these cases are due to *Plasmodium falciparum,* a dangerous parasite responsible for deaths due to malaria. Seen in the background of changing malaria profile, return of malaria has its own characteristic features involving vector, parasite, host and the environment, establishing new malaria paradigms. This is facilitated by failures of control measures due to blunted control tools aided and abetted by poor understanding of the malaria transmission dynamics. Malaria control now requires new approaches and targets, selective and sustainable vector control, strengthening of health delivery systems at the periphery, and rapid absorption of new environment-friendly technologies into the National Malaria Eradication Programme.

Other presentations on malaria included investigation on developing immunogens against ring-infected erythrocyte surface antigen (RESA) of *P. falciparum,* establishing community demand for insecticide-impregnated mosquito nets in rural Orissa and a report on knowledge, attitude and practice (KAP) regarding malaria in tribal areas of Maharashtra and some desert villages of Rajastan. That only 4.36% of the respondents in Maharashtra were aware of the fact that malaria is transmitted with the bite of mosquitoes once again shows that literacy and awareness are also critical factors for any effective malaria control programme.

Filariasis

A major presentation was on the advances in chemotherapy of lymphatic filariasis with diethyl carbamate (DEC) and ivermectin separately and in combination. There were also presentations on the natural history and dynamics of the disease, new diagnostic tools, drug targeting models, promotion of demand for safe methods to control the disease like the use of insecticide-impregnated mosquito nets in tribal belts of Orissa and an overview on the present status and future of the national filariasis control strategies.

Leishmaniasis

Many aspects of this disease were discussed like immuno-adjuvant activity of positively charged liposomes towards *Leishmania donovani* promastigote antigens, electron transfer system of *L. donavani* promastigotes, characterisation of isoenzyme banding patterns of post-kala-azar dermal leishmaniasis (PKDL) with respect to *L. donavani* and *L. tropica,* carbamyl phosphate synthetase II from *L.donavani* and cultivation of virulent *L.donavani* promastigotes in a simplified media.

Arboviral diseases

A senior WHO official shared the experience of his group on the new trends in the integrated control of dengue/ dengue haemorrhagic fever (D/DHF) particularly in the light of global resolution on the prevention and control of this disease. New findings on entomological studies and the insecticide susceptibility of vectors of D/DHF - *Aedes aegypti* and *Culex quinquefasciatus* from Bikaner and Jalore, West Rajastan were also presented and discussed.

Vector biology and control

Results on several newer class of chemicals and insect growth regulators like triflumuron were presented. The symposium was also informed that this insect growth regulator, known for its larvicidal activity, can also be used as an adulticide. There were presentations on the natural history of the vectors of malaria, filariasis and leishmaniasis, mechanisms of drug resistance by these vectors and parasites, efficacy of spraying of insecticides, biopesticide formulations as well as other biological control methods. Many experts also felt that the successful future vector control strategies would be a judicial combination of both biological and conventional control methods.

After a brain storming session of experts from India and abroad, there was a general consensus that control of vector-borne diseases should receive highest priority from the Government. The symposium also made the following recommendations:

General Recommendations

1. For each of these vector-borne diseases, a National Control Strategy should be refined and/or developed and implemented taking into consideration recent experiences, ecological changes, technical developments and newer tools.

2. The system of surveillance and reporting of vector-borne diseases like leishmaniasis, dengue and JE needs to be improved to obtain reliable and accurate national level data for building a health management information system to monitor seasonal and annual variations which will facilitate planning strategies for their prevention and control. This activity needs to be independent of their control programmes and laboratories/ centres engaged in such activity should be networked.

3. The Government of India may be approached for an increase in the technical support for diagnosis, management and treatment of re-emerging diseases by means of well equipped reference centres, manned by well trained staff. Regional referral centres may be identified and strengthened for effective diagnostic and monitoring services.

4. The State Governments should ensure competence and preparedness of the surveillance component of health infrastructure in order to forecast epidemics and ensure the capability of health organisations in containing outbreaks in the shortest possible time. Regional coordination committees and national level networking with an apex centre for each disease may yield better results.

5. Training programmes of various health personnel should be reoriented to include adequate coverage on the emerging diseases.

6. The World Health Organisation and other international agencies may be requested to assist India to develop strategies for the prevention and control of resurging diseases.

7. In the light of the recent epidemic of plague, the symposium strongly recommended the revival of research on effective methods of rodent control as well as improved methods of monitoring density of rat fleas and their control, in addition to studies on resistance to commonly used insecticides.

8. The symposium appreciated the commendable progress made in the guinea worm eradication programme and expressed its support for its complete eradication.

9. In view of growing resistance of vectors to the commonly used insecticides like DDT and BHC, the symposium recommended the use of alternative insecticides including synthetic pyrethroids which are under the process of registration for public health use in India. Some recent studies have successfully demonstrated the usefulness of synthetic pyrethroids in resistance management among vectors and for self-protection measures (to be adopted and regularly used by the host) like impregnated bed nets and other material. Studies may be carried out to assess the feasibility of using these tools for managing vector-borne diseases in field conditions.

10. In view of the introduction of newer insecticides, the cost effectiveness, social acceptance and safety aspects of vector control measures should be evaluated in different settings. Personal protection measures requiring positive health action on a day to day basis need to be investigated for pin pointing areas for effective health education.

11. Research Institutes/Centres within the Indian Council of Medical Research have shown great potential for various R&D activities relating to vector biology and control of vector-borne diseases like malaria, filariasis, leishmaniasis, JE and dengue. These Institutes/Centres should be adequately supported to undertake such activities including basic research, development of diagnostic tools, and training. A mechanism may be evolved where the State Governments may suitably interact and utilize the expertise available at these Centres.

12. Reorientation programme for in-service personnel may be taken up to inculcate knowledge regarding newer control measures, diagnostic techniques and strategies for vector control management. Health education campaigns may be mounted to transfer skills and knowledge to the general public regarding various vector-borne diseases and their prevention. The symposium reiterated the need for community participation at various stages of vector control, starting from its

inception and people should be made active participants in the management of their health programmes.

Specific Recommendations

Malaria

1. In the context of the deteriorating malaria situation, a fresh look must be taken at the existing strategy.
2. Research on malaria should receive increasing support by the Government and wherever needed assistance by international bodies/agencies be sought to collect factual data and to develop measures to overcome vector resistance to insecticides and parasite resistance to drugs and to study the associated social and cultural variables to facilitate better management of malaria.
3. It is recommended that in selected areas, biopesti-cides, environmental control methods and neem oil should be properly tested on a large scale trial basis by more than one organisation before introduction into the national control programmes. Different ecological zones should be included in these trials, spanning over a period of 3-4 years. These evaluations should include epidemiological assessment of the efficacy of these newer tools.

Filariasis

1. The existing national filariasis control strategy should be carefully analysed and reviewed, taking into consideration guidelines available from global level strategies, especially the use of DEC fortified salt and the new modified DEC regimens.
2. Recognising that vector control alone does not reduce disease morbidity of filariasis at least for some years, newer vector control tools may be evaluated for their impact upon disease incidence. These newer tools include biopesticides, expanded polystyrene beads, pyrethroid impregnated nets, *etc.* These trials should be properly planned and have to be of prolonged duration covering 8-10 years period to register any changes in the incidence of filariasis in children.

References:

1. *The World Health Report 1995 - Bridging the Gap.* The World Health Organisation, Geneva, 1995

This report has been prepared by Dr A.P. Dash, Assistant Director, Regional Medical Research Centre, Bhubaneswar and Dr. K. Satyanarayana, Deputy Director-General, ICMR Headquarters.

ABSTRACTS

Some Research Projects Completed Recently

Phase I trials on intralesional recombinant interferon gamma in leprosy patients.

The study was carried out on 66 patients with polar lepromatous leprosy or borderline lepromatous leprosy to find out the efficacy of intradermal recombinant interferon gamma (rIFN-γ) and to evaluate the duration, dose and multiplicity of injections required to induce improvement in clinical and histological features and bacillary clearance. The cellular infiltrates were also studied in the biopsies using immunological markers. After completion of interferon treatment *ie* 4-6 days later, the patients were given multidrug therapy (MDT). The MDT was continued throughout the follow up period. Patients in reaction were excluded from the study. rIFN-γ in 100 µl of excipient was injected intradermally into well characterised lepromatous lesions. Contralateral lesions, clinically similar in terms of infiltration and erythema were injected with a similar volume of excipient only as control.

rIFN-γ proved to have potent effects on the lepromatous dermal lesions. It had multiple effects, inducing inflammatory responses akin to delayed type hypersensitivity reaction associated with cell mediated immunity. The lepromatous skin was found to be capable of mounting an immunoinflammatory response. There was no defect in migration of cells nor an irreversible abnormality in the microenvironment of the bacilliferous granuloma.

The studies involving histology, immunochemistry and ultrastructure gave credance to the fact that multiple cellular and molecular events were initiated by rIFN-γ. The skin induration was due to epidermal thickening resulting from keratinocyte proliferation and infiltration of T cells

and young monocytes into the dermis. The predominant lymphocyte was CD4+. Major histocompatibility complex (MHC) class 2 antigens not only increased on macrophages but they were newly induced on hitherto negative keratinocytes. In addition, IP 10, a specific protein induced by IFN-γ was also seen in the skin.

Repeated injections of rIFN-γ resulted in a distinct reduction at 3 weeks of the cutaneous load of organism from 4+ to 5+ to 1+ to 3+. The disposal of bacilli occurred faster in the diffused site compared to nodular sites. The immune induced elimination was rapid and more effective than that observed by antileprosy drugs alone. It was associated with activation of macrophages.

The study thus indicated that rIFN-γ is a powerful biological therapeutic for leprosy. Both improvement of local immunity as well as bacillary elimination were achieved in two thirds of the patients. Further systemic studies are required to establish the power of this agent as an adjunct to MDT in leprosy.

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Publication:

Sivasai, K.S.R., Prasad, H.K., Misra, R.S., Ramesh, V., Wilfred, D. and Nath, I. Effect of recombinant interferon gamma administration on lesional monocytes/macrophages in lepromatous leprosy patients. *Int J Lep 61:* 259, 1993.

Strategy for a possible new vaccine against leprosy — Use of recombinant gene product.

Preparation of monoclonal antibodies to components of the delipidified cell component (DCC) of *Mycobacterium leprae* was undertaken. Hybridoma technology was adopted using spleen cells of DCC immunised Balb C mice and SP_2 O myeloma cell lines and 4 monoclonal antibodies were obtained, showing binding ability to DCC components.

Monoclonal antibodies to delipidified cell components of *M. leprae* were obtained through hybridoma technique and two monoclonals with affinity to 38kDa and 65kDa proteins of DCC have been identified. The other two did not pick up any specific components in the Western blot. One monoclonal helped in distinguishing 65kDa of the cloned protein as being different from the classical heat shock protein (hsp) of 65kDA of *M. leprae*. The monoclonals are not specific but show reactivity to some other mycobacterial components. The monoclonals can pick up antigens in the sera of lepromatous leprosy patients by ELISA as distinguishable from sera of normals or patients of tuberculoid leprosy. Thus the monoclonal antibodies obtained against DCC of *M. leprae* helped in identifying a 65kDa protein as part of the immunomodulatory components.

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ICMR NEWS

The following meetings of various technical groups/ committees of the Council were held:

Meetings of Scientific Advisory Committees of ICMR Institutes/Centres:

National Institute of Nutrition, Hyderabad	June 15, 1995 (at Hyderabad)
Laboratory Animal Information Services Centre, Hyderabad and Food and Drug Toxicology Research Centre, Hyderabad	June 16, 1995 (at Hyderabad)
Centre for Advanced Research in Ocular Infections, New Delhi	June 20, 1995 (at New Delhi)
Joint Meeting of Regional Medical Research Centres	June 27-28, 1995 (at Bhubaneswar)
Central Jalma Institute for Leprosy, Agra	July 12, 1995 (at Agra)

Meetings of Task Forces/Project Review Committees/ Expert Groups held at New Delhi:

Task Force on Management of Glaucoma	June 6, 1995

Project Review Committee for Projects on Non-Communicable Diseases	June 7-8, 1995
Expert Group on Scientometric Studies	July 12, 1995

Participation of ICMR Scientists in Scientific Events:

Dr. R. Prabhakar, Director, Dr. P.R. Narayanan and Dr. C.N. Paramasivan, Dy. Directors, Tuberculosis Research Centre, Madras, visited Russia for 10 days under the Indo-Russian Agreement in the Field of Medical Sciences and Public Health (Problem Area — Tuberculosis) (May 14-23, 1995).

Dr. D.K. Das, Officer-in-Charge, Institute of Cytology and Preventive Oncology, New Delhi, participated in the XII International Cytology Congress at Madrid (May 21-25, 1995).

Dr. V.P. Sharma, Director, Malaria Research Centre, Delhi, participated in the IX General Assembly of the Scientific Committee on Problems of the Environment (SCOPE) at Tokyo (May 28 - June 3, 1995).

Dr. Aurobindo Roy, Asstt. Director, National Institute of Virology, Pune, participated in the International Congress on Hazardous Waste : Impact on Human and Ecological Health at Atlanta (June 4-8, 1995).

Dr. M.D. Gupte, Officer-in-Charge, CJIL Field Unit at Avadi, Madras, participated in the evaluation of the leprosy vaccine trial component of the Karonga prevention study (Malawi leprosy vaccine study) as a member of the Diagnostic Review Team and Data Monitoring Committee at Chileumba (Malawi), London and Cambridge (June 4-23, 1995).

Dr. K.N. Panicker, Dy. Director, Vector Control Research Centre, Pondicherry, participated in the consultation on key issues in dengue vector control towards the operationalization of a global strategy, at WHO, Geneva (June 4-11, 1995).

Dr. Ghafoorunissa, Dy. Director, National Institute of Nutrition, Hyderabad, participated in the II Congress of the International Society for the Study of Fatty Acids and Lipids (ISFAL) at Bethesda (June 7-10, 1995).

Dr. G.V. Satyavati, Director-General, ICMR, addressed the state convention on the launching of the Green Health Movement at the M.S. Swaminathan Research Foundation at Madras (June 8, 1995).

Dr. P.K. Nag, Asstt. Director, National Institute of Occupational Health, Ahmedabad, participated in the XII International Symposium on Night and Shift Work at Ledyard, USA (June 13-18, 1995).

Dr. V.P. Sharma participated in the Neem Training Workshop as a resource person on Neem and Malaria Control at Mblta, Kenya (June 20-21, 1995).

Dr. N.V. Giridharan, Senior Research Officer, Laboratory Animal Information Services Centre, Hyderabad, participated in the International Conference on Frontiers in Laboratory Animal Sciences at Helsinki (July 2-6, 1995).

Dr. B. Dinesh Kumar, Research Officer, Food and Drug Toxicology Research Centre, Hyderabad, participated in the VII International Congress of Toxicology at Seattle (July 2-6 1995).

Dr. G.V. Satyavati participated in the XVIII Session of the Joint Co-ordinating Board of the UNDP/World Bank/WHO Special Programme for Research and Training on Tropical Diseases at Luxembourg (July 3-5, 1995).

Dr. Srikant Tripathy, Sr. Research Officer, National AIDS Research Institute, Pune, participated in a meeting on HIV Vaccine for Developing Countries at Boston (July 10-13, 1995).

COUNCIL'S TRAINING PROGRAMMES FOR 1995-96

Virology

At the National Institute of Virology, Pune:

- Diploma in Medical Virology (June 1995 - May 1996).

Reproductive Biology

At the Institute for Research in Reproduction, Bombay:

- Training Course on Techniques in Immunology, Cell Biology and Molecular Biology (November 2-25, 1995).
- Training Course on Techniques in Neuroendocrine Research (February 6-10, 1996).

Endocrinology

At the National Institute of Nutrition, Hyderabad:

- Annual Training Course on Endocrinological Techniques and their Application (August/September, 1995).

Nutrition

At the National Institute of Nutrition, Hyderabad:

- M.Sc. in Applied Nutrition (June 1, 1995 - February 28, 1996).
- Annual Training Course in Nutrition (December 1, 1995 - February 28, 1996).

Oncology

At the Institute of Cytology and Preventive Oncology, New Delhi:

- Workshop on Molecular Biology of Viruses and Cancer alongwith Oligo DNA Synthesis and Polymerase Chain Reaction (September 18-22, 1995).

Occupational Health

At the National Institute of Occupational Health, Ahmedabad:

- Orientation Course on Occupational Health for Industrial Medical Officers (November 13-24, 1995).
- Training Course on Air Pollution Monitoring and Risk Assessment (December 13-19, 1995).

Medical Entomology

At the Vector Control Research Centre,Pondicherry:

- M.Sc. in Medical Entomology (From August 1995: for 2 years).

Laboratory Animal Technology

At the Laboratory Animal Information Services Centre, National Institute of Nutrition, Hyderabad:

- Training Course for Laboratory Animal Technicians (June - July, 1995).
- Training Course for Laboratory Animal Supervisors (September 4 - November 30, 1995).

Haematology

At the Institute of Immunohaematology, Bombay:

- Training Course in Blood Group Serology and Blood Bank Methodology for Medical Officers (August 1 - September 29, 1995).
- Training Course in Blood Group Serology and Blood Bank Methodology for Technicians (August 1-31, 1995).
- Training Course in Advanced Haematology and Immunohaematology (September 11-29, 1995).

ERRATUM

Article entitled **"AIDS and the Family" November-December, 1994, vol. 24, page 127, para 6, lines 20-24 :** "If for any reason .....bleach solution" should read as follows:

"If for any reason disposable syringes and needles are used, needles should not be recapped/bent/broken/removed from disposable syringes or otherwise manipulated by hand. After use, the syringe with needle and other sharp instruments should be placed in puncture proof containers and incinerated. If the facility for incineration is not available, hypochlorite or other suitable disinfectant should be aspirated into the syringe and then the syringe and attached needle should be immersed in disinfectant solution for 30 minutes".

EMERITUS MEDICAL SCIENTISTS

INDIAN COUNCIL OF MEDICAL RESEARCH

Nominations/applications are invited from distinguished retiring Scientists engaged in research in the field of biomedicine for consideration for appointment as Emeritus Medical Scientists under the Council. Full particulars can be obtained from the office of the Director-General , (Personnel Section), Indian Council of Medical Research, Post Box No.4911, New Delhi-110029. Scientists who have retired or are going to retire upto 31st March, 1996 may apply for the appointment as Emeritus Medical Scientist under the Council.

Last date for receipt of applications is **30th September, 1995**.

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