CSIR – National Environmental Engineering Research Institute, Nagpur

IVPM Training Programme Report

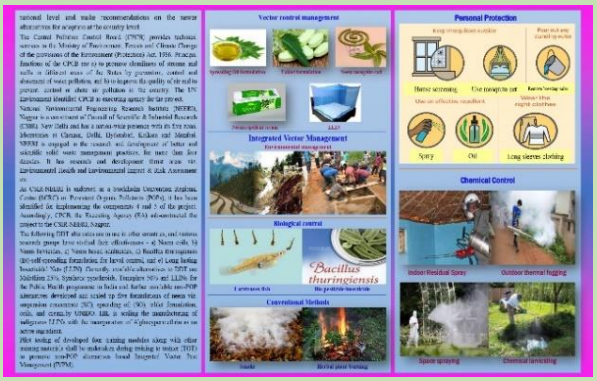
On

Five days Training Programme on Integrated Vector and Pest Management (IVPM) for ToT (SPO, DMOs, DVBDCO/ Biologists and VBD Consultants from Bihar State)

Venue: ***Chandragupt Institute of Management Patna (CIMP), Patna, Bihar***

Date: 21/08/2023 to 25/08/2023

Time: 09:30 AM to 17:30 PM



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List of Abbreviations

BCC	Behaviour Change Communication
Bti	*Bacillus thuringiensis var. israelensis*
CCHF	Crimean-Congo Haemorrhagic Fever
CPCB	Central Pollution Control Board
CSIR	Council of Scientific & Industrial Research
DDT	Dichlorodiphenyltrichloroethane
EC	Emulsifiable Concentrate
FFS	Farmer Field School
GEF	Global Environment Facility
GoI	Government of India
HIL	Hindustan Insecticide Limited
ICMR	Indian Council of Medical Research
IEC	Information Education and Communication
IGRs	Insect Growth Regulators
IRS	Indoor Residual Spraying
IVM	Integrated Vector Management
IVPM	Integrated Vector and Pest Management
JE	Japanese Encephalitis
KFD	Kyasanur Forest Disease
LLINs	Long Lasting Insecticidal Nets
MoCF	Ministry of Chemicals and Fertilizers
MoEFCC	Ministry of Environment Forests and Climate Change
MoEFCC	Ministry of Environment, Forest and Climate Change
NEERI	National Environmental Engineering Research Institute
NIP	National Implementation Plan
NVBDCP	National Vector Borne Disease Control Programme
NCVBDC	National Center for Vector Borne Disease Control
POPs	Persistent Organic Pollutants
RNA	Ribonucleic Acid
SC POPs	Stockholm Convention on Persistent Organic Pollutants
SIT	Sterile Insect Techniques
UNEP	United Nations Environment Programme
VBD	Vector-Borne Disease
WDP	Water Dispersible Powder
WHO	World Health Organization
WP	Wettable Powder
ZIKV	Zika Virus

1.0 Introduction

Stockholm Convention (SC) is an international treaty works for the protection of human health and environment from harmful Persistent Organic Pollutants (POPs). The Government of India (GoI) signed the Stockholm Convention on POPs and the Ministry of Environment, Forests and Climate Change (MoEFCC) was assigned as the National Focal Point. India has committed to fulfilling its obligations under the Convention, prepared its National Implementation Plan (NIP) and submitted it to the Secretariat of the Stockholm Convention on 21 April 2011. India assured in the NIP, that the development and promotion of non-POPs alternatives to DDT is one of the top priorities that require immediate action. Accordingly, the project entitled "**Development and promotion of non-POPs alternatives to DDT**" was jointly developed by United Nations Environment Programme (UNEP) and United Nations Industrial Development Organization (UNIDO). The project was approved by Global Environmental Facility (GEF) in April 2015 with two GEF implementing agencies *i.e.,* United Nations Industrial Development Organization (UNIDO) and the United Nations Environment Programme (UNEP), which are responsible for supporting delivery of specific project components. Following are the major project components to be implemented under the project:

I. Legislation, policy framework and institutional capacity (UNEP)
II. Alternatives to vector control (UNIDO)
III. Promotion and propagation of new cultivars of Neem (UNIDO)
IV. Development and Promotion of Integrated Vector Pest Management (IVPM)
V. Monitoring and evaluation of results (UNIDO / UNEP)

For components I and IV, MoEFCC has nominated Central Pollution Control Board (CPCB) as a national Executing Agency to look after a partial execution of the project. As per the project document, the other part will be executed by the UNEP Law Division. The components of UNEP prescribe broadly Legislative framework and development, and pilot application of a set of Guidelines for Integrated Vector and Pest Management. UNIDO is working on the development of non-POPs alternatives to DDT viz. Long-Lasting Insecticidal Nets (LLIN), Neem based insecticides, *Bti* based pesticides under its two components.

The Global Environment Facility (GEF) was established to tackle our planet's most pressing environmental problems. The GEF supports countries to build capacity for the implementation

of the Stockholm Convention through Introduction and demonstration of viable, cost-effective and sustainable alternatives to eliminate dependency on DDT and other POPs chemicals.

The United Nations Environment Programme (UNEP) is the voice for the environment and the primary driving force for international activities related to the sound management of chemicals in the United Nations system. The UNEP promotes chemical safety by providing policy advice, technical guidance and capacity building to the developing countries. UNEP Chemicals Branch has the leadership of the Global Alliance for the Development and Deployment of Alternatives to DDT. As such, UNEP is a well-placed partner with other organizations to phase out current use and avoid future practices of DDT use in India.

The Directorate of NCVBDC, central agency responsible for guidelines, policy for prevention and Control of vector-borne diseases in India has been implementing the Integrated Vector Pest Management (IVPM) strategy for effective management of vectors. It recommends Indoor Residual Spray (IRS) and Insecticide Treated Bed Nets (ITNs)/Long lasting Insecticide Net (LLIN) for vector control in rural areas and anti-larval measures in urban areas.

IVPM is a tool for managing vector population to reduce or interrupt transmission of disease. IVPM is a way forward to improve cost-effectiveness, ecological soundness and sustainability of disease vector control. It emphasizes that the insecticides used in the programme must have negligible adverse human health effects, must be effective against the target species, must have minimal effect on non-target species and natural environment and their use must take into account the need to prevent the development of resistance. Key stakeholders involved in the project are the three Ministries viz. Ministry of Environment, Forests and Climate Change (MoEFCC), Ministry of Chemicals and Fertilizers (MoCF), and Ministry of Health and Family Welfare (MoHF&W) whose mandates and roles are given below:

The Ministry of Environment, Forests and Climate Change (MoEFCC) is the nodal ministry for planning, promoting and coordinating environmental programmes including the management of chemical disasters in India. The Ministry is mandated to protect the land, air and water systems and is responsible for the prevention and Control of pollution including hazardous substances. MoEFCC is the GEF and Stockholm Convention focal point in the country, which coordinates activities and cooperation between relevant stakeholders of the NIP.

The Ministry of Chemicals and Fertilizers (MoCF) is mandated to control the production and scaling up of alternatives to chemical pesticides. The Department of Chemicals and Petrochemicals of MoCF is entrusted with the responsibility of policy, planning, development and regulations of chemicals and petrochemicals. The public sector named HIL under the MoCF is involved in the production, scaling up and setting up of the facility for industrial production of the alternatives, viz. production of synthetic pyrethroids, production of Long-Lasting Insecticidal Nets (LLINs), neem-based botanical pesticides and *Bti*-based biopesticides.

The MoHF&W mainly performs advisory role for matters related to public health including vector control programme in the country. The Ministry is responsible for the application, assessment and adoption of alternatives in public health activities; the State Health Departments coordinate and implement the project activities at the respective state level for the evaluation and assessment of newer alternatives to DDT in the field on the target pest; the National Centre for Vector Borne Disease Control (NCVBDC), National Institute of Malaria Research (NIMR) and the National Centre for Disease Control (NCDC) undertake activities at the national level and make recommendations on the newer alternatives for adoption at the country level.

The Central Pollution Control Board (CPCB) provides technical services to the Ministry of Environment, Forests and Climate Change of the provisions of the Environment (Protection) Act, 1986. Principal functions of the CPCB are a) to promote cleanliness of streams and wells in different areas of the States by prevention, Control and abatement of water pollution and b) to improve the quality of air and to prevent, Control or abate air pollution in the country. The United Nations Environment programme (UNEP) identified CPCB as executing agency for the project.

National Environmental Engineering Research Institute (NEERI), Nagpur is a constituent of Council of Scientific & Industrial Research (CSIR), New Delhi and has a nationwide presence with its five zonal laboratories at Chennai, Delhi, Hyderabad, Kolkata and Mumbai. NEERI is engaged in the research and development of better and scientific solid waste management practices, for more than four decades. It has research and development thrust areas viz. Environmental Health and Environmental Impact & Risk Assessment, etc. As CSIR-NEERI is endorsed as a Stockholm Convention Regional Centre (SCRC) on Persistent Organic Pollutants

(POPs), it has been identified for implementing the components IV and V of the project. Accordingly, CPCB, the executing agency (EA) sub-contracted the project to the CSIR-NEERI, Nagpur.

2.0 Training Objectives

At the end of the training programme, the participants should be trained to:

- Describe the vectors and their role in Vector-Borne Diseases, the basic information about vector-borne diseases, how vector-borne diseases are transmitted, transmission cycle for respective vector-borne diseases and global distribution as well as the burden of the diseases in India.
- Define the vector, describe the morphological characteristics of adult and immature stages of mosquitoes and about the biology and ecology of vectors.
- Promotions and development of locally safe, effective, affordable and environmentally sound alternatives to DDT, Environment management methods for vector control: Biological control methods, Genetic control methods, Control of vectors by chemical, non-chemical methods, Natural and conventional vector control management strategies.
- Learn the role of Integrated Vector and Pest Management (IVPM), describe different control measures used to control vectors and pests, learn organization and management of IVM in different sectors including FFS and how IVM improves the awareness in the community through BCC.

3.0 Training Programme

This training programme was conducted for 05 days from 21/08/2023 to 25/08/2023, the total number of the training sessions were 05 and each session has 4-13 training parts. 25 participants from Bihar states were selected including SPOs, DMOs, DVBDCO, Biologists and VBD Consultants participated in the training programme. Dr. Gujju Gandhi, Project Scientist, coordinated all the training sessions. The training content covered from Training module-1: DDT and Vector-borne disease, Training module-2: Vector morphology and bionomics, Training module-3: Alternatives to DDT in vector control management and Training module-4: Integrated vector and pest management developed by CSIR-NEERI under the project "Development and promotion of non-POPs alternatives to DDT."

3.1 Registration

On 21st August 2023 09:15 AM twenty-five participant trainees were registered and training materials *viz.* four training modules, four training booklets, FAQs book, IEC materials, 64 GB pen drive, bag and stationery were provided to them.

4.0 Training Programme Inaugural Function

Inaugural function of the five-day training programme for Training of Trainers (ToTs-SPOs/DMOs, DVBDCOO/Biologists and VBD Consultants from Bihar State) on Integrated Vector and Pest Management was held on 21st August 2023 in Bihar at *Chandragupt Institute of Management Patna (CIMP)*, Patna between 09:30 a.m. to 17:30 p.m. by CSIR-NEERI, Nagpur, Chemical and Hazardous Waste Management Division (CHWMD). Dr. A. Ramesh Kumar, Project Leader and Principal Scientist on behalf of Dr. A. N. Vaidya, Director, CSIR-NEERI warmly welcomed Dr Ashok Kumar SPO on behalf of Sh. Pratyaya Amrit (Chief Guest), I.A.S., Additional Chief Secretary in Health, Bihar; Dr. Rakesh Chandra Sahay Verma (Guest of Honour), Director in Chief (Disease Control), Patna; Dr. Shaukat Kamal (Guest of Honour), Addl. Director, NCDC, Patna Branch, Bihar and Dr. Rajesh Panday, NTD Consultant, WHO. Dr. R. S. Sharma (Ex-Addl. Director, NCDC & NCVBDC); Dr. P. T. Joshi, Former Gujarat State Entomologist; Dr. Ramesh Chandra, former State Entomologist, U.P., Dr. L.J. Kanhekar, Former Jt-Director, NCDC & Former Project Consultant, CSIR-NEERI and all the participant trainees. Dr. A. Ramesh Kumar delivered an introductory speech and briefly introduced about the training programme under the project "Development & promotion of non-Persistent Organic Pollutants (PoPs) alternative to DDT". The project is being funded by GEF-UNEP. India is the sole manufacture of DDT at M/s HIL(India) Ltd. at Rasayani, Dist. Raigad, Maharashtra. DDT has been used in vector control programme, due to the adverse effect of DDT on environment as well as human health various International Agencies like-WHO, UNEP etc. working towards replacing DDT in public health programme with some alternatives. CSIR-NEERI has developed four training modules and several training materials for pilot testing & capacity building of state vector control officials. This is the 12th training program. So far, CSIR-NEERI has completed eleven (11) training programs in a total of 19 states, including 01 U.T. (08 of them in online mode due to Covid-19 restrictions and 03 training programs in offline mode). We have the best expert faculty with us, so with their vast knowledge, we ensure that all the participants will receive more exposure on VBDs, various

control measures, and the alternatives being developed under this project for vector control. Your valuable interaction with experts in this training program will further improve the training modules and be helpful.

Dr. Shaukat Kamal, Addl. Director, NCDC, Patna and Guest of Honour addressed all the participant trainees and express his deep gratitude for being part of such a great learning programme. He also gave a brief introduction of this training programme and its importance for minimizing DDT reliance and malaria eradication & other vector borne diseases. As this is pilot testing, feedback and suggestion from the participants will be vital to make these modules more informative. At the end, he thanked and gave best wishes to all the participants in this training programme (Exhibit-1).

Exhibit-1: Photograph of Inaugural Session

Dr. R. S. Sharma, Former Addl. Director (NCVBDC & NCDC) welcomed the Chief guest, Dr. Ashok Kumar, SPO, Bihar and all the participant trainees of Bihar State. Bihar State has been facing VBDs as Malaria, Kala-azar. He praised all the DMOs, SPOs, & Entomologists of Bihar for their continued hard work and efforts to eliminate VBDs and hope that they will achieve success with this approach. He recommended strengthening active surveillance of any VBDs and abiotic factors which is a challenging task. He also congratulates CSIR-NEERI for their hard work and efforts in the preparation of four training modules. He thanked all the

participants to join this training and suggested to share their knowledge and input with us to make these modules more feasible and understandable.

Dr. Ashok Kumar, SPO, Bihar, has inaugurated this training programme by releasing the training modules to promote non-POPs alternatives based on IVPM. He welcomed all the participant trainees (DMOs/Consultants/ Entomologists) from Bihar State. He also welcomed all the subject experts and CSIR-NEERI team to organised an important training programme. He also discussed about DDT used for Vector Borne Disease control and its long-term harmful effects on environment as well as on human. It is very important to start looking for alternatives to DDT. At the end, he congratulates and wishes to all the participants for the success of the training programme.

Dr. A. Ramesh Kumar (Project Leader and Principal Scientist, CHWMD) on behalf of CSIR-NEERI has expressed his gratitude to the chief guest and other dignitaries. Dr. L.J. Kanhekar has briefly introduced about the objectives of this training programme which includes- training of trainers (ToTs) and Capacity building of trainers and proposed the vote of thanks. (Exhibit-2)

Exhibit-2: Group photo of the inaugural session

5.0 Training sessions

The total training sessions were 5, each session covered 4-13 parts and each part was conducted for approximately 30-40 minutes and the time was managed depending on a questionary discussion at the end of the session. Every session was conducted as per the timetable of the training programme.

5.1 Training session-1 (Day -1: Monday - 21/08/2023)

On the first day (**Exhibit-3**) Dr. Gujju Ghandhi, Project Scientist-II deliberated on the training modules 1 to 4 and their content. He informed that training modules were made available to all the participants inform of module, training booklets, PPT on each module & its content, IEC materials and FAQ's. He deliberated the focus of CSIR-NEERI to develop these training modules for pilot testing of these training modules (1-4). He suggested to all the participants to provide suggestions/ comments to edit for the perfection of training modules.

Exhibit-3: Training Modules 1 to 4

Dr. A. Ramesh Kumar deliberated on DDT and its use in Vector Control and explained Stockholm convention on PoPs, what is DDT; Historical use of DDT; Why DDT needs phaseout; Monitoring study of DDT concentration in Human milk; WHO action plan for the reduction of dependence on DDT in disease vector control; Overview of Stakeholders; Current scenario of DDT production and use in India, State-wise consumption of DDT (2019-2020); Development and promotion of non-PoPs alternatives to DDT and alternatives to chemical pesticides in vector control programme.

A discussion was made on VBD- Japanese Encephalitis by Dr. L. J. Kanhekar and he deliberated on causative agents: a virus (Flavivirus) and J.E. vectors in India, key players in JE transmission: Environment, Vector-Agent, Host (amplifying): Pig, Host carrier: birds & human incidentally; Transmission Cycle of J.E. Virus (Natural transmission, horizontal & vertical transmission); Epidemiology: Epidemic patterns & Endemic patterns; Burden in India (JE endemic states, JE cases & deaths) and global disease burden; Prevention & Control.

Dr. R. S. Sharma has deliberated this training session, a brief introduction about the vector borne disease: Malaria and its impact. Causative agents of Malaria: Plasmodium Parasite (P. Falciparum, P. Vivax, P. ovale, P. malariae) & its life cycle: Asexual & Sexual cycle; transmission of malaria; Vectors: Female Anopheles Mosquitoes (globally more than 70 vectors recorded out of which 9 in India (6- primary & 3- secondary vectors); Host: Human; Current status according to National Strategic Plan: Malaria elimination mode supported by organisation like NCVBDC, NCDC, NIMR etc., as per National framework for malaria elimination cases has been gradually decreasing from 2006 to 2020 approx. 70% decline, Global disease burden and burden in India. He deliberated regarding WHO documentation on Malaria elimination framework for Urban areas

Dr. P.T. Joshi has deliberated on Chandipura virus (CHPV) with its prevalence in India and at global level. Chandipura virus belongs to the genus Vesiculovirus placed in the order of Mononegavirales of Rhabdoviridae family. The vector is female sandfly, Phlebatomus papatasi and Host: Human, other vertebrates, camel, Goat, arthropods etc. He deliberated on outbreaks of Chandipura virus infection, isolation of CHPV and its transmission.

Dr. L. J. Kanhekar has deliberated on Morphology of Anopheline Vector Mosquitoes, mosquito vectors: Anopheles, and Mansonia spp.; Classification of mosquitos; Morphological characters of mosquitoes. vectors of malaria: Anopheles mosquito (Anopheles culicifacies, An. stephensi,

An. fluviatilis, An. minimus, An. dirus (baimai), An. epiroticus); Morphological characters, classification (egg, larva, pupa and adult).

Dr. Ramesh Chandra introduced Crimean Congo Hemorrhagic Fever (CCHF), History of CCHF; Causative agent (Nairovirus of the family Bunyaviridae and vectorHyalomma ticks), Transmission (Transovarial and Transstadial transmission), Epidemiology and major risks factors; Major outbreaks in India and extensive global geographic distribution; Tick life cycle: Egg→ Larva→ Nymph→Adult; H. anatolicum, H. asiaticum, H. dromedarii, H. impeltatum, H. marginatum, H. rufipes and H. truncatum, potential vectors for acquiring, maintenance and transmission of CCHFV- H. turanicum; Controlling CCHF in animals & ticks, Insecticide recommended for the control of ticks (Malathion, Dichlorvos, Carbaryl etc.); Reducing the risk of tick to human transmission, animal to human transmission, human to human transmission.

Dr. B. K. Tyagi has deliberated on Bionomics of Anopheline Vector Mosquitoes: vector biology (life cycle of vector mosquitoes) and ecology (Distribution, breeding places etc.); Vector of Brugian filariasis - Mansonia spp. Mosquito & its external morphology (egg, larva, pupa, adult); Vector biology and Vector ecology.

Dr. Shaukat Kamal, Addl. Director, NCDC introduced Bionomics of Ticks and Mites and its classification; capable of transmitting diseases: mainly Crimean-Congo Hemorrhagic Fever (CCHF), Kyasanur Forest disease (KFD); Type of ticks: Soft ticks and Hard ticks and their lifecycle. Population depends on various factors: climate, hosts, predators & competitors; Introduction of Mites and its Classification; External morphology; Leptotrombidium (vector of Scrub Typhus), Biology and Ecology of Mites; Collection of soft ticks (direct mechanical methods, vacuum collection & CO2 traps), hard ticks (passive, systematic & special collection) & mites (Sherman trap) and their Identification.

On Leishmaniasis (Kala-azar), a lecture had been delivered by Dr. Vijay Kumar (consultant ICMR) and he mentioned: Leishmaniasis (Kala-azar) and its causes: Cutaneous Leishmaniasis, Muccocutaneous Leishmaniasis and Visceral Leishmaniasis & post kala-azar dermal leishmaniasis (PKDL); Causative agent: Protozoa Leishmaniasis (L. donovani- in India only, L. infantum and L. chagasi); Vector: only sand fly vector of kala-azar in India Phlebotomus argentipes; Life cycle within human (Amastigote) and Sand fly (Promastigate/ flagellate), Environment factors: altitude, season, rural areas, development projects; Burden in India and global burden.

5.2 Training session-2 (Day-2: Tuesday-22/08/2023)

On the second day, Dr. L. J. Kanhekar has deliberated on Morphology and Bionomics of Culicine Vector Mosquitoes, mosquito vectors: Mansonia spp.; Classification of mosquitos; Morphological characters of mosquitoes. vectors of malaria; Morphological characters, classification (egg, larva, pupa and adult), vector biology (life cycle of vector mosquitoes) and ecology (Distribution, breeding places etc.); Vector of Brugian filariasis - Mansonia spp. Mosquito & its external morphology (egg, larva, pupa, adult); Vector biology and Vector ecology (**Exhibit-4**).

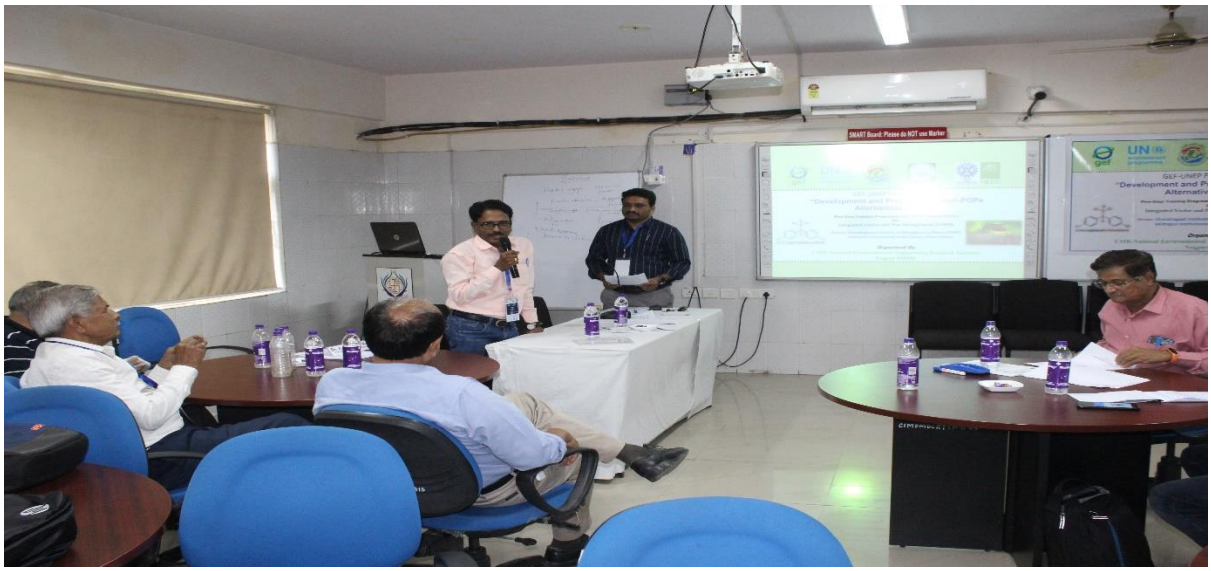

Exhibit-4: Lecture/Discussion on Training session-2

Morphology and bionomics of Sandflies, a lecture had been delivered by Dr. Shaukat Kamal and he deliberated briefly on vector of kala-azar/ Leishmaniasis disease: Causative agent: protozoan parasite; Phlebotomus argentipes only known vector of visceral leishmaniasis or kala-azar in India and Phlebotomus papatasii- vector of cutaneous leishmaniasis for human; Classification of Sand Fly; External morphology; Vector biology: complete life cycle of sand fly in insectarium; Vector ecology: Distribution, Breeding places, resting habits, feeding habit, biting habit, flight range; Types of parasite development (Exhibit-4).

Dr. Himmat Singh, Scientist-D, ICMR-NIMR elaborately explained entomological surveillance of VBDs, entomological parameters and its importance - Methods: detection & monitoring of larval and adult population- Collection of Adult mosquito, Larval collection & Eggs; Methods- Qualitative and Quantitative; Vector Traps for disease surveillance &

Surveillance tools; Sampling methods of larval collection- Netting method (surface collection), Dipping method; Siphoning method (Tree hole), well net collection, Larval collection by dropper/ pipettes.

He also gave brief introduction about Entomological parameters and their importance: Adult vector parameter; Entomological Indices: Malaria vector density; Vector incrimination; Mosquito life expectancy (longevity) etc.; Flea: Total flea index, percentage of hosts infested, Burrow index; Larval Survey: Indicator (Density of immatures), larval density, Pupal density; Dengue Larval survey- a) House Index, b) Container Index, c) Breteau Index, d) Pupae Index; Entomological Survey of Lymphatic Filariasis: Ten Man-hour Vector density, infectivity rate, infection rate, mean number of L3/infective mosquito) (Exhibit-4).

Dr. B. K. Tyagi has deliberated on vector control management Biological and Genetic Control: Introduction to Biological control- Different Biological agents used in vector control: 1) Copepods, 2) Nematode, 3) Flatworms, 4) Fungi, 5) Invertebrate Predators, 6) Anuran Predators, 7) Micro-organism: Bacteria (Bt), *B. sphaericus* & Protozoans, 8) Fish: Larvivorous Fishes (*Gambusia affinis,* guppy *Poecilia reticulata*); NIMR– suitable fish species used in different mosquito breeding habitats; Phytophagus Fish: Cyprinus carpio, Ctenopharyngodon idella, & Oreochromis mossambicus; Desirable attributes of Bio-control agents and Advantages of Biological Control (Exhibit-5).

Exhibit-5: Lecture/Discussion on Training session-2

Genetic Control: Mutagenesis, trans-genesis– gene delivery, Cis-genesis– Gene transfer, Para-transgenesis; Sterile Insect Techniques: 1. Conventional SIT- Sterilization & Irradiation, 2. Translocation of Heterozygotes; 3. Genetic sexing; 4. Cytoplasmic Incompatibility; 5. Hybrid Sterility; Refractoriness to disease transmission; Population replacement using *Wolbachia*; Release of insects carrying lethal gene; Gene Silencing using RNA interference; other genetic approach: gene drive; Advantages & disadvantages of genetic control were discussed.

Dr. P. K. Srivastava, Former Jt. Director, NCVBDC introduced VBDs- Lymphatic Filariasis: Causative agent (Filarial worm: Wuchereria bancrofti, Brugia malayi), Micro Filaria periodicity (Nocturnal Periodicity, Diurnal Periodicity), Transmission and life cycle (in human and mosquito body), Vector: Culex quinquefasciatus, Mansonia annulifera and Mn. uniformis. He also discussed national and global burden of Filariasis, its history in India, salient features of the vector life cycle, elimination of Lymphatic Filariasis, Species of filarial infections prevalent in India, current status of Lymphatic Filariasis in India, Differences between W. bancrofti and B. malayispecies, Filariasis disease manifestation (acute & chronic).

He also gave brief introduction about Equipments for Larviciding and Adulticiding- Equipment used for Larviciding- a) Knapsack pump & b) Hand Compression pump; Equipment for Adulticiding- a) Stirrer pump, b) Fogging machine: Cold and Thermal- i) Portable and ii) Vehicle-mounted; c) Atomizer and d) Finit Pump. During this session, he discussed all the equipment parts, its working and application.

Dr. Ramesh Chandra deliberated on VBD: Scrub Typhus: Its history; Causative agent: a gram-negative, obligate intracellular bacterium Orientia; Vector: Mites genus- Leptotrombidium diliense; Sign & symptoms; Diagnosis & treatment: diagnosis bases on bacterial culture, serology, molecular methods- rapid ICT, ELISA, PCR test; Transmission: Trans-stadial and trans-ovarial transmission; Life cycle of mites: Egg→Larva→Nymph→Adult; Epidemiology & control; prevention & control using topical application of DMP, DEET etc. and burden in India and global.

He also gave brief introduction about Integrated Vector Management: IPM and introduced-IPM (agricultural sectors); Integrated pest control measures: Biological, Cultural, Chemical, Mechanical & Physical Control; IPM implementation consists suppression of harmful organisms, monitoring, adequate decision-making, non-chemical plant protection measures, specific pesticides and evaluation.

Dr. R. S. Sharma deliberated on Alternatives to DDT in Vector Control Management- Conventional Methods & Environmental Management: Introduction to Vector Control tools; Conventional management, Environmental Management, Biological Control, Chemical Control, Genetic Control and Natural Control; Introduction to conventional methods: Cleanliness, Premises inspection, Removal of standing water bodies, Community awareness and sensitization; Introduction to Environmental Management: Components of environmental management (WHO)- Environmental Manipulation, Environmental Modification and Modification or manipulation of human habitation or behaviour (Exhiti-6).

On IVPM- Behaviour Change Communication (BCC) Dr. P. T. Joshi deliberated and commented on IEC strategies: between community & Health workers, Social & Community; Objective of BCC; Outcomes of interventions, knowledge & skills, behaviour & activities, Impact- control of vector density & disease; Tools of BCC: Media Information (Radio/ TV Broadcast), Education & Communication, Communication for behavioural impact, and Farmer Field schools; Accredited Social Health Activist (ASHA) trained under National Health Mission (NHM); Multipurpose Health Workers (MPHW)- various kinds of IEC materials like posters, stickers, pamphlets, key materials- prepared to be displayed for BCC & IEC (preferably in local languages).

The training session of day-2 was concluded with a memento presented to the subject experts and other resource persons for their contribution during the training (Exhibit-6)



Exhibit-6: Memento presentation to experts/ resource persons

5.3 Training session-3 (Day-3: Wednesday-23/08/2023)

On the second day **(Exhibit-7)**, Dr. P. K. Srivastava discussed about Planning & Implementation of IVPM: Learning objectives; Introduction to IVPM; Planning & implementation of vector control management (WHO)- Technical steps: 1. Disease situation: a) Epidemiological Assessment- Measures and Estimation of disease occurrence; b) Entomological assessment- Xeno-monitoring or xeno- surveillance; 2. Operational steps: a) Local determinants of disease: i) Parasite, ii) Vector, iii) Human activities & iv) Environment; b) Selection of vector control methods: Environmental, Mechanical, Biological and Chemical to reduce vector population or to reduce human vector contact; Need & resources; He also discussed roles of various sectors in IVM implementation strategy.

Exhibit-7: Lecture/Discussion on Training session-3

Dr. L. J. Kanhekar explained Morphology and Bionomics of Flies and Flea and introduced fleas and its genera and species occur in India; Xenopsylla spp. medically important flea (vector of plague and murine typhus); classification and external morphology; Difference between male & female vector and Bionomics of Fleas. He also deliberated on vector of enteric diseases: House Fly (Musca domestica), vector of Helminths, faecal bacteria, protozoan & viruses resulting in the spread of enteric diseases; classification of House fly; morphology and its life cycle.

Dr. Rajesh Pandey, State Coordinator, WHO described vector borne disease: Dengue, Chikungunya & Overview of Neglected Tropical Diseases- What is Dengue? It's form, Sign and symptoms; Causative agent: Flavivirus (Four strain- DEN-1, DEN-2, DEN-3 & DEN-4);

Vector: Aedes Mosquitoes (Primary- aegypti & Secondary- albopictus); Transmission cycle of Dengue: Forest/Enzootic, Rural/Epidemic & Urban/Endemic/Epidemic; Chikungunya & its symptoms: fever, chills, headache, nausea, vomiting, severe joint pain, rashes; Causative agent: Alphavirus; Vectors: Aedes Mosquitoes (Aegypti, Albopictus); Transmission cycle of Chikungunya: Sylvatic CHIKV transmission and Urban CHIKV transmission; Burden in India and global burden (Exhibit-8).

Exhibit-8: Lecture/Discussion on Training session-3

He also gave brief introduction about NVBDCP Recommended insecticide for Larval source management and Adult-vector control. NVBDCP recommended insecticide, importance of larval source management, methods of larval source management, Mosquito Larvicidal Oil (MLO), Temephos 50% EC, insect growth regulators (IGR) including pyriproxyfen 0.5% and Diflubenzuron 25% WP. She also deliberated a lecture on adult vector control: adulticides; LLINs; adult vector control (outbreak condition)- indoor space spray, outdoor fogging; preparation and application of ready to use suspension (insecticides).

Dr. P. T. Joshi has deliberated on vector borne disease: Zika, its history: 1st isolated in 1947 from a rhesus monkey in Kampala, Uganda from Aedes Africanus mosquitoes and its sign & symptoms, Causative agent: Flavivirus; Vectors: Aedes Mosquitoes (aegypti, albopictus, vitattus, furcifer, africanus & apicoargenteus); Birth complications: Microcephaly, Guillain-Barre syndrome; Incubation and Viremia- incubation period of zika virus 3 to 14 days;

Transmission of Zika virus: Vector transmission and Non-vector transmission; Burden in India and global burden of Zika.

He also gave brief introduction about Integrated vector management (IVM): VBDs control programme- knowledge about vectors, diseases & disease determinants; Integrated pest control measures: Biological, Cultural, Chemical, Mechanical & Physical Control.

Dr. R.S. Sharma introduced IVPM: Vector management through Farmer Field School (FFS) approach and background, rational and concept of FFS in IVPM. How to implement FFS in the public health and agricultural community. Farmer Field School (FFS): Evolution of the farmer field school approach, integrated production and management through FFS, vector and VBDs management through FFS, farmers health risks associated with agriculture in India. Role of FFS at the field level for increasing continued monitoring and evaluation to reduce the vector and pest population. Management of mosquito breeding in rice fields through FFS (Sri-Lanka). He also suggested FFS is a very important part of Integrated vector and pest management in the community.

He also gave brief introduction about Integrated vector pest management: IVM- Integrated vector control methods and IVM in different situations was introduced by Dr. P.T. Joshi with the basic introduction of VBDs in India, integrated vector and pest management. The main content covered was IVPM basics. fine key elements of IVM, methods of IVM, vector bionomics of IVM. Integrated vector control methods: environmental management (modification, manipulation and changes to human habitation (or) behaviour, personal protection (protective clothing, repellents, installation of vaporization), larval source management (chemical control- larvicides (dosage & formulation), insect growth regulators, biological control (larvivores fish-Gambusia, Guppy), IRS, LLINs, Spray formulation & dosage for impregnation of bed-nets.

Dr. L. J. Kanhekar deliberated on Monitoring and evaluation of IVPM and discussed Methods, Outcome indicators: Planning and implementation, Organization and management (Within health sector); Behavioural Changing Communication; Entomological surveillance; Insecticide resistance monitoring through susceptibility test, Surveillance of dengue/ malaria vector; Entomological survey of Lymphatic Filariasis Epidemiological surveillance: Incidence, Prevalence; Epidemiological parameters of malaria (A*P*I, ABER, A*f*I & SPR) and

Epidemiological parameters of Filariasis (Microfilaria rate, Microfilaria density & Filarial endemicity rate).

On the Epidemiological surveillance and parameters topic Dr. Ramesh Chandra explained regarding determination of the incidence and prevalence (point and period) of all vector-borne diseases; Epidemiological parameters of Malaria: Annual Parasite Index (API), Annual Blood Examination Rate (ABER), Annual falcipuram Incidence (AFI), Slide positivity rate (SPR); Epidemiological parameters of filariasis: Microfilaria rate, Microfilaria density, Filarial endemicity rate.

He also carried Pilot Testing of FAQs- Lymphatic & Brugian Filariasis with a brief introduction about FAQs material and asked the participant trainees (DMOs, SPO/entomologists/VBD consultants) from Uttar Pradesh to provide inputs on FAQs material.

Dr. N Balkrishnan deliberated on vector borne disease: Plague and its causative agent. Causative agent: Yersinia pestis- Gram -ve bacteria); Vectors: Xenopsylla cheopis, X. brasiliensis; Reservoirs: Tatera indica, Bandicota bengalensis; Susceptible hosts: Rattus Rattus, Mus musculus, Bandicota indica; History; Transmission cycle; its current global status and types of plague (Bubonic plague, Pneumonic plague, Septicemic plague). He also deliberated on current status of plague in India, cases and deaths, plague surveillance network (Rodent, Blood, Organ, Dog sera, Human blood, fleas; surveillance methodology (bacteriology, Serology, molecular & entomological), surveillance-investigation of seas and airports and endemic plague foci in India (1951), treatment, vector control, etc.

He also gave brief introduction about Kyasanur Forest Disease (KFD) its symptoms and clinical features, Host factors, Diagnosis; History; Transmission: trans-stadial mode (nymphal stage ticks), incubation period; Transmission cycle; KFD virus ecology, Vector- ticks (Haemophysalis spinigera & H. turturis); Natural cycle of KFD: Egg→Larva→Nymph→Adult; Environmental factors increasing risks factor for KFD; Burden in India; Epizootiology of KFD in wild monkeys, amplifying host (Semnopithecus entellus/ macaca radiata), reservoirs: cattle, dogs & other domestic animals; Preventive protection measures & Control: Hot spot spray- Malathion powder, use of tick repellent- DMP (dimethyl phthlate) oil, KFD vaccine; recent outbreaks of KFD were discussed (Exhibit-9).

Exhibit-9: Lecture/Discussion on Training Session-3

Pilot Testing of FAQs materials- Malaria, Dengue, Chikungunya & Zika was carried by Dr. P T Joshi and Dr. L J Kanhekar with a brief introduction about FAQs material and glossary on Vector Borne Diseases and asked the participant trainees (DMOs, SPO/entomologists/VBD consultants) from Uttar Pradesh to provide inputs on FAQs material and Glossary of all modules.

The training session of day-3 was concluded with a memento presented to the subject experts and other resource persons for their contribution during the training **(**Exhibit- 6 & 7).

5.4 Training session-4 (Day-4: Thursday-24/08/2023)

Field visit to the locality to explore vector prevalence, demonstration of vector breeding and collection method.

CSIR-NEERI has organised a field visit for all participant trainees from Bihar to the locality (Chandragupt Institute of Management Patna) to explore vector prevalence, demonstration of vector breeding and collection method **(Exhibit-10).** Apart from participant trainees, District Malaria officer team, Biologists, State Entomologists and Subject experts (Dr. R.S. Sharma, Dr. P.T. Joshi and Dr. Ramesh Chandra) were also present. Participant trainees were divided into two teams and asked to perform entomological landscape surveillance (vector biology and vector ecology) such as breeding places/sites, biotic/abiotic factors etc. All teams were equipped with collection tools (Ladle, Enamel bowl, Pipette, Larval vials, larval nets, Aspirators, Torch, paper cups with nets covers, Cotton wool, a pencil, a notebook, a bag to put all material etc.).

Exhibit-10: Photographs of the field visit to the CIMP office premises.

Dr. Y. P. Ramdev, National Technical Advisor, UNIDO made a discussion on Alternatives to DDT: LLIN, Biolarvicides & Neem derived products, which are evolved through UNIDO for vector control (UNIDO Project) as alternatives to DDT. He introduced UNIDO and its role in this project and the usefulness of neem products. Ramdev explained about the Application inefficiency existing strategy: adulticide-IRS, national implementation of suitable alternative products, methods and strategies. He also deliberated on introduction about non-POPs alternative to DDT: Problem associated with use of Synthetic Pesticide; Promote effective alternatives to DDT and synthetic pesticides: Neem (Azadirachta spp.) & Bacillus thuringiensis (Bt) as Bio-botanical pesticides; Objective of the Project; Mosquito Life Cycle; He also discussed progress made in project: Neem based formulations developed and process standardized for pilot plant production: 1. Process for coil formulation; 2. Process for Cream formulation; 3. Process for Suspension Concentrates formulation; 4. Process for spreading oil formulation; 5. Process for Tablet production; Bio-efficacy of neem-based Spreading formulation/ SC/Tablets/Cream; Technology, Transfer & Training; Bacillus thuringiensis (Bt) based formulation (Exhibit-11)

On Alternatives to DDT: Manufacturing, marketing and distribution- LLIN, Bio-larvicides & Neem derived products for vector control Dr. Rajendra Thapar, Manager, HIL (India) Ltd., gave brief introduction about HIL (India) Ltd. Business segment expansion in various sectors

(Public health, agrochemicals, Fertilizers, seed etc.); HIL contribution in DDT phasing out as part of DDT alternative project; Agreement between UNIDO-HIL in 2015 to develop locally appropriate cost-effective and sustainable alternatives to DDT (LLIN, Bti based Bio-larvicides & Neem derived products); Present status of HIL in production of DDT alternatives .

Field reports had been prepared by all team members with the participant trainees under the guidance of expert faculty and CSIR-NEERI team.

The training session of day-3 was concluded with a memento presented to the subject experts and other resource persons for their contribution during the training (Exhibit-11).

Exhibit-11: Memento presentation to experts/ resource persons

5.5 Training session-5 (Day-5): Friday- 25/08/2023)

The lecture on IEC materials was conducted by Dr. P. T. Joshi, Dr. L. J. Kanhekar, and Dr. Gujju Gandhi, providing a brief introduction to Information, Education & Communication (IEC) materials and their significance in the context of Integrated Vector Management (IVPM) campaigns, IEC operations, and programs. It was emphasized that IEC materials should be presented in the local language or terminology to ensure that people can comprehend, cooperate, participate, and engage in various activities related to the control of vector-borne diseases (VBDs). IEC materials provided in the form of posters, pamphlets, stickers etc. are of great importance for the awareness programme. IEC material included following topics: Mosquito life cycle Aedes, Anopheles, Culex; Mosquito transmitted diseases; How to use insecticide treated nets (ITNs); Awareness on insecticide treated nets (ITNs), Malaria (No Mosquitoes- No Malaria); ways to prevent mosquito bite; Diseases caused by mosquito bite;

Awareness poster (Let's prevent breeding of mosquitoes and protect public health diseases); Introduction, Vectors and its life cycle, Sign & Symptoms, breeding sites, Transmission, Transmission cycle, and preventative measures of VBDs (Malaria, Chikungunya, Dengue, Filaria, Japanese Encephalitis and Zika); CCHF, Scrub Typhus & Kyasanur Forest Disease: Introduction, Vectors and its life cycle, Sign & Symptoms, Transmission, Transmission cycle, and prevention. At the end of this session, Dr. P.T. Joshi asked to participant trainees to provide inputs/ changes to make this IEC material more informative and helps the community to become aware of VBDs programme.

The lecture discussion on FAQs- materials/ Glossary of all modules was carried by Dr. L J Kanhekar, Dr. G. Gandhi and Abhishek Chaudhary with a brief introduction about FAQs material and glossary on Vector Borne Diseases and asked the participant trainees (DMOs, SPO/entomologists/VBD consultants) from Bihar to provide inputs on FAQs material and Glossary of all modules.

Feedback on Modules and training materials from trainees was taken by Dr. L. J. Kanhekar, Dr. Gujju Gandhi, Abhishek Chaudhary and Ashlesh Katapatal to edit Modules and training materials. He gave a brief introduction about all four modules: Vector morphology and Bionomics and all the contents included in the training module. He asked the participants to give their valuable responses and inputs on the training module. Participants have raised queries, suggestions, and also healthy discussion on various topics of modules. Dr. L.J. Kanhekar asked all the participants to provide feedback via e-mail also, if any.

valedictory session followed by group photo and certificates distribution

A valedictory session was conducted by Dr. A. Ramesh Kumar, during which Dr. Ashok Kumar, SPO Bihar, acted as the chief guest on behalf of Dr. Rakesh Chandra Sahay Verma, Director in Chief (Disease Control), Bihar. Dr. L.J. Kanhekar and Dr. R.S. Sharma also participated in the valedictory session. Dr. Ashok Kumar expressed his gratitude to NEERI for providing the training. Dr. Ramesh Kumar proposed the vote of thanks to all the participants and distinguished faculties, summarizing the training program. He also invited participants to share their opinions on the training program (Exhibit-12) by filling out the feedback forms provided to them. Following this, Dr. L.J. Kanhekar and Dr. R.S. Sharma proceeded with the

distribution of certificates to all the participant trainees, who were awarded certificates of participation" (Exhibit-10)

Exhibit-12: Photographs of the valedictory session, feedback from trainees, and the distribution of certificates to participating trainees.

6.0. Annexure

6.1 List of organizing members

1. **Dr. A. N. Vaidya,**
   Director, CSIR – National Environmental Engineering Research Institute,
   Coordinator, Stockholm Convention Regional Centre, Nagpur

2. **Dr. M. P. Patil**
   Chief Scientist & HOD, Chemical and Hazardous Waste Management Division,
   CSIR – National Environmental Engineering Research Institute, Nagpur

3. **Dr. A. Ramesh Kumar**
   Principal Scientist cum Project Investigator,
   Chemical and Hazardous Waste Management Division,
   CSIR – National Environmental Engineering Research Institute, Nagpur

4. **Dr. Gujju Gandhi**
   Project Scientist-II,
   CSIR – National Environmental Engineering Research Institute, Nagpur

5. **Mr. Ashlesh Katpatal**
   Project Associate-I,
   CSIR – National Environmental Engineering Research Institute, Nagpur

6.2 List of faculties

1. **Dr. R. S. Sharma**
   Former Additional Director, National Centre for Disease Control

2. **Dr. L. J. Kanhekar**
   Former Joint Director NCDC & Ex. Project Consultant, CSIR-NEERI

3. **Dr. P. K. Srivastava**
   Former Joint Director, National Vector Borne Disease Control Programme.

4. **Dr. Y. P. Ramdev**
   National Technical Adviser,
   United Nations Industrial Development Organization.

5. **Dr. Rajendra Thapar**
   Manager, (Public Health & Export), HIL (India) Ltd.

6. **Dr. Himmat Singh**
   Scientist -D, ICMR - National Institute of Malaria Research.

7. **Dr. Vijay Kumar**
   ICMR- Consultant, (Ex- Scientist E),
   ICMR-Rajendra Memorial Research Institute of Medical Sciences.

8. **Dr. Ramesh Chandra**
   Former State Entomologist, Uttar Pradesh

9. **Dr. P. T. Joshi**
   Former State Entomologist, Gujarat state.

10. **Dr. Dr. Shaukat Kamal**
    Additional Director, NCDC, Patna Branch, Bihar.

11. **Prof. Dr. B.K. Tyagi**
    Emtd. Scientist "G" (Director) & Director in-Charge, ICMR-CRME,
    Jodhpur (Rajasthan).

12. **Dr. Balakrishnan**
    Former Joint Director, NCDC, Bangalore.

13. **Dr. Rajesh Panday**,
    Neglected Tropical Diseases (NTD) Consultant, Bihar, World Health Organization

6.3 List of nominated trainees

Sl. No.	Name	Designation	District
1	Dr. Ashok Kumar	SPO cum Addl. Director	Patna
2	Dr. Parmeshwar Prasad	VDCO	Patna
3	Pankaj Kumar	VDCO	Patna
4	Rakesh Kumar	VDCO	Patna
5	Abu Nasar Arif	Consultant	Patna
6	Dr. Bedananad Yadav	DVBDCO	Bhagalpur
7	Dr. Shailendra Kumar	DVBDCO	Buxar
8	Dr. Md. Ehteshamul Haque	DVBDCO	Gaya
9	Dr. Subhash Chandra Prasad	DVBDCO	Patna
10	Dr. D. K. Dhusiya	DVBDCO	Jamui
11	Dr. Arvind Kumar Singh	DVBDCO	Munger
12	Dr. Lalan Kumar	DVBDCO	Araria
13	Dr. Sarad Chandra Sharma	DVBDCO	East Champaran
14	Dr. Ravindr Kumar Yadav	DVBDCO	Sitamarhi
15	Dr. Rajesh Kumar Singh	DVBDCO	Aurangabad
16	Dr. Harendra Ram	DVBDCO	West Champaran
17	Dr. Aftab Kalim	DVBDCO	Nawada
18	Dr. Rajendra Prasad Mandal	DVBDCO	Purnea
19	Dr. Rabindra Chaudhary	DVBDCO	Kaimur
20	Dr. Sunil Keshari	DVBDCO	Vaishali
21	Dr. Shilpi Sinha	DVBDCO	Saran
22	Dr. Brij Nath	DVBDCO	Arwal
23	Dr. Sushma Saran	DVBDCO	Gopalganj
24	Dr. Jay Prakash Singh	DVBDCO	Katihar
25	Dr. Subhash Ranjan Jha	DVBDCO	Begusarai

6.4 Training Schedule

CSIR-National Environmental Engineering Research Institute, Nagpur

(*Project: - Development and promotion of non-POPs alternatives to DDT*)

Five Days Training Programme on Integrated Vector and Pest Management (IVPM) from 21st to 25th August 2023, for SPO/ DMOs/DVBDCO/ Biologists and VBD Consultants from Bihar

Venue: *Chandragupt Institute of Management Patna (CIMP), Patna*

Training Programme Schedule

Time	Topic	Resource Person
Day 1 (Monday) 21/08/2023		
0915-1000	Registration – Distribution of training materials	
	Inaugural Function	
1000-1030	**Welcome Address** : **Dr. A. Ramesh Kumar,** Principal Scientist & PL CSIR-NEERI, Nagpur **Guest of honours** : **Dr. Rakesh Chandra Sahay Verma,** Director in Chief (Disease Control) **Dr. Shaukat Kamal,** Addl. Director, NCDC, Patna Branch, Bihar **Inauguration by Chief Guest** : **Shri. Pratyaya Amrit,** I. A. S, Additional Chief Secretary in Health **Vote of Thanks** : **Dr. Gujju Gandhi**, Project Scientist-II, CSIR-NEERI, Nagpur	
1030-1045	***High Tea & Group Photo***	
1045-1115	Introduction to Modules 1 to 4	Dr Gujju Gandhi, Project Scientist-II
1115-1155	Introduction to DDT and its use in Vector Control (Module-1: Chapter- 1)	Dr A Ramesh Kumar, Principal Scientist & Project Leader
1155-1225	Introduction to VBD: Japanese Encephalitis (Module-1: Chapter- 2: 2.3)	Dr L. J. Kanhekar, Former Jt-Director, NCDC & Former Project Consultant, CSIR-NEERI
1225-1255	Introduction to VBD: Malaria (Module-1: Chapter-2: 2.1)	Dr R S Sharma, Former Addl. Director, NCVBDC & NCDC
1255-1330	Introduction to Chandipura Virus (Module-1: Chapter-2: 2.12)	Dr P T Joshi. Former. State Entomologist, Gujarat
1330-1430	**LUNCH BREAK**	
1430-1510	Morphology of Anopheline vector mosquitoes (Module-2: Chapter -2: 2.1)	Dr L. J. Kanhekar
1510-1540	Introduction to Crimean Congo Hemorrhagic Fever (Module-1: Chapter- 2: 2.10)	Dr Ramesh Chandra, Former State Entomologist, UP
1540-1610	Bionomics of Anopheline vector mosquitoes (Module-2: Chapter -2. Pg-15-22)	Dr B.K Tyagi
1610-1620	***Tea Break***	

1620-1700	Bionomics of Ticks and mites (Module-2: Chapter 9)	Dr Shaukat Kamal, Addl Director, NCDC
1700-1730	Introduction to VBD: Leishmaniasis (Kala-azar) (Module-1: Chapter- 2: 2.7)	Dr Vijay Kumar, Former Scientist, ICMR-RMRIMS
Day 2 (Tuesday) 22/08/2023		
0930-1010	Morphology and Bionomics of Culicine vector mosquitoes (Module-2)	Dr L. J. Kanhekar
1010-1050	Morphology and Bionomics of sandflies (Module-2: Chapter- 6)	Dr Shaukat Kamal, Addl Director, NCDC
1050-1100	***Tea Break***	
1100-1130	Entomological surveillance of VBDs (Module-4: Chapter-3: 3.4)	Dr Himmat Singh, Scientist -D, ICMR-NIMR
1130-1210	Vector control management: Biological Control and Genetic Control (Module-3: Chapter-3 & 4)	Dr B.K Tyagi
1210-1250	Introduction to VBD: Lymphatic Filariasis (Module-1: Chapter -2: 2.2)	Dr P K Srivastava, Former Jt. Director, NCVBDC
1250-1330	Introduction to VBD: Scrub Typhus (Module-1: Chapter -2: 2.9)	Dr Ramesh Chandra
1330-1430	**LUNCH BREAK**	
1430-1520	Equipment for larviciding and adulticiding (Module-3: Chapter- 8)	Dr P K Srivastava, Former Jt. Director, NCVBDC
1520-1610	Integrated Pest Management: IPM (Module-4: Chapter -1: 1.3-1.3.2)	Dr Ramesh Chandra
1610-1620	***Tea Break***	
1620-1700	Alternatives to DDT in Vector Control Management – Conventional Methods & Environmental Management (Module-3: Chapter-1-3)	Dr R S Sharma
1700-1735	IVPM: Behavior Change Communication (Module-4: Chapter-1: 1.5)	Dr P T Joshi
1735-1800	Entomological parameters and its importance (Module-4: Chapter -3: 3.4.5-3.4.8)	Dr Himmat Singh
Day 3 (Wednesday) 23/08/2023		
0930-1000	Planning and implementation of IVPM (Module-4: Chapter-2)	Dr P K Srivastava
1000-1030	Morphology and Bionomics of flies & Flea (Module-2: Chapter- 7 & 8)	Dr L. J. Kanhekar
1030-1100	Introduction to VBDs: Dengue, Chikungunya and Zika (Module-1: Chapter- 2: 2.4-2.6)	Dr. Rajesh Panday, NTD Consultant, WHO
1100-1110	***Tea Break***	

1110-1140	IVPM: Vector management through Farmer Field School approach (Module-4: Chapter-1: 1.4)	Dr R S Sharma
1140-1230	NCVBDC Recommended Insecticide: Larval Source Management (Module-3: Chapter- 7)	Dr P K Srivastava
1230-1300	Monitoring and evaluation of IVPM (Module-4: Chapter-3: 3.1-3.3)	Dr L. J. Kanhekar
1300-1330	Integrated Vector Pest Management: IVM – Integrated vector control methods and IVM in different situations (Module-4: Chapter-1: 1.2.1-1.2.1.4 & 1.2.2-1.2.3)	Dr R S Sharma
1330-1430	**LUNCH BREAK**	
1430-1500	Integrated vector management (Module-4: Chapter -1: 1.2.1.6 -1.2.1.7)	Dr P T Joshi
1500-1530	Epidemiological surveillance and parameters (Module-4: Chapter 3- 3.5)	Dr Ramesh Chandra
1530-1600	FAQ- Lymphatic & Brugian Filariasis	Dr. Ramesh Chandra
1600-1610	***Tea Break***	
1610-1640	Introduction to VBD: Plague (Module-1: Chapter -2: 2.8)	Dr N Balkrishnan
1640-1710	Pilot Testing of FAQ- Malaria, Dengue, Chikungunya & Zika	Dr L J Kanhekar & Dr P T Joshi
1710-1730	Introduction to Kyasanur Forest Disease (Module-1: Chapter-2: 2.11)	Dr N Balkrishnan
Day 4 (Thursday) 24/08/2023		
0800-1330	Field Visit to the locality to explore vector prevalence, demonstration of vector breeding and collection method	Dr L J Kanhekar, Dr R S Sharma, Dr P T Joshi, Dr Ramesh Chandra, Dr. Vijay Kumar, Dr. G Gandhi, Abhishek Chaudhary and Ashlesh Katpatal,
1330-1430	**LUNCH BREAK**	
1430-1510	Alternatives to DDT: LLIN, Biolarvicide & Neem derived products for vector control (UNIDO Project) (Module-3: Chapter-9)	Dr Y P Ramdev, National Technical Adviser, UNIDO
1510-1550	Alternatives to DDT: Manufacturing, marketing and distribution – LLIN, Biolarvicide &Neem derived products for vector control	Dr Rajendra Thapar, Manager (Public Health & Exports), HIL (India) Ltd
1550-1610	***Tea Break***	
1610-1745	Preparation of the field report	Dr R.S Sharma, Bihar State Entomologist, Dr G. Gandhi & Abhishek Chaudhary
Day 5 (Friday) 25/08/2023		
09.30-1030	Presentation of the field report	SPO Bihar & Participant Trainees
1030-1110	Discussion on IEC materials	Dr R S Sharma, Dr P T Joshi, Dr L J Kanhekar, Dr. Vijay Kumar & Dr G Gandhi
1110-1120	***Tea Break***	
1120-1230	FAQs: KFD, CCHF & Scrub Typhus	Dr L J Kanhekar, Dr G Gandhi & Abhishek Chaudhary

1230-1330	FAQs: IVPM, Mosquito & Glossary of all modules	Dr Ramesh Chandra, Dr L J Kanhekar, Dr R S Sharma & Dr .G.Gandhi
1330-1430	**LUNCH BREAK**	
1430-1530	Presentation and Feedback on Modules and training materials from trainees	Dr L J Kanhekar, Dr G Gandhi, Abhishek Chaudhary & Ashlesh Katpatal
1530-1600	Valedictory session followed by group Photo and certificates distribution	Dr. A. Ramesh kumar

Copy to: **1. SPO, Bihar**
2. All Participant Trainees

(Dr. Gujju Gandhi)
Project Scientist-II
CSIR-NERI, Nagpur