

MERA-India brings you...

NEWS & VIEWS

Issue 27 | January 2023

Interview



Dr Kasinathan Gunasekaran,
Scientist G, Retd.,
ICMR-VCRC, Puducherry

Upcoming Events



Lecture Series on Infectious
Diseases 2.0, Lecture 01 by
Dr Radha Rangarajan,
Director, CSIR-CDRI, Lucknow



Distinguished Lecture by,
Dr Madhumita Dobe,
Director-Professor,
AIIH & PH, Kolkata

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MALARIA THROUGH THE LENS OF RESEARCHERS | UPCOMING EVENTS

Editorial

Dear Readers,

MERA-India team brings you the twenty-seventh issue of our newsletter, 'News & Views'.

We wish all our readers a very happy and successful new year 2023!

We hope that through everyone's collective efforts, this year we can move closer to building a malaria-free future. We begin this new year with a renewed vigour and commitment to supporting research for strengthening India's malaria elimination efforts. India has been showing a consistent decline in malaria cases and deaths. However, with India's malaria elimination target set for the year 2030, it is imperative that we not only brace ourselves to face the existing challenges such as drug resistance and insecticide resistance but also prepare for the enhanced risk of vector-borne diseases with expanding urbanization, water crisis, and threats such as climate change. We call upon the scientific community to work synergistically towards building innovative solutions for not only sustaining the gains achieved in malaria control thus far but also facing unforeseen challenges. No health campaign can be successful without the participation of the community, and therefore, the researchers should take the onus to not just build solutions but also share them with the community in a way that is readily accepted by the masses. COVID-19 pandemic is a brilliant example of how empowering the community by sharing the correct information about the risks and preventive measures can lead to the control of an infectious disease. MERA-India is committed to support translational/ implementation/ operational research, the outcomes of which can strengthen the malaria elimination programmes.

In this issue, you will find the highlights of lectures by Dr Ravi Kumar (Former Senior Regional Director, National Center for Vector Borne Diseases Control, Karnataka, India) and Dr John C Oommen (Honorary Consultant at the Christian Hospital, Bissamcuttack, Odisha, India) under MERA-India Distinguished Lecture Series. We have also covered an informative interview of Dr K. Gunasekaran (Retd. Scientist G, ICMR-Vector Control Research Centre, Puducherry, India).

In the "Research in Spotlight" section, we have highlighted three recent articles describing the impact of natural plant diet on the insecticide susceptibility of Anopheles mosquitoes by Paré Prisca SL. *et al*; the role of low number of oocysts containing Amazonian anophelines in malaria transmission by Pereira-Silva JW. *et al*.; and the mosquito-proofing of houses using insecticide-treated screens in rural Tanzania by Msoffe R. *et al*.

In the "Malaria Through the Lens of Researchers" section, we have featured the third winning entry of the MERA-India Image Competition 2022, submitted by Dr Renuka S, Postdoctoral Fellow at ICMR-National Institute of Malaria Research (NIMR) - Field Unit, Bengaluru, India.

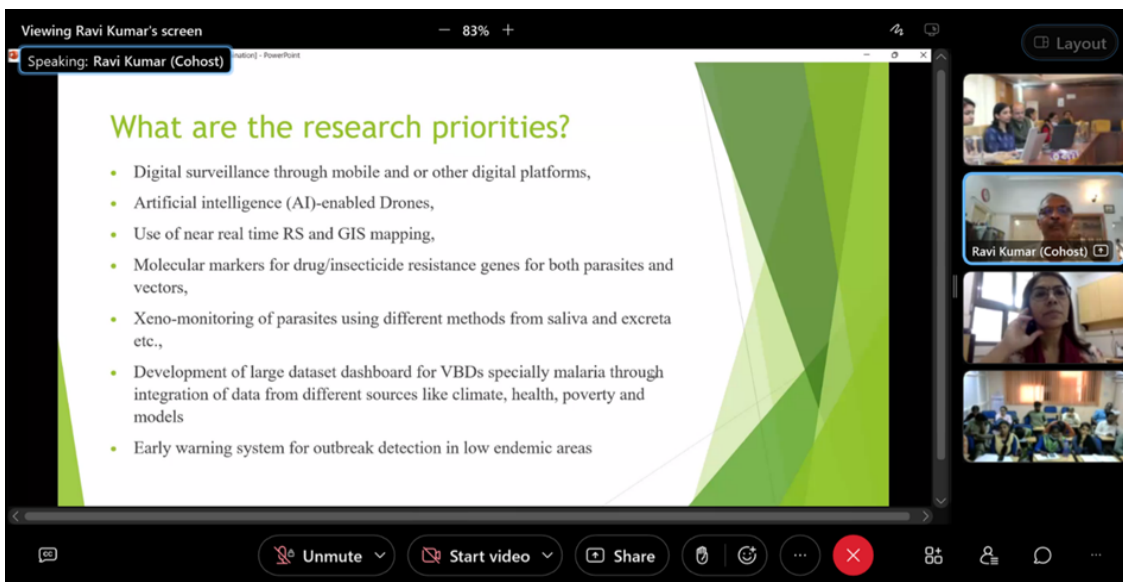
This month, we announce the launch of the “Lecture Series on Infectious Diseases 2023”, in which twelve scientists from around the world, working in the field of different infectious diseases, will be invited to deliver a lecture each month throughout the year 2023. The opening talk of this series will be delivered by Dr Radha Rangarajan (Director, CSIR-Central Drug Research Institute, Lucknow, India). This month, we will be also organizing a Distinguished Lecture by Dr Madhumita Dobe, (Former Dean, Director-Professor and Head of the Department of Health Promotion and Education, All India Institute of Hygiene & Public Health, Kolkata). The details of both lectures are provided in the “Upcoming Events” section.

We hope that you will find this issue engaging and fascinating. Please write to us for any feedback or suggestions regarding the newsletter’s content at meranewsletter@gmail.com.

With best wishes,
MERA-India team

ICMR-NIMR & MERA-India Activities

Distinguished Lecture by Dr Ravi Kumar



The screenshot shows a Zoom meeting interface. The main window displays a slide titled "What are the research priorities?" with a bulleted list of seven research areas. The slide is presented in a dark theme with green accents. The Zoom controls at the bottom include buttons for Unmute, Start video, Share, and a red 'X' button. On the right side, there is a vertical stack of video thumbnails for other participants, with "Ravi Kumar (Cohost)" highlighted.

Viewing Ravi Kumar's screen — 83% +

Speaking: Ravi Kumar (Cohost)

What are the research priorities?

- Digital surveillance through mobile and or other digital platforms,
- Artificial intelligence (AI)-enabled Drones,
- Use of near real time RS and GIS mapping,
- Molecular markers for drug/insecticide resistance genes for both parasites and vectors,
- Xeno-monitoring of parasites using different methods from saliva and excreta etc.,
- Development of large dataset dashboard for VBDs specially malaria through integration of data from different sources like climate, health, poverty and models
- Early warning system for outbreak detection in low endemic areas

Unmute Start video Share

The thirteenth lecture in the series of ICMR-NIMR & MERA-India “Distinguished Lecture Series” was organized in November 2022. Dr Ravi Kumar (Former Senior Regional Director, NCVBDC, Karnataka), was invited as the speaker, who delivered a talk on the topic “Malaria surveillance in the context of Malaria Elimination.” Dr Manju Rahi (Director in-charge, ICMR-NIMR) welcomed Dr Kumar and thanked him for accepting the invitation to deliver the lecture. Dr Sachin Sharma (Chief Consultant, MERA-India) opened the lecture and briefly introduced the speaker to the audience.

In his lecture, Dr Kumar covered the general malaria surveillance activities, refinements required in the field of surveillance with the context of elimination, and priority research areas in terms of malaria prevalence and application in surveillance. Talking about surveillance, he described the malaria surveillance process in India, types of surveillance, case classification, surveillance in different settings, and Lot Quality Assurance Sampling (LQAS) surveys. He also highlighted that to achieve elimination, accelerated efforts are required to conduct surveillance in mission mode with complete coverage *i.e.*, no house/village/ward should be left out from surveillance and the quality of surveillance should also be improved. He explained various indicators for measuring the quality and quantity of surveillance activities including MBER (Monthly Blood Examination Rate), API (Annual Parasite Index), TPR (Test Positivity Rate), Desegregation analysis, and many more. He also introduced a malaria portal, IDSP-Integrated Health Information Platform (IHIP), which is a real-time, case-based surveillance dashboard that is being developed by NCVBDC (National Center for Vector Borne Diseases Control) with the support of WHO (World Health Organization). The system will help to get real-time case-based information, integrated analytics and outbreak investigation activities. He concluded the lecture by highlighting the research priorities and expectations of the program from ICMR-NIMR.

Dr Kumar answered the queries raised by the audience. The lecture was concluded by Dr Sharma with a vote of thanks to Dr Kumar and all the attendees.

The recording of this lecture can be found on the MERA-India website (<https://www.meraindia.org.in/lecture-series>).

Distinguished Lecture by Dr John Cherian Oommen



Dr John C Oommen, {Honorary Consultant at the Christian Hospital, Bissamcuttack (CHB) Rayagada District in south Odisha}, India, visited ICMR-NIMR in December 2022 to deliver a lecture in the ICMR-NIMR & MERA-India “Distinguished Lecture Series”. Dr Oommen served at CHB for over 30 years, and his main area of work has been as Team Leader of the MITRA (Madsen’s Institute for Tribal & Rural Advancement) Community Health program

of CHB, engaging and working with the people of 54 predominantly tribal villages to combat endemic malaria through community-based efforts. Dr Manju Rahi welcomed Dr Oommen to NIMR and introduced the speaker to the attendees.

Dr Oommen’s lecture was entitled “A People’s Movement Against Malaria: Stories and Reflections from a 25-Year Journey”. In his insightful lecture, he shared his experiences on the key strategies which led to the successful decline in malaria cases in Odisha over the last 25 years. He highlighted how in 1998, Odisha contributed to the majority of malaria cases, despite having only 3% of the country’s population. He described the approaches adopted to take the research-based knowledge to the field; and, educate and empower the tribal communities, to dispel misinformation and make informed choices for adopting the interventions such as bed nets. He gave several examples of the ways in which the

problem of malaria, its symptoms, transmission, and preventive measures were communicated through simple and engaging means to the community, which had no background knowledge of the disease, for introducing behaviour change and use of personal protection measures. He also described the observation related to malaria-

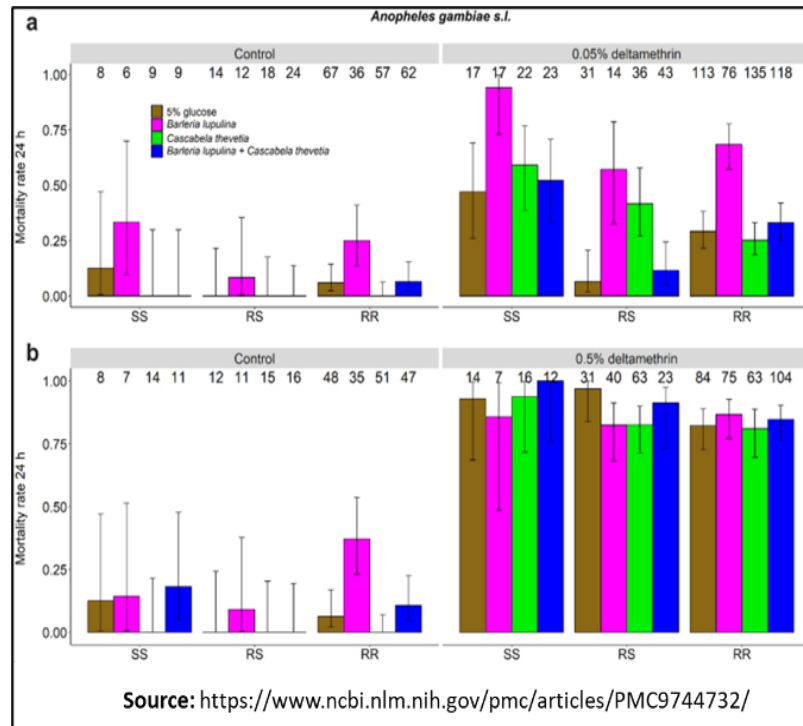
induced malnutrition in children. He further described the concept of the Durgama Anchalare Malaria Nirakarana (DAMaN) strategy which further contributed to the reduction in malaria cases in Odisha. He summarised the key factors leading to the reduction in Odisha's malaria cases in 2018, which included funding and political will, strategies, community empowerment, decentralized access to diagnosis and treatment at the village level, long-lasting insecticidal nets (LLIN) distribution and DAMaN initiative.

The lecture was followed by an interaction between Dr Oommen and the online participants. The session concluded with Dr Manju Rahi thanking the speaker and the attendees.

The recording of this lecture is available on the MERA-India website (<https://www.meraindia.org.in/lecture-series>).

Research in Spotlight

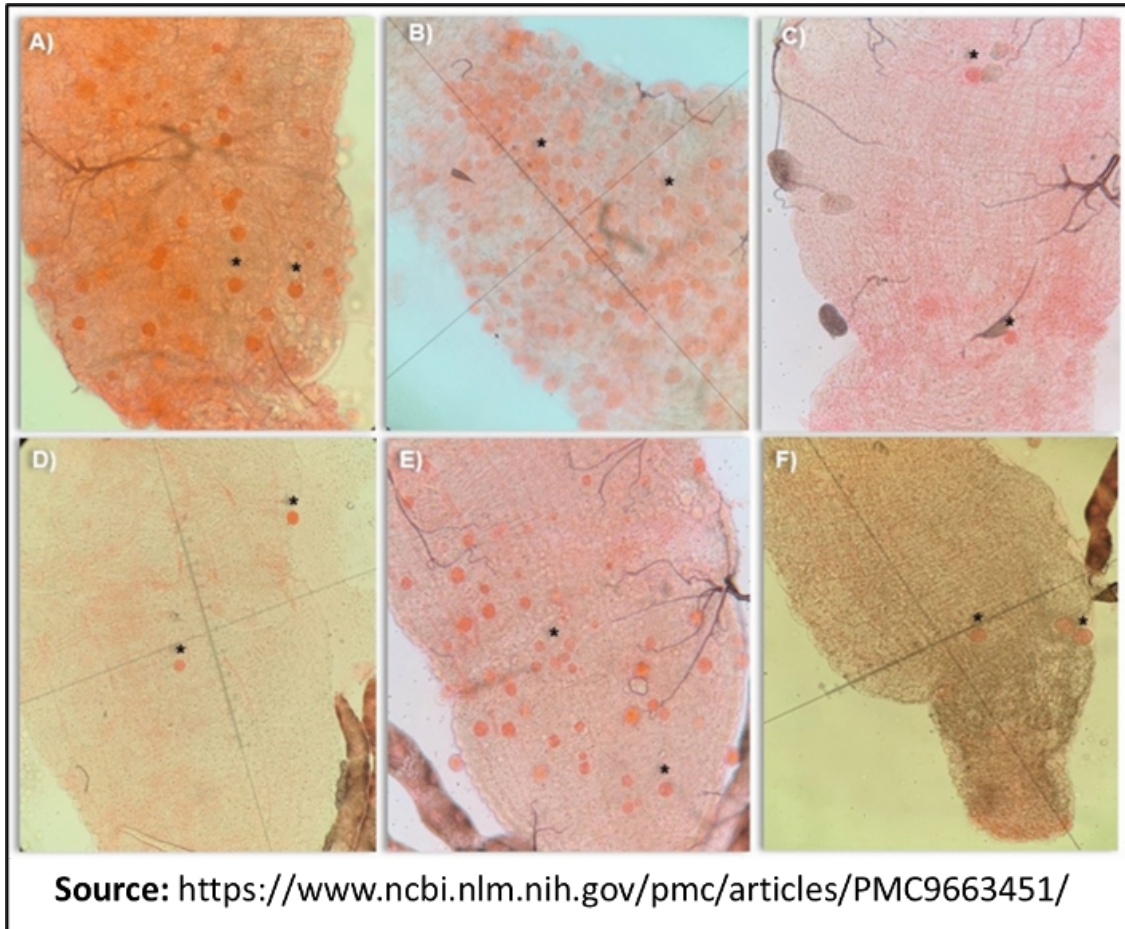
Paré Prisca SL. *et al.*, *Sci Rep.* 2022: Natural plant diet impacts phenotypic expression of pyrethroid resistance in *Anopheles* mosquitoes



Insecticide resistance is one of the emerging challenges for vector management. The vast distribution of insecticide-treated nets and the use of the same insecticides in agricultural practices are leading the community to face the challenge of insecticide resistance. In the present [study](#), the authors have documented the impact of a natural plant diet (*Barleria lupulina*, *Cascabela thevetia*, and a combination of *C. thevetia* + *B. lupulina*) on the pyrethroid resistance in *Anopheles gambiae* sensu lato, predominant vector species of the study site (Diébougou in southwestern Burkina Faso). They fed the adult mosquitoes with the nectariferous flowers of *C. thevetia*, *B. lupulina*, and a mixture of *C. thevetia* + *B. lupulina*. The set of adult mosquitoes fed on 5% sugar solution was taken as control for the experiments. Then to determine the susceptibility for two concentrations (0.5% and 0.05%) of deltamethrin, WHO recommended cone assay was performed on all four sets of mosquitoes.

The results showed that the mosquitoes fed on *B. lupulina* flowers were 2.5 fold more susceptible to 0.05% of deltamethrin exposure than the control ones. Further, they have also observed that even without the insecticide treatment, *B. lupulina*-fed mosquitoes showed more mortality than the sugar-fed mosquitoes. This observation indicates that some plant species adversely affect the health of mosquitoes and make them more susceptible to insecticides. More studies with a range of plant species will help to reveal new tools for vector management and to understand the evolution and ecology of insecticide resistance.

Pereira-Silva JW. et al., *Sci Rep.* 2022: Amazonian Anopheles with low numbers of oocysts transmit *Plasmodium vivax* sporozoites during a blood meal



Out of 49 anopheline species found in Africa, only 19 can naturally be infected with the malaria parasite. *Anopheles darlingi* is one of such primary vectors which carry and transmit malaria parasites in the Amazon region of Brazil. But there are other anopheline species like *An. triannulatus* s.l., *An. benarrochi* s.l., *An. nuneztovari* s.l., and *An. evansae*, which are present in the regions, and are reported to get *Plasmodium vivax* infection naturally, but are not considered malaria vectors in the region.

In the present [study](#), authors have infected these mosquito species with *P. vivax* and tracked the significance of the number of oocysts on salivary gland invasion and transmission. Lab reared *An. annularis* was taken as a control for the experiments. The study found the highest infection rate in the field population of *An. darlingi*, where the average oocyst and sporozoite production rate was 13 and 1080 per mosquito respectively. But despite comparatively low oocyst numbers in other Anopheline species, the authors found DNA of *P. vivax* in the saliva of all the species. They have concluded that the Brazilian Anopheline species, *An. triannulatus* s.l., *An. benarrochi* s.l., *An. nuneztovari* s.l., and *An. evansae*, with a low number of oocysts, are the potential transmitters of the malaria parasite and can occasionally be the competent vectors of *P. vivax*.

Msoffe R. et al., Malar J. 2022: Participatory development of practical, affordable, insecticide-treated mosquito proofing for a range of housing designs in rural southern Tanzania



Vector-control interventions are central to the prevention of vector-borne diseases. However, the success of many of these interventions is based on the appropriate and regular usage, and adoption by the community. In this [study](#), the authors, while involving the community members, looked into the potential of mosquito-proofing the houses by making simple structural changes, and screening the houses by adopting an affordable intervention of using treated netted screens, based on the combined benefits of insecticide-treated nets (ITNs) and indoor residual spray (IRS). For this, 52 households in a rural Tanzanian community recruited to the study were surveyed for the structural features and randomly assigned to one of the three groups viz. a) negative control - households with no screens installed; b) households with untreated screens installed at all mosquito-entry points; c) households with screens installed and treated with the insecticide pirimiphos-methyl (PM). The screens in groups b) and c) were installed after making necessary structural changes using locally available materials. The indoor mosquito densities in the households were surveyed for over 3 months before introducing the structural changes and 5 months after the mosquito-proofing. While there was no difference in the indoor mosquito densities in the three household groups before the screening of the houses, the screened households in groups b) and c) showed a greater than 98% reduction in the most common local malaria vector, *An. arabiensis*, and around 46% reduction in the indoor densities of the non-malaria vector, *Culex quinquefasciatus*. While the households using untreated or treated screens did not differ in mosquito

densities, the treated screens had the ability to kill the lab-reared insecticide-susceptible *An. gambiae* mosquitoes even after 8 months. Thus, while the screening of the households reduces the mosquito densities inside the households, the insecticide-treated screens have the potential of being a successful vector control tool at the household level by also killing the mosquitoes and overcoming the limitations of the use of IRS and ITNs, such as acceptability and regular use by the community.

Malaria Scientist to Watch: An interview with Dr Kasinathan Gunasekaran



[Dr Kasinathan Gunasekaran](#)

Scientist G, Retd.,
ICMR-Vector Control and Research Centre,
Puducherry, India

1. Being a renowned entomologist, please share your views on the importance of vector management for achieving the goal of malaria elimination.

Globally, vector-borne diseases (VBDs) such as malaria, dengue, and leishmaniasis contribute to a huge burden of morbidity and mortality. Although, India has made considerable progress in reducing its malaria burden over the past 15 years, malaria control and elimination is a major challenging task in the country, especially in areas that are facing certain operational obstructions due to drug-resistant strains of human Plasmodium species, low-density Plasmodium infections, vector resistance to insecticides, a shift in vector behaviour, extra-domiciliary/outdoor transmission, population migrations, ecosystem degradation, and climate change. Nevertheless, vector control, with a long and well-recognized history, remains to be highly effective in managing vector populations to reduce/ interrupt/ prevent transmission of the disease. By implementing the existing vector control interventions, a few countries could achieve the elimination of malaria and set an example of elimination through vector management. Thus, vector control which aims to limit the transmission of disease-causing pathogens by reducing human-vector contact has become a vital component of malaria control and elimination strategies. Vector control currently relies mainly on two long-term measures viz., IRS and distribution of LLINs. Also, WHO has recommended the deployment of either one of these two interventions for vector control in most areas at risk of malaria. While interventions using LLINs and/or IRS have reduced the transmission intensity and burden of malaria in many settings in India, it is not sure whether these interventions alone would tackle the vector-related operational obstacles and push the areas to a zero transmission status. In this perspective, for completely interrupting and sustaining zero transmission, additional/ newer vector control tools with a novel mode of action need to be integrated with the existing tools for evidence-based implementation. Further, the integrated vector management (IVM) approach, which

is a rational decision-making process for the optimal use of resources, would strengthen the vector control components, especially when control is successful and additional efforts/inputs are required to sustain a country-wide malaria elimination.

2. In view of India's malaria elimination target by 2030, what should be the current priority areas with respect to vector control and management?

In view of achieving and sustaining zero transmission, especially in situations with residual transmission, there is a pressing need to update the information on the bionomics of vectors, their behavioural characteristics, and their response to insecticides. In this line, some of the priority areas for research are given below:

- Biology and bionomics of malaria vectors exhibiting distinct distribution patterns in diverse ecosystems, focusing on their resting and feeding behavioural patterns including changes, if any, in response to vector control interventions.
- Improvement of existing vector control tools or implementation of tailored ones or development of novel tools for the control of residual transmission due to outdoor and early biting of malaria vectors.
- Role of Anopheles species other than the recognized vectors (e.g. *An. subpictus* in coastal areas) in malaria transmission and formulating suitable/ targeted control strategies.
- Operational issues related to IRS and LLINs.
- Strategy development to enhance community acceptance and compliance with vector control interventions.
- Determination of receptivity (prevalence of recognized vector species and their vector characteristics) of the vulnerable areas (receiving immigrants from malaria-endemic areas) with reference to formulating suitable vector control interventions.
- Innovative approaches for vector surveillance and impact assessment of larval source management in reducing malaria transmission in urban areas.
- Determination of frequency, intensity, and underlying mechanisms of insecticide resistance among vector populations in relation to resistance management.

3. With the recent advances in technology, how do you think artificial intelligence (AI)-based approaches could support vector management and ultimately vector-borne disease control?

Timely implementation of vector control interventions becomes often difficult in the absence of robust vector surveillance in the field. The conventional methods of collecting mosquitoes and identifying them are laborious and time-consuming. In this context, the application of machine learning and AI techniques, by which a large number of mosquito/vector species can be identified simultaneously while they get collected, will have applied value. Mosquito smart traps that are developed incorporating this technique will have potential applications for vector surveillance thereby facilitating vector management. However, what is needed to operationalize such smart traps is an in-depth validation, especially AI-based identification of anophelines, in the field.

4. There is a growing concern about very few well-trained entomologists in India. What would be your message to the young researchers and students looking to take up entomology as a career option?

An entomologist is basically a scientist, and in the field of public health, he/she will apply his/her research data to determine the effects of the vectors on the community. Entomologists play a crucial role as the information discovered by them is shared with public health professionals to ensure people's safety by reducing the incidence of direct and indirect harm to them. But, in recent years, there is a general feeling that young entomologists are more interested in molecular lab work than identifying and collecting mosquitoes/vectors in the field. This opinion should go as, public health needs entomologists who can go to the field (village, town, or jungle) and figure out what a disease is, and its transmission dynamics: where is it coming from, what's the host, what's the vector, and how can we contain it. Without such outlook/ holistic approach, an effective vector surveillance and control system cannot be built in place.

5. You have been associated with MERA-India as a mentor for the multi-centric project on Vector bionomics and control theme. In your opinion, how significant will be the contribution of MERA-India in achieving India's malaria elimination target?

Effective implementation of interventions is a critical component of malaria elimination. For achieving this, research needs, from all perspectives, to be identified, prioritized, and responded. MERA-India has created a platform for this and identified, through a series of deliberations, the knowledge gaps in various fields, including vector bionomics and control. Presently, MERA-India is engaged in supporting the researchers both technically and financially to carry out studies on various aspects including the development and/or testing of innovative and sustainable vector control tools/strategies to accelerate malaria elimination. Besides, MERA-India conducts training workshops for capacity building, an essential requirement for disease control. These endeavours need to be continued till the elimination target is achieved. Thus, the contribution of MERA-India in achieving malaria elimination in India will be highly significant.

Malaria Through the Lens of Researchers

In this issue, we are highlighting the **third prize winning entry** of the MERA-India Image Competition 2022.

Dr Renuka S, a postdoctoral student of Dr Vani H C, ICMR-NIMR FU, Bengaluru won the third prize in the image competition. Her submitted image was entitled “*Beauveria bassiana*- A slow but steady vector control tool for malaria vector, *Anopheles stephensi* (Culicidae)”



A brief description of the image is as follows:

Adult female *An. stephensi* mosquitoes were exposed to *Beauveria bassiana*-treated cement panels for 30 minutes through the WHO cone bioassay test as per WHO standard protocol. Mosquitoes' mortality was observed 3-4 days after treatment and mycosis was developed within 2-3 days after the mosquito's death. Dead adult female *An. stephensi* mosquitoes showed mycosis when mosquitoes were exposed to entomopathogenic fungi *B. bassiana*. Since *B. bassiana* reduces the survival rate of adult mosquitoes, it can be integrated with the malaria control program for efficiently reducing the adults' density and thereby disease transmission.

Upcoming Events

Lecture Series on Infectious Diseases 2.0: Lecture 01 by Dr Radha Rangarajan



The banner features logos for NIMR (National Institute of Malaria Research), ICMR (Indian Council of Medical Research), and MERA India (Malaria Elimination Research Alliance India). It includes a portrait of Dr. Radha Rangarajan, her title as Director of CSIR-CDRI, Lucknow, India, and the lecture title: "Antibacterial drug discovery: opportunities and challenges". The event is scheduled for Tuesday, 24th January, at 11:00 am IST. A QR code and a lecture link (bit.ly/LSID23-Jan) are provided. Social media handles for @meraindia.org.in, @MERAIndiaICMR, @meraindiaicmr, and @meraindiaicmr are listed at the bottom.

In continuation of the earlier lecture series, ICMR-NIMR and MERA-India are launching the next "Lecture Series on Infectious Diseases 2.0", where twelve lectures will be hosted in the year 2023, from eminent scientists working in the field of infectious diseases. The first lecture in the series will be delivered by Dr Radha Rangarajan, Director of CSIR-Central Drug Research Institute (CDRI), Lucknow India on 24th January at 1100 hrs IST. In addition to her directorial responsibilities, she is also a member of the Steering Council of the MedTech Incubator, International Institute of Information Technology, Hyderabad (IIIT-H); Scientific Program Committee of IHub-Data, IIIT-H; the Selection Committee of the NIDHI-Seed Support System at the Atal Incubation Centre-CCMB; and the Selection Committee for DST INSPIRE Faculty Fellows.

Dr Rangarajan's research interest is understanding the molecular mechanisms of antimicrobial resistance and developing novel approaches to incapacitate resistant pathogens. She will be delivering the lecture entitled "Antibacterial drug discovery: opportunities and challenges", where she will discuss the clinical needs, new scientific approaches, and other aspects to support anti-bacterial drug discovery and development.

To join this lecture, please click on this link: bit.ly/LSID23-Jan.

Distinguished Lecture by Dr Madhumita Dobe

Dr Madhumita Dobe (Chairperson, Foundation for Actions and Innovations Towards Health Promotion (FAITH); Former Dean, Director-Professor and Head of the Department of Health Promotion and Education, All India Institute of Hygiene & Public Health, Kolkata) will be our speaker for the upcoming distinguished lecture, organized by ICMR-NIMR and MERA-India. Dr Dobe's core interest is Health Promotion and Education, Social and Behaviour Change Interventions, Water, Sanitation, and Hygiene (WASH) and health, Maternal & Child Health, and Nutrition – with a special focus on Infant and young child feeding.

The lecture will be held on 30th January 2023 at 1100 hrs IST. The link to join the lecture and other details will be circulated through our website (<https://meraindia.org.in>) and social media accounts.

To receive regular updates about the events being organized by MERA-India, please subscribe at https://www.meraindia.org.in/event_sub.



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