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News & Views

Issue 21, July 2022

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Dr Regina Rabinovich
ISGlobal, University of Barcelona

Dr Bontha V Babu
ICMR, New Delhi

Upcoming Event

Distinguished Lecture by

Dr Arun Sharma
Director, ICMR-NIIRNCD

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Dear Readers,

MERA-India team brings you the twenty-first issue of our newsletter.

After the sultry summer season, the arrival of the monsoon brings a soothing cool breeze which is a great relief from scorching heat waves, especially in the northern part of India. However, the monsoon season marks the spurt of some life-threatening diseases like malaria, dengue, and others. All these are vector-borne diseases caused by viruses, parasites, and other microbes. Due to water stagnation and unclean surroundings, there is an increase in breeding sites of mosquitoes and transmission of vector-borne diseases during the rainy season.

As featured in our previous newsletter issues, climate change drastically impacts on the incidence of vector-borne diseases worldwide. The outbreak of these diseases primarily occurs in tropical and subtropical regions, which results in burdened health facilities in endemic areas. Hence, it is imperative to take protective measures through public awareness and behavioral changes at the community level, to reduce the burden of vector-borne diseases.

MERA-India encourages innovative research and supports researchers working on malaria, one of the life-threatening mosquito-borne diseases present worldwide. To spread awareness of mosquito-borne diseases like malaria, before the onset of the transmission period, the month of June has been observed as 'anti-malaria month' in our country. MERA-India has been instrumental in spreading awareness about the causes, symptoms, diagnosis, and treatment of malaria through social media platforms. These posts are summarized in the current issue.

This issue of the MERA-India newsletter brings to you inspirational, encouraging interviews by two experts, Dr Regina Rabinovich (Director of the Malaria Elimination Initiative at ISGlobal at the University of Barcelona) and Dr Bontha V. Babu (Scientist G & Head, Division of Socio-Behavioural & Health Systems Research, Indian Council of Medical Research) in the 'Malaria Scientists to Watch' section.

In the 'Research in Spotlight' section, you will get the latest research updates in the fields of malaria epidemiology and data visualization through a digital dashboard, vector control tools, and malaria diagnostics. Under the "Resource for Malaria Researchers" section, we have featured "VectorBase", an online resource for invertebrate vectors of human pathogens. In our "A Child's Perception of Malaria" section, we have displayed another

beautiful sketch from a young kid demonstrating his understanding of malaria symptoms.

We are excited to have Dr Arun K. Sharma (Director, ICMR-NIIRNCD) as our next Distinguished Lecture speaker. We invite all our readers to attend this lecture in August.
In the "Announcements" section, we have highlighted the India-EMBO Lecture course to be held in November 2022 and the Biotechnology Ignition Grant (BIG) funding scheme for entrepreneurs by Biotechnology Industry Research Assistance Council (BIRAC).

We hope that this issue will be more engaging and fascinating for you. Please write to us for any feedback or suggestions regarding the newsletter's content at meranewsletter@gmail.com.
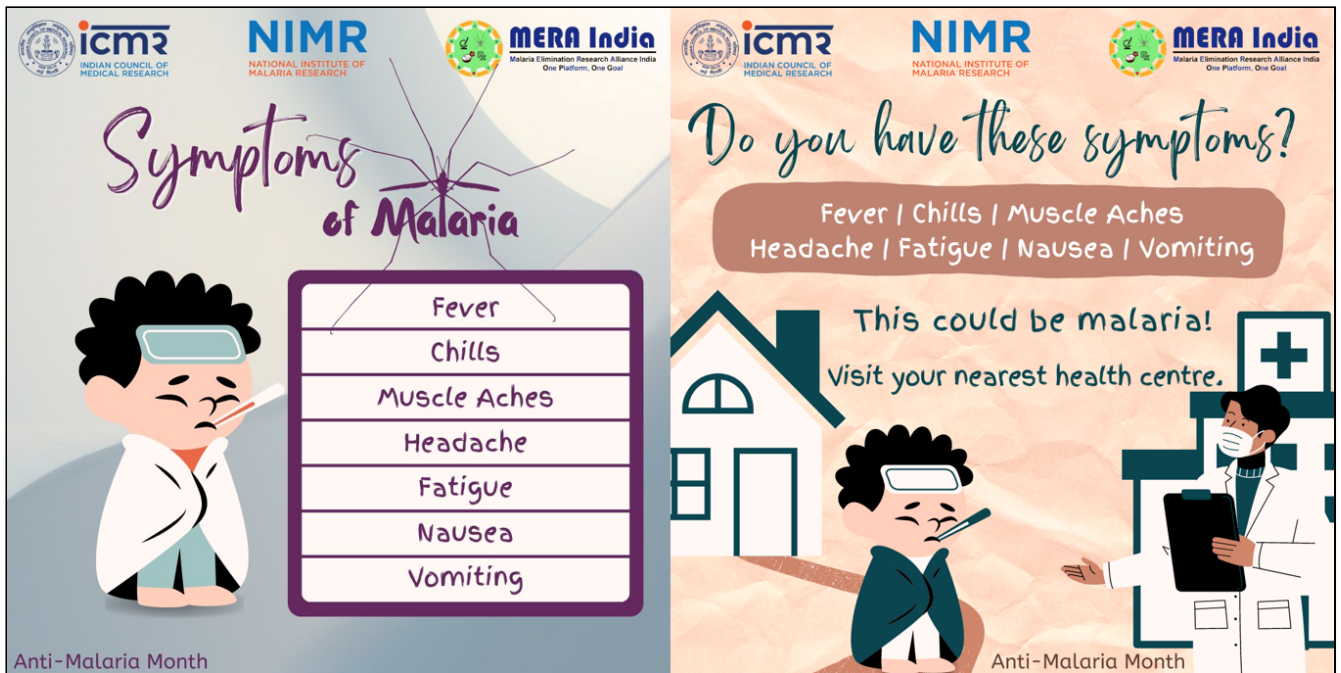
With best wishes,
MERA-India team

ICMR-NIMR & MERA-India Activities
June: Anti-Malaria Month in India

The month of June, marking the beginning of monsoon and malaria transmission season, is observed as anti-malaria month across India. Awareness campaigns, fever surveys, and sanitation drives are carried out across the country to make people aware of the threat of malaria, tools for protection against mosquito bites, and the ways to prevent malaria and vector-borne diseases. In this regard, MERA-India spread awareness about malaria through our social media accounts (Twitter, Facebook, LinkedIn, Instagram & Koo) and our website. We posted information about various aspects of malaria transmission, diagnosis, treatment, prevention, and control. The messages were posted in English and Hindi. Malaria is a preventable and curable disease if diagnosed timely. Community engagement is critical to the success of any disease elimination programme and for the success of any intervention. India is targeting to eliminate malaria by 2030. Therefore, to eliminate malaria, it is important that every individual contributes to the fight against malaria.

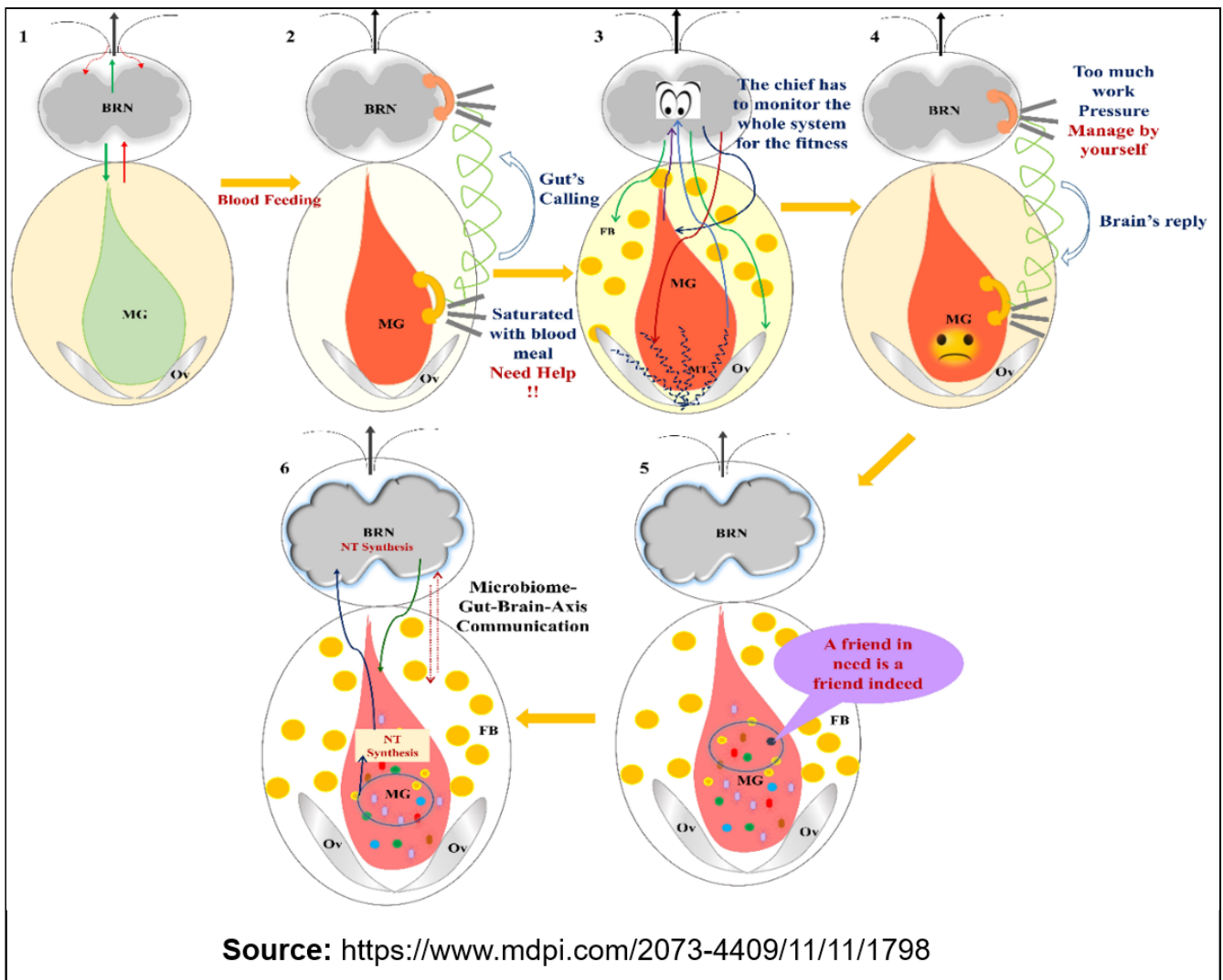Some of our posts from the anti-malaria month are highlighted below:

Research in Spotlight

Yadav CP and Sharma A., *The Lancet Reg Health - Southeast Asia*, 2022: National Institute of Malaria Research-Malaria Dashboard (NIMR-MDB): A digital platform for analysis and visualization of epidemiological data

Source: https://www.thelancet.com/journals/lansea/article/PIIS2772-3682(22)00035-X/fulltext#seccesectitle0001
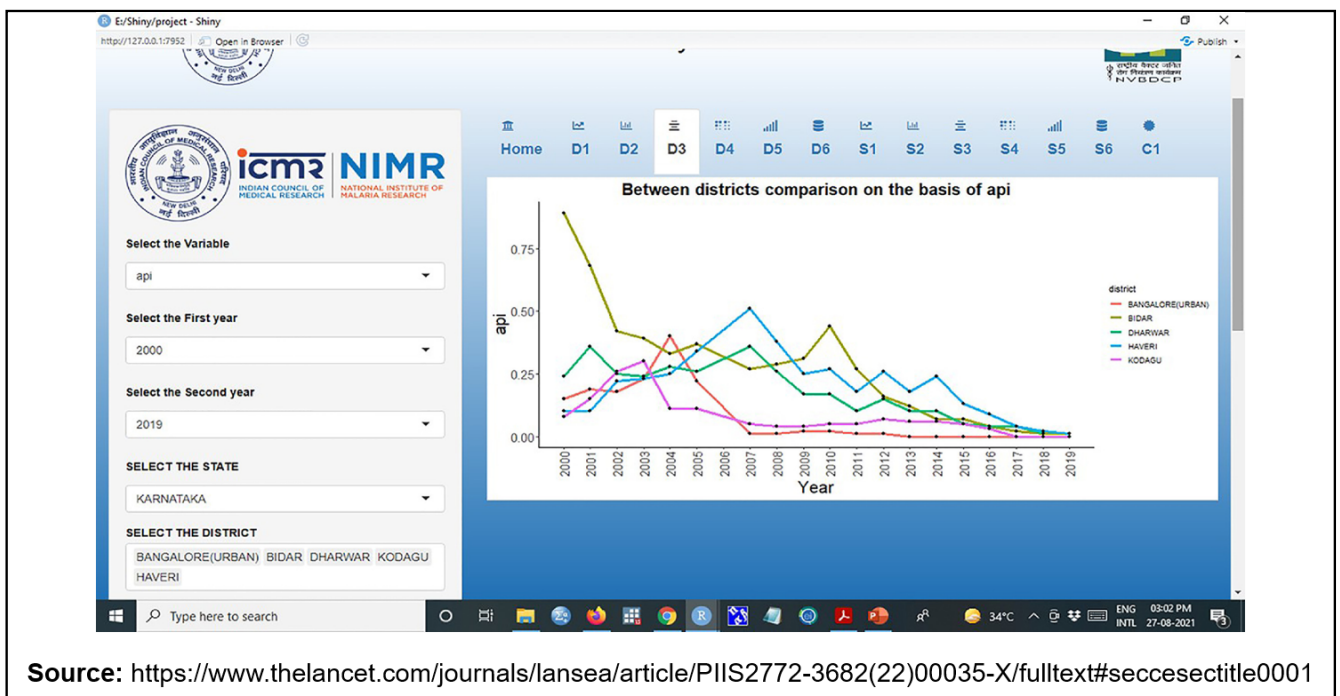
The use of digital tools, like a dashboard, for real-time data monitoring and assessment is very helpful in taking timely decisions and actions for handling the disease situations. In India, the Directorate of the National Centre for Vector Borne Diseases Control (NCVBDC) has been collecting and recording data on vector-borne diseases, including malaria, for decades. However, a tool for the analyses of this data has been missing. In this article, the authors describe the building and use of an R-based interactive digital dashboard (National Institute of Malaria Research-Malaria Dashboard: NIMR-MDB) for easy analysis and visualization of malaria epidemiological data from India recorded since the year 2000. With NIMR-DB, various malaria parameters such as the number of malaria cases, deaths, API, SPR, ABER, etc., can be visualized at the national, state, or district level and can be easily compared between different districts. Such tools can be used by researchers, policy-makers and national malaria programmes to strategize malaria-centric activities and resources based on the trends and evolving malaria situations. Further, this dashboard can serve as a model dashboard and can also be tailored for monitoring other diseases as well.

Source: https://www.mdpi.com/2073-4409/11/11/1798

"Gut feeling" has been common parlance for ages. Scientists have also stated that gut feelings are actually the product of bidirectional communication between the gut and brain with the help of a complex network of neurons and neurotransmitters. Gut microbiota plays a crucial role in regulating this gut-brain axis and can influence mood, cognition, obesity, etc.

In this article, the authors have established the understanding of this microbiome-gut-brain axis in mosquitoes. They have shown that as soon as the mosquitoes take a protein-rich blood meal, the brain shifts its functioning from regulating external communication to inter-organ management, referred to as a "metabolic switch". Using decapitation experiments, authors have shown that even in the absence of a brain, the mosquito gut can

independently regulate the neuro-modulatory functions and act as the second brain for maintaining physiological homeostasis. Comparative metagenomic analysis and aseptic experiments provide evidence that the microbiome may have a neuro-modulatory role in regulating the gut-brain axis. This study provides a novel insight to explore the modulation of mosquitoes' olfactory and neural networks using microbiome alteration to develop new vector control tools.

Orban A. *et al., Sci. Rep.,* **2021: Sensitive detection of *Plasmodium vivax* malaria by the rotating-crystal magneto-optical method in Thailand**

Source: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8448879/
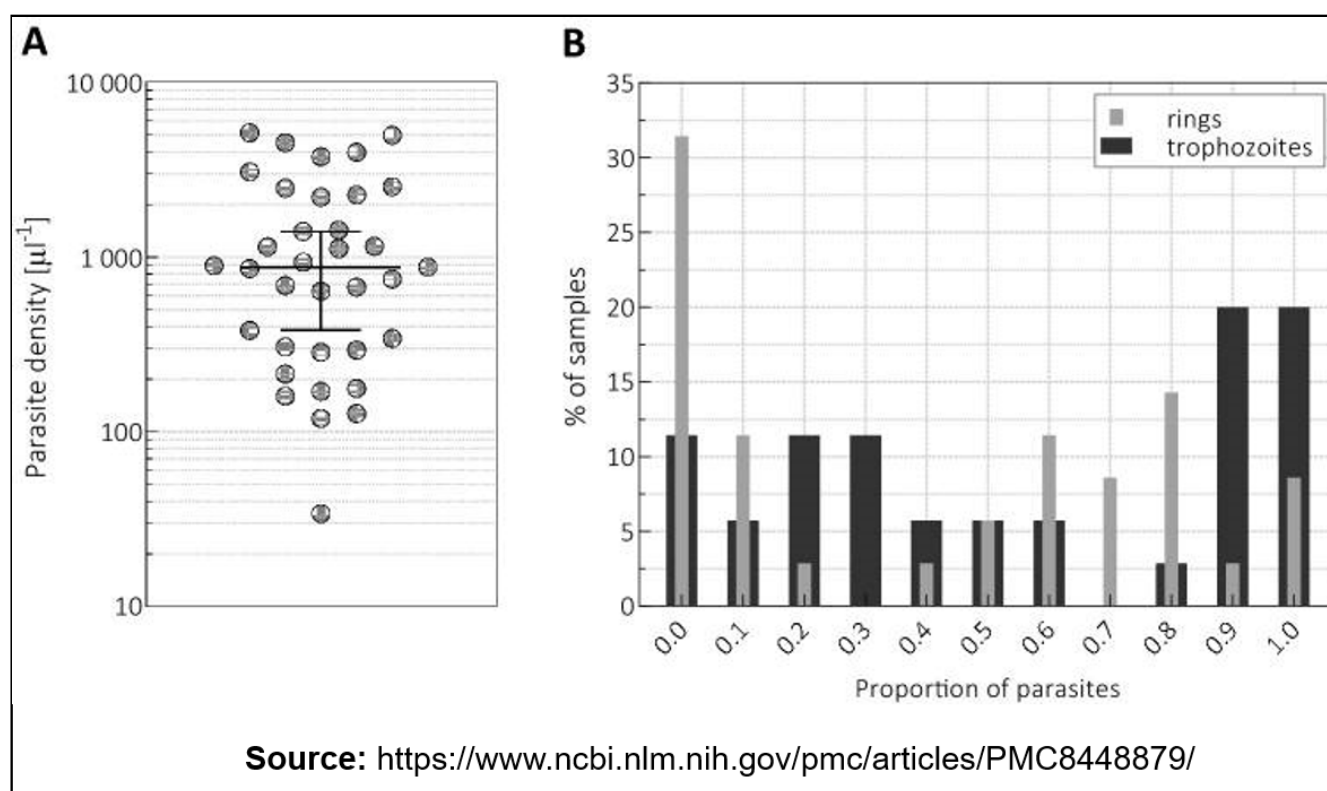
The development of efficacious, rapid, and low-cost diagnostic methods with high sensitivity and specificity is urgently needed in malaria research. The diagnostic method for quantitative detection of malaria is based on the rotating-crystal magneto-optical diagnostic detection (RMOD) by measuring the amount of hemozoin formed as a result of the breakdown of hemoglobin in red blood cells during intraerythrocytic stages has been recently developed. As these paramagnetic hemozoin crystals are present in peripheral blood, they play an important role as a biomagnetic marker of Plasmodium infection. An extended field trial in the high transmission study site in Papua New Guinea (PNG) which involved malaria-suspected patients, showed the greater potential of RMOD in the detection of malaria parasites, especially *Plasmodium vivax*. In the current study, the

authors determined the sensitivity of RMOD for diagnosing *P. vivax* malaria in regions of low transmission in Thailand. For the study, they used confirmed positive samples for *P. vivax* infection by microscopy. *P. vivax*-infected samples were classified as malaria-positive with MO values typically 1–3 orders of magnitude higher than the cut-off level of RMOD determined on uninfected samples. Further, the authors tested the potential of the magneto-optical (MO) signal for malaria diagnosis and determined parasite stages in the samples. The authors found that the limit of detection for *P. vivax* for RMOD competes with molecular diagnostic tools such as PCR, as tested by the serial dilutions of the samples with malaria infection where low parasite density could be achieved. Moreover, the authors estimated the relative hemozoin production rates of the different blood stages of *P. vivax* infections *in vivo* based on the MO values of the samples. The applicability of RMOD based method that quantifies the hemozoin content present in blood stages for in-field malaria diagnostics and epidemiological surveillance studies need to be tested further.

Malaria Scientists to Watch

An interview with Dr Regina Rabinovich

Dr Regina Rabinovich
Director,
Malaria Elimination Initiative, ISGlobal,
University of Barcelona

1. You have been working in the field of global health and infectious diseases for the last 25 years and have held key positions, including the current roles as Chair of the Malaria Eradication Scientific Alliance and the Director of the Malaria Elimination Initiative at ISGlobal, University of Barcelona. What motivated you to work in the field of malaria research?

My engagement in malaria began with vaccine development when the NIAID extramural program for vaccine evaluation took on an early transmission-blocking vaccine candidate more than 25 years ago. As a physician, I was struck by the enormous gaps in attention to a disease that was killing three children per minute, by best estimates. I was intrigued by the very complexity of the interplay between the parasite and the human immune response. This was indeed a worthy opponent. Twenty years ago, the current 'standards' were all new – the result of trials in the 1990s. Long-lasting insecticide-treated bednets, rapid diagnostics, artemisinin-based combinations. Rapid scale-up, fuelled by the new Global Fund, opened-up horizons for new impact on this ancient disease. Contributing to malaria at that time was full of optimism and new horizons.

2. While we have been battling malaria for centuries, we have also seen the advent of several new tools, for example, LLINs, ACTs, and the RTS,S malaria vaccine approved for use by WHO last year. If you have to pick one intervention that has played the biggest role in our fight against malaria, which one would that be?

The key intervention has to be knowledge.We have learned a lot over the past 200 years – from the discovery of the parasite to the understanding of the transmission cycle and

mathematical computation of transmission dynamics. However, there is so much more to be learned, ranging from the key elements of natural immunity to how to combine interventions to the best effect – and delivering them to the furthest afflicted areas. The next-generation drugs, vector tools, and diagnostics cannot be imagined and developed without this kind of investment.

3. India has set up a target of malaria elimination by 2030 and has been seeing a decline in the number of cases and deaths. What do you see as the biggest challenge for India in achieving this goal?

A laudable goal indeed – and when achieved, this gift will keep on giving, as has been shown in the countries that have eliminated and been certified. The biggest challenge to achieving elimination in any country is sustained political commitment, particularly as the numbers drop and the disease becomes, due to competing priorities, a lower priority. The problem is that unless transmission stops, there are ample lessons that malaria returns, and often with marked epidemics, as happened in Sri Lanka.

4.What challenges do you see for women working in STEM?

In the ideal world, the challenges are the same as for men. Getting good ideas competitively funded, results, whether positive or negative, published, and generating the next ideas is hard! While historically dominated by men, we have wonderful female role models in the malaria field today. Realistically, there are cultural and historical challenges in almost every setting to the leadership roles for women. Change is visible, but the measurement is critical: tracking tenure rates for women in academic settings, publications, and project leadership, are all indicators of progress.

5. *What significance do you see for MERA-India in achieving India's malaria elimination target?*

A wonderful opportunity to drive science to impact. Using genetic epidemiology to better characterize gene flows, better targeting of interventions, and the interplay with social determinants of sustained transmission – given the progress that has been made already, this is the time for accelerating progress, and MERA-India can be a force for impact.

An interview with Dr Bontha V. Babu

Dr Bontha V. Babu
Scientist G & Head,
Division of Socio-Behavioural & Health Systems Research
Indian Council of Medical Research, India

1. Please share with our readers your journey from being a young scientist to your current role as the Scientist - G & Head, Division of Socio-Behavioural & Health Systems Research at ICMR.

Starting out as a young scientist, I was very motivated and eager to make a difference in people's health. I was very fortunate to join ICMR's Regional Medical Research Centre, Bhubaneswar as a scientist as soon as I completed my PhD. I was recruited as a senior research officer (re-designated as Scientist-C). Everything was new and confusing at first, but my energy and enthusiasm were high. I slowly realised that I had to struggle and find ways to survive in the system. During this process, I set an agenda with larger public health interests in mind, which further led to my professional growth. That was when WHO intensified its activities under the global programme to eliminate lymphatic filariasis. I was involved in these activities to strengthen the programme in Odisha and Andhra Pradesh. Some of my projects have been funded by WHO/TDR. Making the programme successful by improving the compliance to mass drug administration to anti-filarial drugs became the major goal of my research. In this period, I realised the importance of operational or implementation research. In addition, growing up in a political family and its pro-people ideology made this feel like a cause worth pursuing. Ultimately, I turned towards implementation research that aimed to improve people's access to health care and other disease-specific programmes. Thus I developed an interest in implementation research and gained the required expertise to accomplish it.

This journey took a sharp turn when I got transferred to ICMR headquarters to initially lead the division of health system research and later the socio-behavioural & health systems research. I used this position to promote research towards improving health care access. We conducted implementation research and community-based interventions to improve health care access to vulnerable populations like migrant labourers, tribals, etc. I believe these studies have a lot of impact by directly benefitting the people seeking treatment and thereby improving their health. As an average human being, I feel happy with this.

2. Humankind has been battling malaria for ages. Several countries have successfully eliminated malaria, and many others are on the path to achieving malaria-free status. In your opinion, which approaches/interventions have played the biggest role in our fight against malaria?

It is known that the world has made tremendous progress in the fight against malaria. During the second half of the 20th century, and 21st century, some countries have eliminated malaria. However, many countries are still struggling, and malaria continues to take a heavy toll.

I believe strongly that governments' commitment and transparent implementation of strategies work a lot. Technically, no single strategy has worked successfully. Strategies like epidemiological and entomological surveillance with integrated vector control with responsive diagnosis and treatment strategies worked together with effective programme management.

3. India has been seeing a continuous decline in the number of malaria cases and deaths and has set up a target of eliminating malaria by 2030. What do you see as the biggest challenge for India in achieving the malaria elimination goal by the year 2030?

India, through MERA-India, set the framework for eliminating malaria by 2030. The word 'elimination' was brought forth again. To achieve it, a primary focus should be on early detection and effective treatment along with integrated vector control. Effective community engagement is also vital in successfully achieving the objectives of these activities. Reporting of malaria cases should happen transparently in the system. MERA India should connect to and work with the state health departments and other implementing agencies. Novel tools and strategies should be shared with them. Hence, implementation research will have a significant impact.

As I mentioned earlier, a transparent implementation and commitment from all sectors are required. I believe that transparency is missed currently. We have to admit our flaws and limitations and move forward by correcting them.

4. You have been associated as a mentor for the MERA-India funded multi-centric project on Community Behavior determinants for malaria elimination. What potential do you see in MERA-India towards supporting India's malaria elimination target?

I am delighted to be involved in the MERA-India, which hopefully guides the nation in achieving the malaria elimination target. I believe that understanding the community behaviour and thereby achieving the community's participation in the elimination efforts are vital.

I have gone through the goals of MERA-India, which are extended from identifying the gaps to translating the research findings to the programme. These goals look very promising. Through a more robust advocacy component, MERA-India should work with the programme. Best practices found during the MERA-India's research are to be scaled up as an integral part of the programme. Thus, I hope that MERA-India will significantly contribute to achieving the target of malaria elimination.

5. What is one piece of advice that you would like to give to PhD students and early-career researchers?

I advise the younger generation, in general, to realise that there are no shortcuts. One has to inculcate the culture of hard work and self-making rather than relying on others. For the young people in research, I advise them to develop a passion for the subject they study. One should be competent in both the theoretical and practical aspects of the subject. That is enough to succeed.

Resource for Malaria Researchers: VectorBase


Source: https://vectorbase.org/vectorbase/app

[VectorBase](https://vectorbase.org/vectorbase/app) is a Bioinformatics Resource Center (BRC) for invertebrate vectors of human pathogens, funded by the National Institute of Allergy and Infectious Diseases (NIAID) and the National Institutes of Health (NIH). This database contains genomes of 22 mosquitoes (20 Anopheles *spp.* including major, minor, and non-vectors, *Aedes aegypti* and *Culex quinquefasciatus*) and other 13 invertebrate vectors like ticks, sandflies, etc. This database provides access to various tools like BLAST (Basic Local Alignment Search Tool) for finding regions of sequence similarity, CRISPR guide design tool for designing mosquito CRISPR sgRNA and finding orthologues, genome browser, sequence retrieval, etc. The search tool provides all possible information about the gene (annotation, function prediction, gene models, structure analysis, proteomics, transcriptomics, etc.), organisms, ESTs, metabolic pathways, and genomic sequences. VectorBase also maintains the ontologies related to vector control like IDODEN – Infectious Disease Ontology DENgue, IDOMAL - Infectious Disease Ontology MALaria, and MiRNAO – MicroRNA Ontology.

To know and explore more about VectorBase, visit https://vectorbase.org/vectorbase/app

A Child's Perception of Malaria

In this issue, we showcase the sketch of Mr Dipansh Bhasin, aged twelve years. Through the sketch, Mr Dipansh has described the symptoms associated with malaria-like fever, headache, nausea, vomiting, and dry cough.
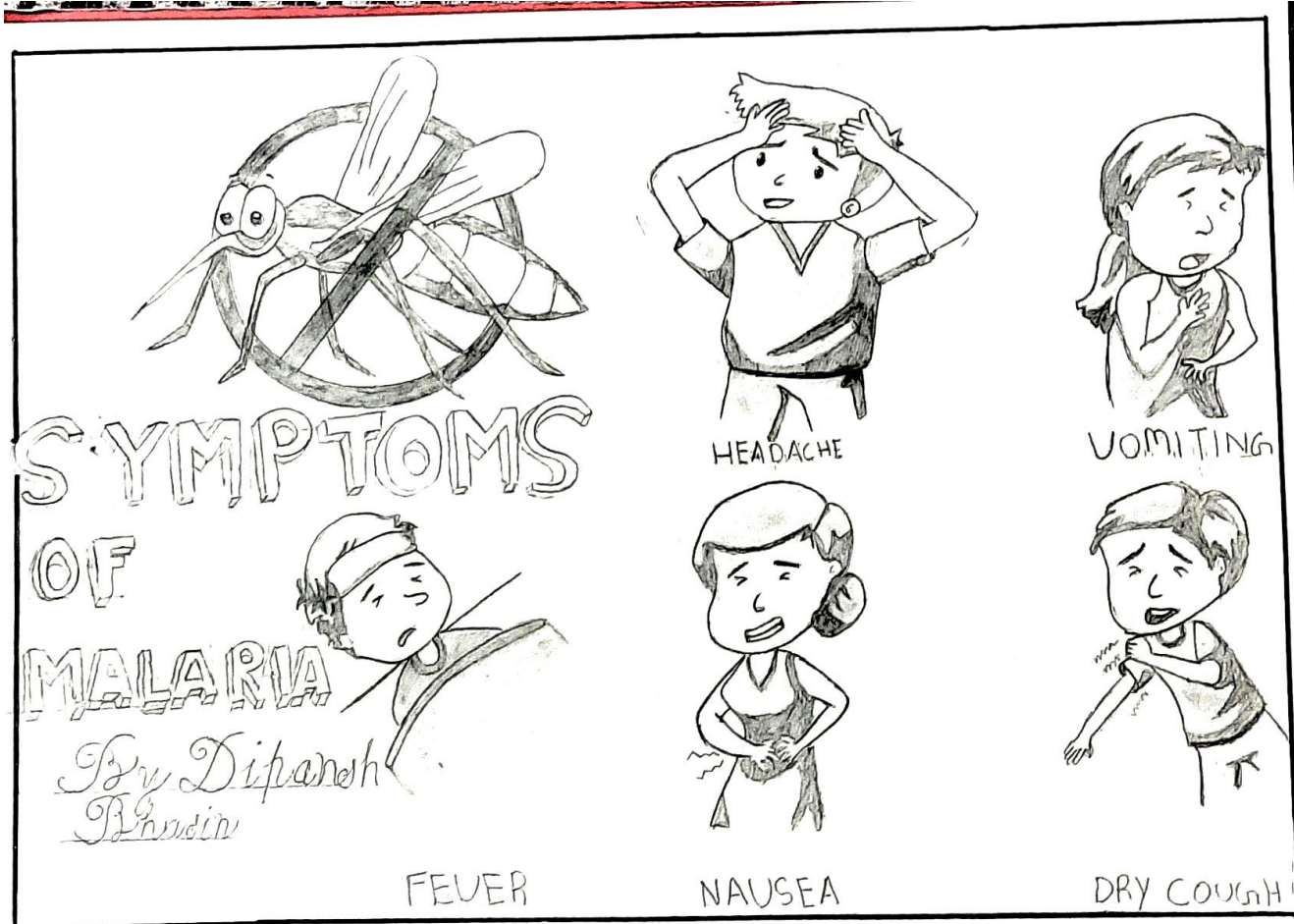
Sketch by: Mr Dipansh Bhasin (son of Mrs Meenakshi Bhasin, ICMR-NIMR Delhi); **Age:** 12 years; **Class:** Eighth
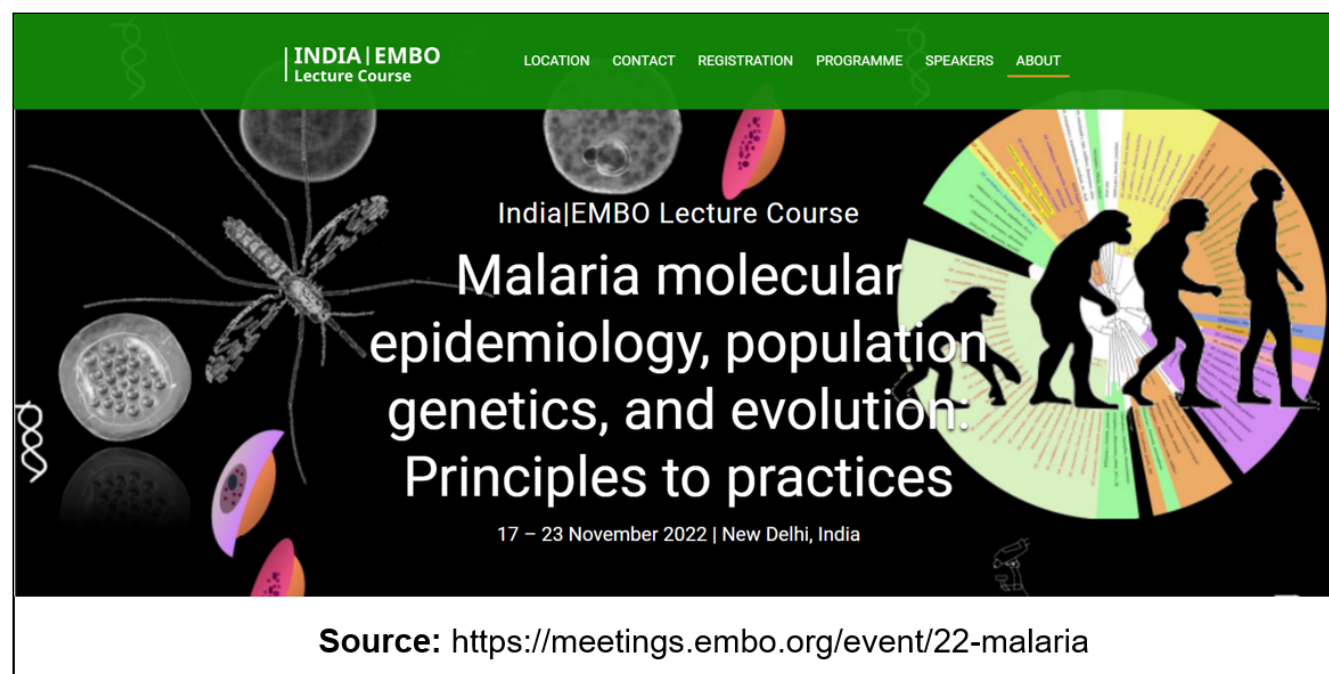
We are pleased to announce that Dr Arun Sharma, Director, ICMR-NIIRNCD will be our next speaker for the Distinguished Lecture Series. The lecture will be held in August, and further details will be shared through our website (https://meraindia.org.in/) and social media accounts.

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

Announcements

India-EMBO Lecture Course 2022

Source: https://meetings.embo.org/event/22-malaria

A six-day India-EMBO lecture course focusing on malaria molecular epidemiology, population genetics and evolution is being organized in New Delhi, India, in November 2022. The course is limited to 50 participants and aimed at PhD students, postdocs, and early career researchers.

The registration and abstract submission deadline has been extended to 15th August 2022.

For more details, visit: https://meetings.embo.org/event/22-malaria

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Biotechnology Industry Research Assistance Council (BIRAC): Biotechnology Ignition Grant (BIG)

Source: www.startupindia.gov.in/content/sih/en/government-schemes/biotechnology-ignition-grant.html

A grant funding scheme called Biotechnology Ignition Grant (BIG) launched by Biotechnology Industry Research Assistance Council (BIRAC) is available for individual entrepreneurs from research institutes, academia, and start-ups. This BIG scheme invests in ideas having potential to develop into commercial products/technologies. Funding up to Rs. 50 Lakhs for a duration of up to 18 months, mentorship, access to incubation etc., will be provided in this scheme.

The last date for proposal submission is 16th August 2022.

For more information, please visit:
www.startupindia.gov.in/content/sih/en/government-schemes/biotechnology-ignition-grant.html or https://birac.nic.in/desc_new.php?id=942.

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