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Malaria Elimination Research Alliance India
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MERA-India presents you...

NEWS & VIEWS

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INTERVIEWS

Dr Pragyan Acharya,
Associate Professor,
AIIMS, New Delhi

Dr Praveen Kumar Bharti,
Scientist E,
ICMR-NIMR, New Delhi

ANNOUNCEMENTS

1. Biology of Vector-borne Diseases Course
2. Keystone Symposia conference on Vector Biology

Editorial

Dear Readers,

MERA-India team brings you the twenty-fourth issue of our newsletter, “News & Views”.

We begin this issue by congratulating and welcoming Dr Rajiv Bahl for his new role as the Director-General of the Indian Council of Medical Research and the Secretary to the Government of India, Department of Health Research. Dr Bahl is a physician-scientist and played a crucial role in World Health Organization (WHO) from 2012-22. While working for Newborn and Child Health Research at WHO, he supported research in around 50 institutions in 20 Asian and African countries.

Through this issue, we would like to highlight one of the old yet new fields of science *i.e.*, Science photography. We all know that science is an extraordinary field that helps people understand the phenomenon in their surroundings and this vast tree has several branches with various carrier opportunities, such as engineering, medicine, geology, research, etc. But science photography is one of the most fascinating yet obscure fields of science. Science photography is the visual representation of scientific phenomena/discoveries and a way of communicating research to society using photographs. It is not just eye-pleasing but a paid profession. Scientific photography helps to gather the information that is difficult to capture through the naked eye and hence is very impactful for the researchers. This is mostly pursued by astronomers and ecologists to explore hidden gems of nature. The modern era of research uses advanced photographic technologies like electron microscopy, fluorescence microscopy, functional magnetic resonance imaging (fMRI), etc. to understand nature’s phenomenon.

Various photography competitions like “Science in Focus” from the India Science Festival, the #ScientistAtWork photo competition by Nature, annual photography competition by The Royal Society of Biology encourages researchers to showcase their research on a global platform. Although publishing research papers is the best way of displaying research on a global platform, their reach is limited to the scientific community. Displaying scientific photographs on a global platform will outstretch the reach of scientific research to people with limited knowledge of the subject.

MERA-India also encourages researchers to participate in such scientific photography events to showcase their research in an understandable way, which will attract common people and spread awareness. Working towards the same, MERA-India is hosting a national-level image competition on the theme “malaria” on the occasion of ICMR-National Institute of Malaria Research (ICMR-NIMR), New Delhi annual day. This will be a great platform for budding researchers to showcase their talent and publicize their work against malaria.

The current edition brings the distinguished lecture delivered by Dr Arun Sharma, who is presently the Director of ICMR-National Institute for Implementation Research on Non-Communicable Diseases (ICMR-NIIRNCD), Jodhpur. Through the lecture, he introduced

the concepts of implementation research and its role in the Control of Vector-Borne Diseases. In addition to that, we have also enclosed the inspiring interviews of Dr Pragyan Acharya, Associate Professor at the Department of Biochemistry, AIIMS, New Delhi, and Dr Praveen Bharti, Scientist E, ICMR-NIMR.

In the section “Research in Spotlight” we are showcasing three research articles, defining the chemoprophylaxis with artemether-lumefantrine as the intervention for forest-acquired malaria, the efficacy of R21/Matrix-M vaccine even after 2 years of follow-up in children during randomized control trials, and the effect of *Plasmodium* interspecies interactions on the prevalence of non-falciparum species. This newsletter also features the Protein Data Bank of Transmembrane Proteins (PDBTM) as a resource for researchers and “A Child’s Perception of Malaria”, through a beautiful sketch by nine year’s old Mr Stavya Kumar Badodiya.

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

With best wishes,
MERA-India team

ICMR-NIMR & MERA-India Activity: Distinguished Lecture by Dr Arun Sharma

Dr Arun Sharma, the Director of ICMR-NIIRNCD, Jodhpur, India, visited ICMR-NIMR in September 2022 to deliver a lecture in the ICMR-NIMR & MERA-India "Distinguished Lecture Series." Dr Sharma has served as a faculty in Community Medicine for 28 years and headed the Department of Biostatistics & Medical Informatics at the University College of Medical Sciences, Delhi, for more than ten years. Dr Manju Rahi, Director in-charge,

ICMR-NIMR, welcomed Dr Sharma, and Dr Sachin Sharma, Chief Consultant, MERA-India, introduced the speaker to the attendees.

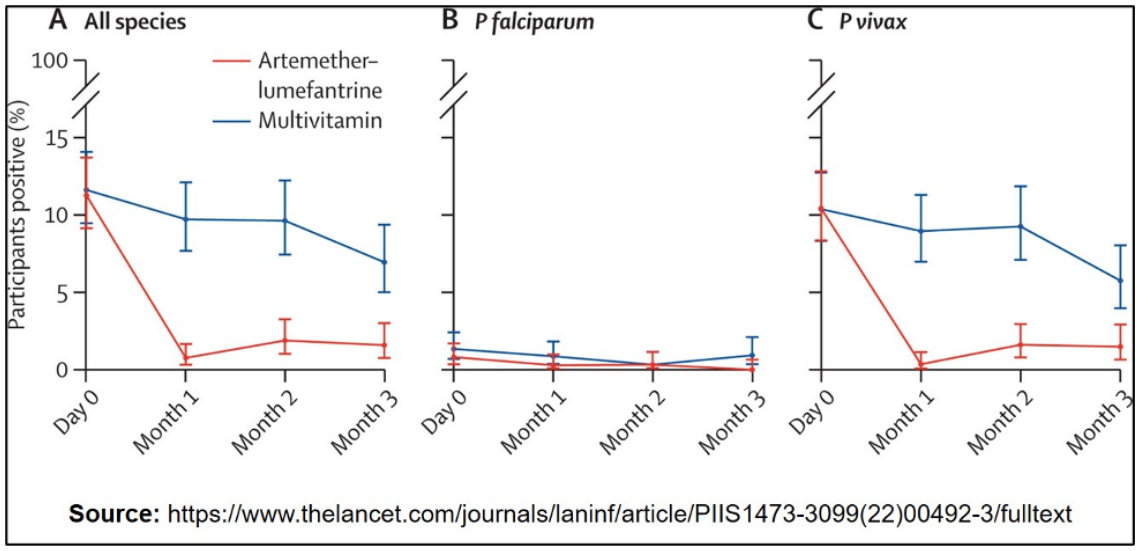
Dr Sharma's lecture was entitled "Role of Implementation Research in Control of Vector-Borne Diseases". In his lecture, Dr Sharma introduced the concept, principles, scope and methods of implementation research. He described the advantages, challenges and limitations of implementation research. He presented the scenario of publication status in the context of the major vector-borne diseases in India and implementation research for these diseases, at the global level and in India. He pointed out the disproportionately few publications from India focusing on implementation research for these diseases compared to other research types. He next highlighted the application and examples of implementation research in the control of vector-borne diseases with reference to malaria, kala-azar, acute encephalitis syndrome and dengue.

The lecture was followed by an interaction between Dr Arun Sharma and the NIMR scientists and answers to the questions from the audience. The session concluded with Dr Manju Rahi and Dr Sachin Sharma 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

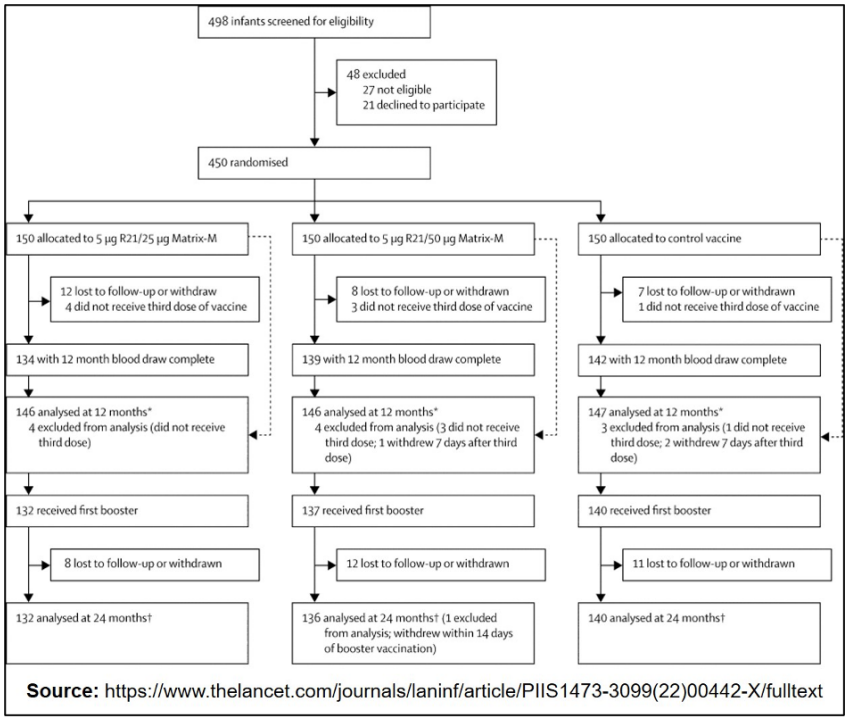
Tripura R. *et al.*, *Lancet Infect Dis.*, 2022: Antimalarial chemoprophylaxis for forest goers in southeast Asia: an open-label, individually randomised controlled trial



Source: https://www.thelancet.com/journals/laninf/article/PIIS1473-3099(22)00492-3/fulltext

Despite the increasing antimalarial drug resistance, the countries in the Greater Mekong subregion have been showing a great decline in malaria cases. Most of the current and recent infections in these countries are concentrated in forested regions. With most forest goers being asymptomatic infection carriers, and the malaria vectors in this region biting outside or before bedtime, no efficacious intervention against forest-acquired malaria is available. In this study, the authors conducted an open-label, individually randomized controlled trial in Cambodia to assess chemoprophylaxis efficacy against forest-acquired malaria. A total of 1480 participants, aged 16-65 years and staying overnight in forests, were recruited for the study. The participants were randomly allocated 1:1 to the group receiving antimalarial prophylaxis of artemether-lumefantrine or the control group receiving multivitamins without any antimalarial activity. The participants were followed up after every 28 days (+7 days window period) over a period of three months. The outcome was measured as a diagnosis of clinical malaria or subclinical infection detected by PCR, and adherence to the medication was assessed during follow-up visits by self-reporting. As compared to 17% of participants in the control group, only 3% of the participants receiving the chemoprophylaxis had clinical malaria or parasitemia. While *Plasmodium vivax* infections were reported in 16% of control group participants, 3% of treatment group participants were positive for *P. vivax.* The percentage of participants with *P. falciparum* infections was 1.7% and 0.3% in the control and treatment groups, respectively. The adherence to the full medication course was 97% in the treatment group and 98% in the control group. The adverse events were observed in 1.9% and 1.1% of participants in the treatment and control groups, respectively. This study has thus shown that chemoprophylaxis with artemether-lumefantrine can be an effective and feasible intervention for protection against forest-acquired malaria in low-endemic regions.

Datoo MS. *et al.*, *Lancet Infect Dis.*, 2022: Efficacy and immunogenicity of R21/Matrix-M vaccine against clinical malaria after 2 years' follow-up in children in Burkina Faso: a phase 1/2b randomised controlled trial



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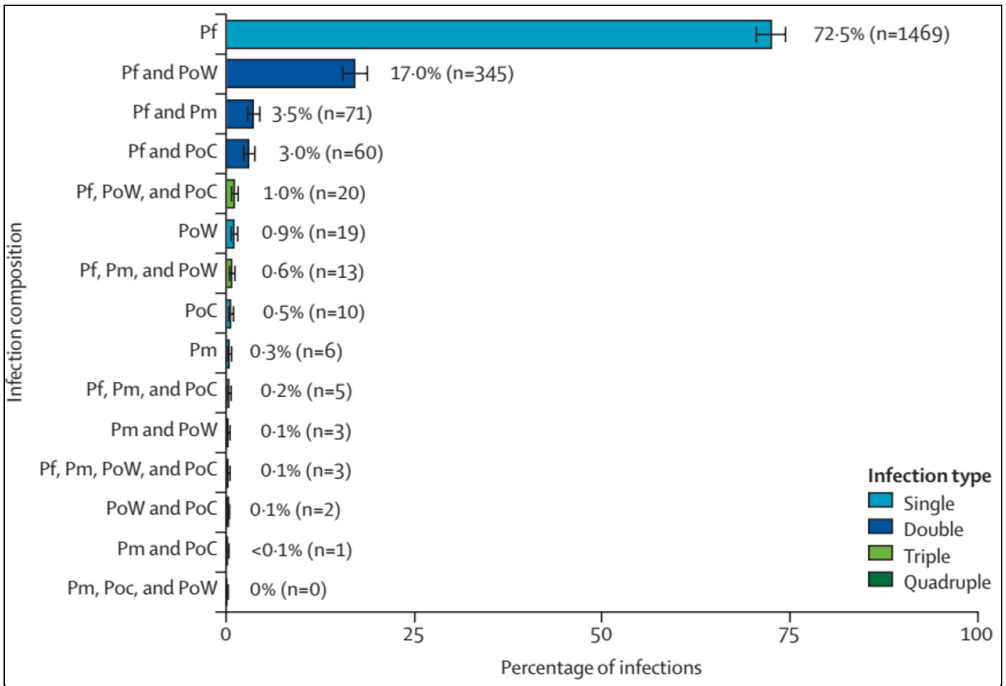
Vaccines play an important role in the control and elimination of any disease. In the case of malaria RTS, S/A10S, also known as "Mosquirix^{TM}" (GSK) is the only vaccine recommended for implementational trials by WHO initially on the children of Malawi, Ghana and Kenya. But the results of the third phase trial showed a decline in efficacy from 68% to 44% after 6 months of administration of the fourth dose. Hence to achieve the goal of malaria elimination, one of the goals should be to develop a vaccine with an efficacy of at least 75% for more than two consecutive years in endemic areas.

R21/Matrix-M is another vaccine candidate (developed at Oxford University, UK), which is being manufactured by the Serum Institute of India and already has achieved the WHO goal of 75% efficacy over the period of 12 months. In the present study, the authors have conducted phase 1/2b randomized control trials in 5-17 months old children of Nanoro, Burkina Faso. Through this trial, they were trying to assess the safety, efficacy and immunogenicity of the R21/Matrix-M vaccine over the period of 12 months after the administration of a booster dose. Out of 450 randomly assigned children (1:1:1) finally, 132,136 and 140 children were administered with 5 µg R21/25 µg Matrix-M,5 µg R21/50 µg Matrix-M and a control Rabivax-S rabies vaccine respectively. This study has revealed the efficacy of 71% and 80% after booster vaccination with low and high adjuvant groups respectively. Even in the groups of high adjuvant booster vaccination, an efficacy of 78% was achieved after multiple malaria episodes. Post immunization, anti-NANP antibody titers were also monitored for 12 months, which has also correlated with the efficacy results in the follow-up of both consecutive years. After the promising results of this trial, the phase three trial has already started with around 4800 participants, with the aim of achieving a license for the R21/Matrix-M vaccine by 2023.

Akala HM. *et al., Lancet Microbe.,* 2021*: Plasmodium* interspecies interactions during a period of increasing prevalence of *Plasmodium ovale* in symptomatic individuals seeking treatment: an observational study



Source: https://www.thelancet.com/journals/lanmic/article/PIIS2666-5247(21)00009-4/fulltext

P. falciparum is a major cause of lethal malaria worldwide; however, non-falciparum malaria cases also contribute significantly to the malaria burden in endemic regions. In this article, the authors determined the prevalence of non-falciparum malaria in the symptomatic individuals shown at healthcare facilities in the given study period in different malaria-endemic regions in Kenya. The clinical samples were examined for different *Plasmodium* species by PCR and the prevalence of species was evaluated by using descriptive statistics. Further, they assessed the interspecies interactions using statistical modelling, which showed significant interference between *P. falciparum* and *P. ovale curtisi*. The present study described the changes in the prevalence of non-falciparum malaria in malaria-endemic areas of Kenya over time, with an increase in *P. ovale spp.* infections, which may be due to the decreased responsiveness of these species to antimalarial treatment. Together, these results suggested that the infections caused by non-falciparum species should be taken into consideration in control strategies for malaria.

Malaria Scientists to Watch

An interview with Dr Pragyan Acharya

Dr Pragyan Acharya

Associate Professor

Department of Biochemistry, AIIMS, New Delhi

1. What inspired you to work in the field of malaria?

I entered malaria research quite accidentally. I did my Ph.D. from the Indian Institute of Science, Bengaluru, through the Integrated Ph.D. program which allows the student to select their lab for Ph.D. I joined the laboratory of Professor Utpal Tatu in the Department of Biochemistry since he was developing proteomics-based methodologies, which seemed like an interesting area of study to me. Once I joined the lab, I realized that proteomics could be used powerfully to uncover various aspects of host-parasite interactions in malaria, which I found fascinating. Subsequently, I went to NIAID, NIH, to the laboratory of Dr Patrick Duffy to understand severe human malaria. There I worked with clinical samples collected in NIH field sites in Mali and Tanzania and understood the methodology and the rigor required to work with human clinical samples. I was convinced early on that I wanted to study human disease directly with clinical samples and to take those leads to laboratory models for mechanistic understanding. In fact, that's the approach that we follow in our lab even today. Our work is shaped heavily by observations made in the clinic and by the needs of patients and clinicians. We have made every effort to ensure that our work always has a component that can benefit the patient and supports the clinicians that provide care, in addition to carrying out cutting-edge basic research.

2. How do you think basic research can contribute to achieving the goal of malaria elimination?

Basic science research can have a profound impact on the goal of malaria elimination. The problem of malaria must be addressed holistically and should involve basic research, clinical care, public health approaches, and tie-ups with the biotech industries to scale up new technology. I see the role of basic scientists at the forefront of malaria elimination in the discovery of new vaccine candidates that will be effective in India; in defining the genomic strains of parasites of different geographic origins; in discovering new aspects of host-parasite interactions, both at the level of the human host and the mosquito vector; in designing innovative vector control strategies without major disruption to ecological balance; in developing innovative and inexpensive diagnostics which allow tracking of less frequent malaria species in addition to the more common *P. falciparum* and *P. vivax*. These are just some ideas, but there are many ways in which basic scientists can participate - as educators or as providers of training in basic molecular approaches like PCR or ELISA to field site technicians - in addition to carrying out molecular research.

3. In today's digital era, what role do you think social media can play in disease control or elimination?

Social media enables scientists, clinicians and policymakers to connect with citizens to increase awareness and education. We should use social media to reach our citizens directly and to begin a "national movement for malaria eradication" that will involve citizens in addition to the government's and the research fraternity's efforts. MERA-India should consider hiring social media managers for this reason. Social media can also make science accessible to the public through active science communication so that scientific discoveries are made understandable.

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

STEM fields are technically challenging and personally demanding. While women can handle any technical challenge thrown at them, their personal commitments need a supportive environment – particularly the caregiving of young children. A major challenge I see that can be overcome with positive intent and infrastructural planning is the inclusion of high-quality childcare units and playschools in institutions of eminence. In addition, strategies that I have found effective are allowing flexible working hours and focusing on productivity in the workplace. I feel that we will be able to support women in the workplace better if we systematically plan to do so by including their needs in our infrastructural designs and work schedules. These issues are not discussed openly and, therefore not addressed; as a result, many young women who would like to continue working in STEM fields drop out.

5. In your opinion, how is MERA-India contributing to India's malaria elimination target?

I think MERA-India is a fantastic endeavour and has the potential to unite malaria elimination efforts from various angles. MERA-India has invited several proposals from malaria researchers nationwide and united their efforts toward India's malaria elimination target. I think the program can still do more by including individual scientists working on malaria and bringing them to the MERA platform. MERA-India has the potential to provide a strong platform to launch the most innovative ideas in malaria elimination.

An interview with Dr Praveen Kumar Bharti

Dr Praveen Kumar Bharti

Scientist E

ICMR-NIMR, New Delhi

1. What inspired you to work towards the goal of malaria elimination?

I was born in a rural part of India and grew up seeing the devastating impact of infectious diseases on humans, especially children. I got curious to learn more about infectious diseases and how to get involved in fighting them. This curiosity grew and as I went through college education, I decided to pursue a research career in infectious diseases. This exposure motivated me to pursue my research in the field of molecular epidemiology of malaria parasites. I started working on different aspects of the malaria parasites, such as molecular diagnosis, antimalarial resistance, population genetics of malaria parasites and molecular markers for insecticide resistance. Subsequently, the Government of India launched a timeline to eliminate malaria. However, malaria elimination from India presents unique challenges because of its population, topography, diverse climate, and uneven healthcare delivery capacity in rural areas. With these challenges, we initiated a study entitled Malaria Elimination Demonstration Project (MEDP) in the malaria-endemic Mandla district of Madhya Pradesh state to demonstrate the possibilities of elimination, quick detection of re-introduction and prevention of malaria. This project was initiated as a public-private partnership between the Indian Council for Medical Research (ICMR), the Government of Madhya Pradesh (GoMP), and the Foundation for Disease Elimination and Control of India (FDEC-India), which is a CSR subsidiary of Sun Pharmaceutical Industries Ltd.

2. According to you, what are the gaps in India's malaria elimination program which need to be filled to successfully achieve the goal of malaria elimination?

In my opinion following research gaps and challenges are being faced in achieving the goal of malaria elimination:

- **Migration and Malaria Surveillance Strategy:** Malaria due to migration is an important concern as it serves as a reservoir and seeds local outbreaks. Moreover, migrant workers either take temporary shelter or come from malaria-endemic areas, and thus could impede surveillance.
- **Pregnant Women and Children:** Pregnant women and children below five years are more susceptible to malaria; therefore, extra caution must be taken for them.
- **Asymptomatic/ Afebrile Malaria:** Asymptomatic cases do not show symptoms but may transmit parasites under favourable settings.

- **Resistance:** Drug resistance in parasite strains and insecticide resistance in vectors are the major roadblocks to malaria elimination. To fight resistant strains of parasites, alternative synthetic antimalarial drugs may be tested and novel vector control strategies need to be developed.
- **Malaria Vaccines:** The unavailability of an effective malaria vaccine is also a prime challenge.
- ***Plasmodium vivax* is also a Roadblock in the Success:** Limited understanding of the pathophysiology of *P. vivax,* such as hypnozoites, a low-density blood-stage infection, mature gametocytes, transmission facilitated by the early production of infective stages and genetic diversity in *P. vivax* populations can affect the elimination goals significantly.
- **Inter-sectoral Coordination:** Public-private partnerships play a crucial role in accelerating malaria elimination; hence efforts need to be made to strengthen this partnership.

Other than the above-mentioned challenges, the following programmatic challenges also exist:

Training healthcare workers should include a pre-and post-assessment with a minimum threshold of expertise required for the implementation of program objectives.

- Using mobile application surveillance tools, digital data reporting can be adopted in the system.
- Strict monitoring of the implementation of vector control measures should be pursued.
- Mass screenings should be undertaken in hard-to-reach and high API sub-centres.
- Periodic and regular reviews can help in refining the overall work product.

3. Resistance, in the context of parasites or vectors, is a potential roadblock to malaria elimination. How do you think it can be overcome?

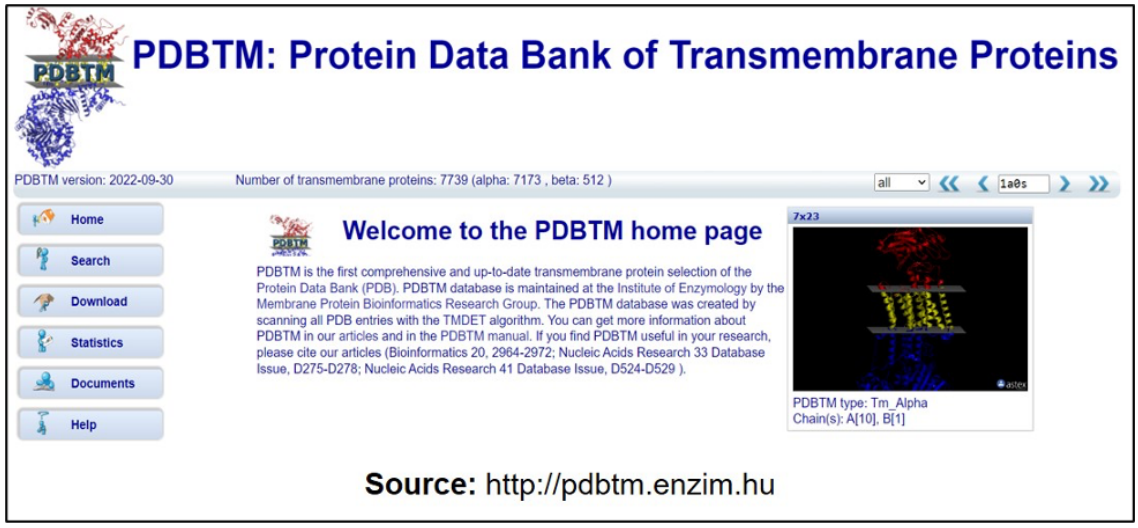
Resistance against the available antimalarial drugs for malaria treatment and insecticides for vector control has been reported worldwide. These are two important factors that can adversely affect the malaria elimination programme. Therefore, continuous and rigorous monitoring of resistance is required to make the in-time decision to deploy alternative interventions. Simultaneously research should also focus on next-generation antimalarials as well as insecticides.

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

A tremendous amount of research has been going on toward the basic understanding of the malaria parasite. However, there was no platform, like MERA-India, which is supporting the research towards malaria elimination. MERA-India aims to fill the research gap at the national level by providing a platform to all the stakeholders where they can interact, discuss and develop strategies for implementing policies for effective malaria control and elimination in India.

MERA-India addresses the issues relevant to the national malaria control program, such as vector control strategies, low-density malaria parasite infections, diagnosis using artificial intelligence, the role of the community in achieving malaria elimination, and capacity building. Thus, I believe that MERA-India helps and motivates researchers, particularly early career researchers, in a guided manner to contribute towards the malaria elimination goal of India through participatory learning.

Resource for Malaria Researchers:
Protein Data Bank of Transmembrane Proteins

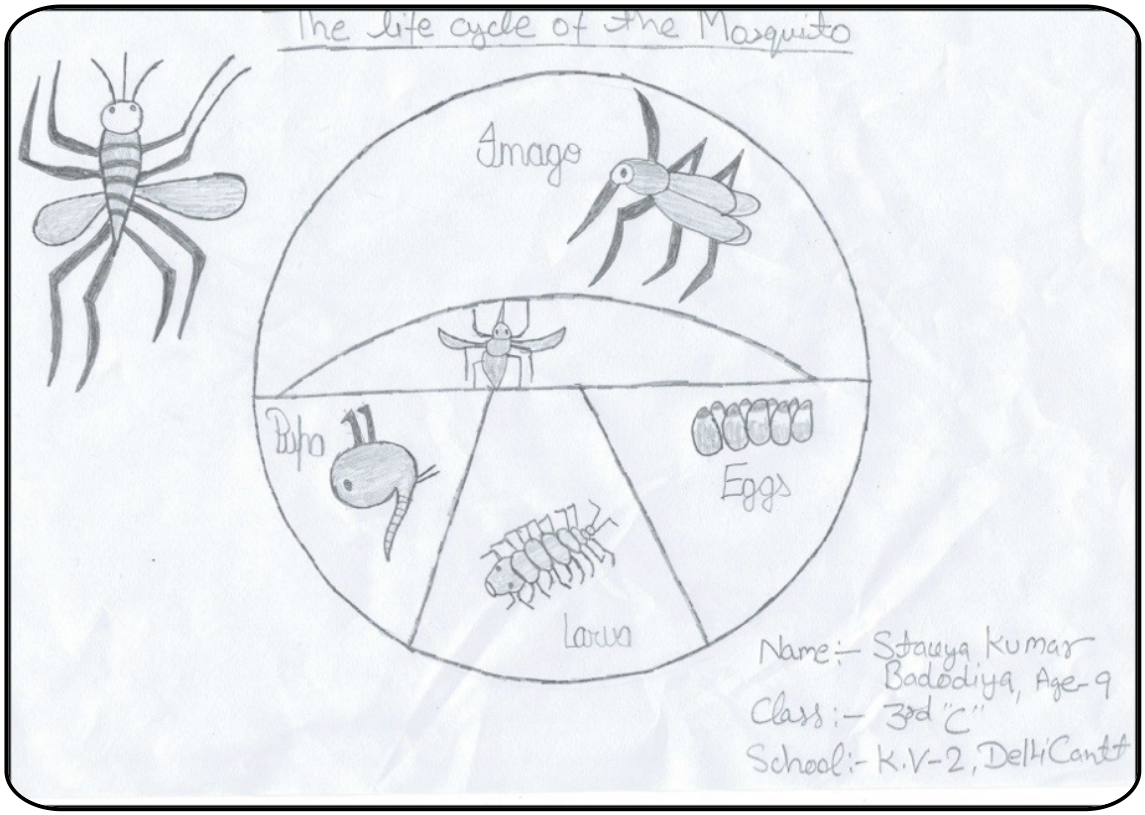


Transmembrane proteins are crucial for biological processes in every living system. The understanding of molecular mechanisms involved in the interactions of these proteins with other proteins and small molecules requires a broad knowledge of their three-dimensional structure and functional domains. **Protein Data Bank of Transmembrane Proteins** (PDBTM) is a comprehensive database and huge collection of PDB entries of transmembrane (TM) proteins whose structures have been predicted. The computational tools enable the prediction of transmembrane regions and extracellular domains useful for interaction analysis with small molecules. This database is continuously updated using the TMDET algorithm that differentiates between TM and non-TM proteins by 3D coordinates.

To know more about PDBTM, please visit: http://pdbtm.enzim.hu/

A Child's Perception of Malaria

In this issue, we showcase the sketch by Mr Stavya Kumar Badodiya, aged nine years. In the sketch, Mr Stavya has shown the developmental stages of the mosquito, namely eggs, larva, pupa and adult.



Sketch by: Mr Stavya Kumar Badodiya; **age:** 09 years; **class:** III

Upcoming Event:
ICMR-NIMR Annual Day 2022

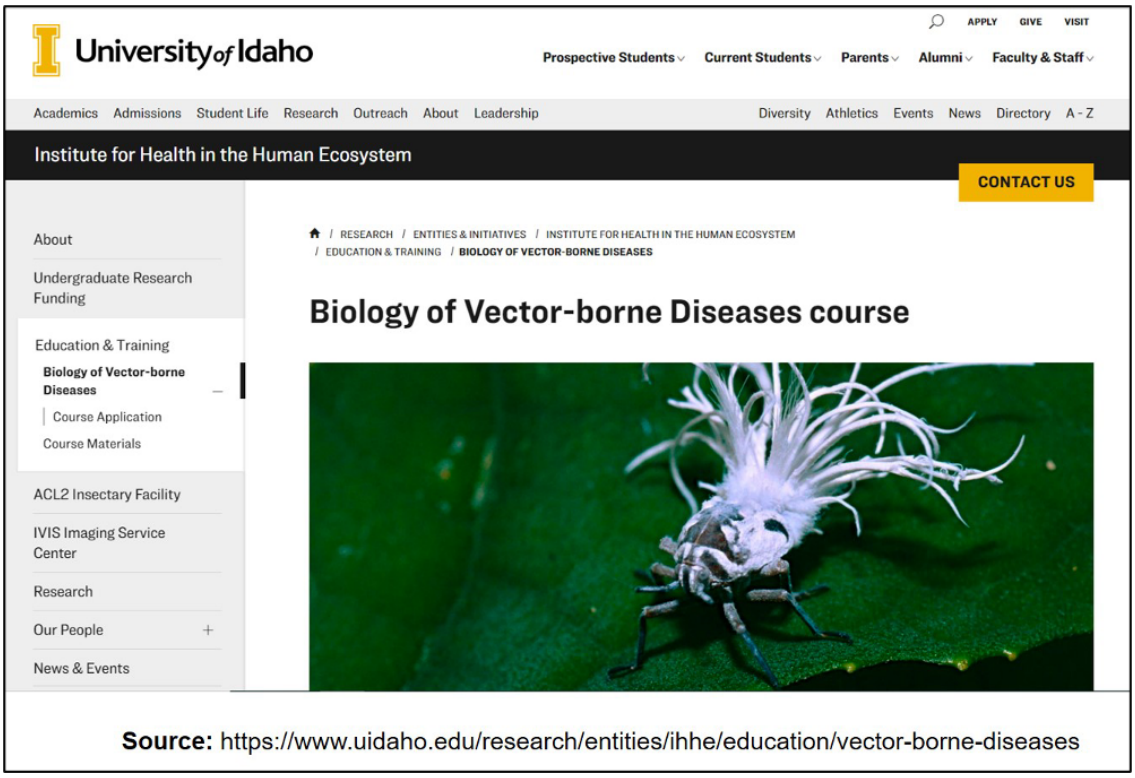
ICMR-NIMR will celebrate the annual day on 01st November 2022 at ICMR-NIMR, Delhi campus. Distinguished scientists including Dr Tanu Jain (Director, National Centre for Vector-borne Disease Control), Dr Shiv Lal (Chairperson, Scientific Advisory Committee, SAC, ICMR-NIMR), Dr Ravi Kumar (Retd. Sr. Regional Director, Karnataka), Dr Ashwani Kumar (Director, ICMR-VCRC, Puducherry), Dr Amit Sharma (Former-Director, NIMR and Group Leader, Structural Parasitology, ICGEB), Dr Sumit Malhotra (Additional Professor, Centre for Community Medicine, AIIMS Delhi) and Dr Jerin Jose Cherian (Scientist D, ICMR-BMS) will be present to grace the occasion. Dr B S Das (Former Adviser DBT and Emeritus Medical Scientist, ICMR) will be present virtually. To enlighten India's progress on the path of malaria elimination, Dr Manju Rahi (Director in-charge, ICMR-NIMR) will moderate a brainstorming panel discussion with the experts highlighting the research needs in the country to augment national malaria elimination goals. An exhibition of the entries shortlisted for the MERA-India Image Competition and the announcement of the winners will also be done on this occasion.

Various cultural activities will also be organized to present the creativity of the students and staff of the organization.

We will be sharing glimpses from this event in our upcoming newsletter issue.

Announcements

Biology of Vector-borne Diseases Course



The Institute for Health in the Human Ecosystem at the University of Idaho will host the fifth annual Biology of Vector-borne Diseases six-day course from 12 - 17June, 2023.

The course will be delivered by internationally recognized experts and aims to highlight the connections and distinctions in vector-borne diseases of plants, animals, and humans. The course will provide condensed training and “knowledge networking” for advanced graduate students, postdoctoral fellows, new faculty, and current professionals and train them to build innovative and sustainable solutions for vector-borne diseases in view of the dynamic and complex ecosystems.

The applications can be submitted till 10th March 2023 and the applicants accepted for the course will be notified in spring 2023.

For more details, please visit:
https://www.uidaho.edu/research/entities/ihhe/education/vector-borne-diseases

Vector Biology: Emerging Concepts and Novel Technologies

Source: https://www.keystonesymposia.org/conferences/conference-listing/meeting?eventid=6860

Keystone Symposia conference on Vector Biology: Emerging Concepts and Novel Technologies, focussing on cutting-edge research areas and new facets of arthropod vector epidemiology and physiology, will take place between 13 - 16 February, 2023 in Colorado, United States. This conference will be hosted in collaboration with "Skin and Immune Crosstalk at Barrier Surfaces." This platform is an excellent opportunity for researchers across the globe to discuss emerging challenges in complex vector biology and collaborations with experts to learn new approaches.

The deadline for abstract submission is 15th November 2022.

For more details, please visit: https://www.keystonesymposia.org/conferences/conference-listing/meeting?eventid=6860

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