





# A MONTHLY NEWSLETTER BY MERA-INDIA NIEWSLETTER BY MERA-INDIA VIEWS

### **ISSUE 15, JANUARY 2022**

<u>Upcoming Event</u> Lecture Series on Infectious Diseases Lecture 08: Dr N. Regina Rabinovich ExxonMobil Malaria Scholar in Residence, Harvard University Director, ISGLOBAL, University of Barcelona

## DR N. REGINA RABINOVICH

### **ACTIVITIES**

- MERA-India participation in 2021 Asia Pacific Leaders Dialogue for Malaria Elimination
- Distinguished Lecture: Prof David Roos
- Lecture Series on Infectious Diseases: Dr Shashank Tripathi

DR CP YADAV ICMR-NIMR, DELHI PROF SARITA KUMAR UNIVERSITY OF DELHI

#### ANNOUNCEMENTS 剩

- MERA-India Call for Research Proposals
- MERA-India Call for Young Malaria Researchers

Editorial | NIMR Activities | Research in Spotlight | Resource for Malaria Researchers: MAP

# Malaria Elimination Research Alliance

#### Dear Readers,

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

As the year 2021 approached its end, we were hopeful that the new year will bring back normalcy in our lives, but with the onset of the third COVID-19 wave in India and flared up cases of infections by the new SARS-Cov-2 variant, Omicron, worldwide, we all realize that we are not out of the pandemic situation yet. The global efforts to contain and manage COVID-19 infections, like improved diagnostics, healthcare facilities, vaccination drive and most importantly maintaining COVID appropriate behavior, have brought rays of hope to humanity that the human loss of lives due to this pandemic will not be as grave as we had seen in the past.

Despite unprecedented challenges posed by the COVID-19 pandemic in 2021, MERA-India continued with its mission of promoting research activities and providing strategic support to researchers for malaria elimination and control. As we step into the new year, we are enthusiastic about nurturing new research innovations and collaborations. We wish all our readers a very happy, safe, successful and productive new year! This first newsletter issue for 2022 brings you announcements about the new funding opportunities and all our redeeming features of the past month, including the latest research highlights, interviews and much more!

After a successful first round of funding, MERA-India is now inviting research proposals addressing questions under specific priority areas addressing the current malaria-research needs of India. We have also launched a call specifically for the young malaria researchers (upto 40 years of age). Details regarding these funding opportunities are provided in this issue.

MERA-India was invited to be a part of the virtual International Leaders Dialogue, a joint venture of Royal Government of Bhutan, APLMA and APMEN that highlighted the committed efforts towards malaria elimination and emphasized the importance of collaborative research between different countries to achieve this target. We proudly share the news with our readers that in this meeting, it was announced that India would be hosting the 2022 Asia Pacific Senior Officials Meeting on malaria!

It was a pleasure listening to the motivating lecture by Professor David Roos (E. Otis Kendall Professor of Biology, University of Pennsylvania, USA) on the importance and tools of data mining and utilization of the available datasets to answer scientific questions. While in the seventh lecture of the "Lecture Series on Infectious Diseases" by Dr Shashank Tripathi, Assistant Professor and DBT-Wellcome Trust India-Alliance Intermediate Fellow at Indian Institute of Science, he shared how existing omics data can be used to design therapeutic interventions against COVID-19. The summaries of these lectures are presented in this issue.

As you navigate through this issue, you will find invigorating and motivational interviews in the 'Malaria Scientists to Watch' section by Professor Sarita Kumar and Dr C.P. Yadav, who have shared their experiences and scientific views.

In our attempt to update you with the latest findings in malaria research, we have included malaria research articles giving insights into the ongoing progress in malaria control and strategies to achieve the goal of malaria elimination in line with the mandate of MERA-India.

Under the stimulating "Resource for Malaria Researchers" section, we have included the Malaria Atlas Project (MAP), an online platform providing various country-wise malaria parameters.

We are excited to have Dr N. Regina Rabinovich, ExxonMobil Malaria Scholar in Residence at Harvard University, and Director of the Malaria Elimination Initiative at ISGLOBAL at the University of Barcelona as the next speaker in the "Lecture Series on Infectious Diseases", to be held on 17<sup>th</sup> January 2022. We invite all our readers to attend this lecture.

We hope you will find this issue more engaging and informative. For any feedback or suggestions towards the content of the newsletter, please write to us at <u>meranewsletter@gmail.com</u>.

With best wishes MERA-India team

#### Announcements: Funding Opportunities for Malaria Research MERA-India Call for Research Proposals

Funding Opportunity	for Malaria Researchers
MERA-India Invites Research Proposals in the following priority areas:	
Scheme 1: Call for Research Proposals Artificial Intelligence (Al), Surveillance, Remote Sensing, Digital Platform for Surveillance and GIS Nodes Identification, Mobile Apps	Scheme 2: Grant for Young Researchers Call for proposals from Young Malaria Researchers (up to 40 years of age)
Vector Control Strategies & Tools	
Compliance, Severity & Relapse in case of <i>Plasmodium vivax</i> Infections Developing alternative surveillance strategies to capture the malaria case load in the community including the private sector	Proposals invited under Operational/ Implementation/ Public Health/ Translational Malaria Research
Deadline: 31 <sup>st</sup> January 2022	
For eligibility and further details, please visit <u>www.meraindia.org.in</u>	

MERA-India is inviting research proposals for the second round of funding in the following priority areas:

#### Scheme 1: Call for Research Proposals

Theme I: Artificial Intelligence (AI), surveillance, remote sensing, digital platform for surveillance, GIS nodes identification, mobile apps

Theme II: Vector control strategies and tools

Theme III: Compliance, severity and relapses in case of P. vivax infections

Theme IV: Developing alternative surveillance strategies to capture the malaria case load in the community including private sectors

#### For eligibility and further details, please visit:

https://epms.icmr.org.in/extramuralstaticweb/pdf/Adhoc/advertisement/MERA\_India\_ Research Proposal Notification 2022.pdf

#### Scheme 2: Grant for Young Researchers

To nurture young researchers, MERA-India has launched a call specifically for the Young Malaria Researchers (up to 40 years of age). The proposals under this call can be submitted in the fields of Operational/Implementation/Public Health/Translational malaria research.

For eligibility and further details, please visit:

https://epms.icmr.org.in/extramuralstaticweb/pdf/Adhoc/advertisement/MERA\_India\_YMR\_ Notification\_2022.pdf

The last date to apply for these calls is 31<sup>st</sup> January 2022.

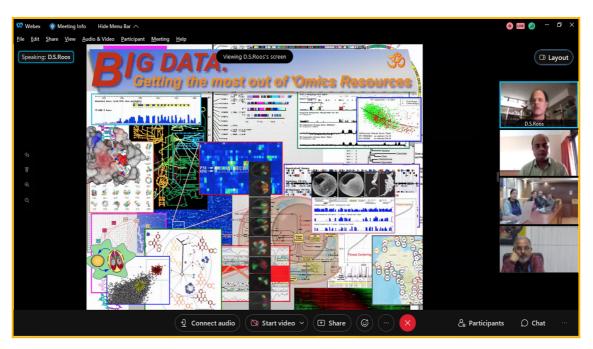
#### NIMR Activities MERA-India participation as a virtual exhibitor in 2021 Asia Pacific Leaders Dialogue for Malaria Elimination



On 13<sup>th</sup> December 2021, Asia Pacific Leaders Malaria Alliance (APLMA) and Asia Pacific Malaria Elimination Network (APMEN), in partnership with the Ministry of Health, Royal Government of Bhutan, hosted the virtual Asia Pacific Leaders Dialogue for Malaria Elimination to advocate for regional collaboration to achieve malaria elimination. The event saw the participation of leaders and organizations from across the world. Some of the sessions during this event were on the malaria elimination efforts and sustaining financing amidst the COVID-19 pandemic, cross-sectoral approaches for malaria elimination and cross-border collaborations for malaria elimination. During the event, Hon'ble Minister of Health and Family Welfare, India, Dr Mansukh Mandaviya, stressed upon the cross-border collaborations, and announced that India would be hosting the 2022 Asia Pacific Senior Officials Meeting on Malaria Elimination.

MERA-India was invited as an official exhibitor in this Dialogue, where we virtually showcased our journey since inception and the various ongoing & upcoming activities and opportunities.

#### **Distinguished Lecture by Professor David Roos**



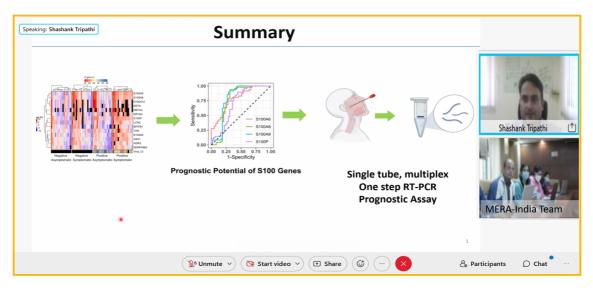
Professor David Roos, E Otis Kendall Professor of Biology and the Founding Director of the Penn Genome Frontiers Institute (PGFI), at the University of Pennsylvania, was the speaker in the "Distinguished Lecture Series" for the month of December. Dr Amit Sharma, the Director NIMR, thanked Professor Roos for taking out time and accepting the invitation to deliver the lecture. Dr Sachin Sharma, Chief Consultant, MERA-India gave an introduction of the speaker to the lecture attendees.

Professor Roos's lecture was entitled "Managing and mining large-scale genomic & epidemiological datasets in our data-rich age". He highlighted the importance of the acquisition of large datasets in different aspects of life, including ordering products online or weather forecasting, and further to different fields of research. He mentioned that to be able to integrate and analyze the vast amounts of available data, the data from different sources must be comparable. He also described some of the resources available on VEuPathDB (Eukaryotic Pathogen, Vector & Host Informatics Resources) to provide data and tools to the global research community to answer research questions. He introduced the features and applications of PlasmoDB, HostDB, ClinEpiDB and MicrobiomeDB resources under VEuPathDB.

After the lecture, Professor Roos answered the questions from the attendees. The session concluded with Dr Sachin Sharma thanking the speaker and the attendees.

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

#### Lecture 07 of Lecture Series on Infectious Diseases



Dr Shashank Tripathi, Assistant Professor at the Centre for Infectious Disease Research, Indian Institute of Science, was the seventh speaker of the NIMR & MERA-India virtual "Lecture Series on Infectious Diseases". Dr Sachin Sharma, Chief Consultant, MERA-India welcomed everyone and introduced Dr Tripathi.

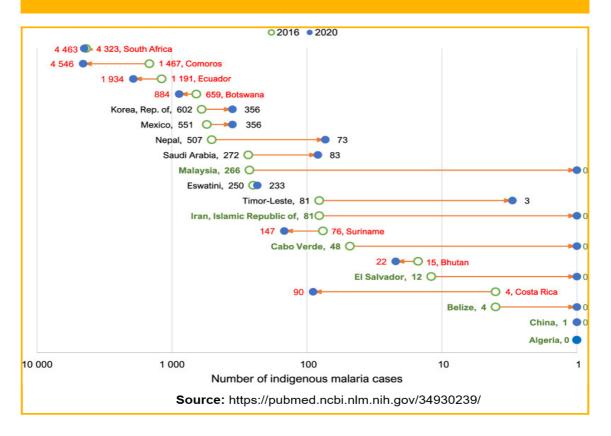
Dr Tripathi gave the lecture on the topic entitled "Translating COVID-19 Big Data into Clinical Interventions". In the lecture, he talked about the ways in which the vast amounts of available transcriptomics and proteomics data could be used for prognosis and designing of new interventions for the management of infectious diseases. He began the lecture by describing the current status of the COVID-19 pandemic and the genomic architecture of the SARS-Cov-2 virus. He mentioned that while a lot of progress had been made on the diagnostics and vaccine fronts; not much research has been done regarding the prognosis and antivirals for COVID-19 management. He further highlighted that a lot of data has been generated using multiple tools addressing different aspects of the COVID-19 infection, host immune responses, susceptibility factors as well as the infection kinetics. He also described the COVID-19 disease course and the factors resulting in either a mild-moderate or a severe disease. He summarised the work done by his group in which a few genes with prognostic potential were identified using the available transcriptomic and proteomic data, and further validation in a patient cohort led to the identification of the S100 genes as promising prognostic marker genes.

In the last part of his talk, Dr Tripathi touched upon the work leading to the therapeutic potential of auranofin, a thioredoxin reductase inhibitor, as a COVID-19 inhibitor. At the end of the lecture, Dr Tripathi also briefly talked about the new SARS-Cov-2 variant, omicron.

The lecture was followed by answers to the questions and ended with a note of thanks from Dr Sachin Sharma to the speaker and the attendees. The recording of this lecture is available on the MERA-India website (<u>https://www.meraindia.org.in/lecture-series</u>).

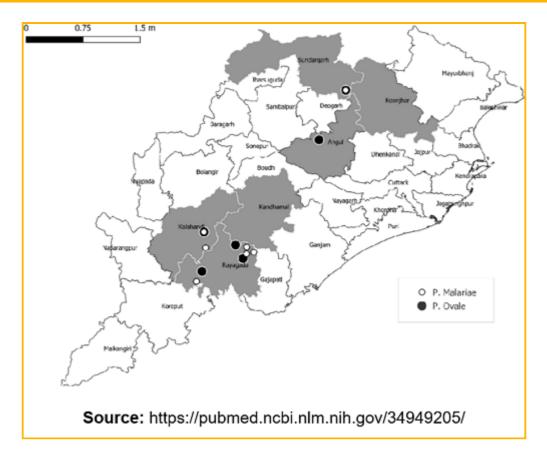
#### **Research in Spotlight**

Lindblade K A *et al.*, *Malaria Journal*, 2021: Supporting countries to achieve their malaria elimination goals: the WHO E-2020 initiative



In 2015, WHO's Global Technical Strategy (GTS) was adopted by the World Health Assembly for malaria, which calls for acceleration of malaria elimination efforts by all the malaria-endemic countries. One of the goals of GTS is to eliminate malaria in 35 of the 90 malaria-endemic countries, by the year 2030 as compared to the status in 2015, with a target of elimination in ten countries set for every five years. In 2017, WHO initiated the Elimination-2020 (E-2020) initiative to support malaria elimination, by the year 2020, in 21 countries with a potential for elimination. In this article, the authors describe and analysed the support provided by the E-2020 initiative to the malaria elimination programmes of the E-2020 countries. The authors show that while the median number of reported cases during the E-2020 initiative period declined in the E-2020 countries, only 12 of the E-2020 countries reported a decline in the number of indigenous malaria cases, of which seven countries (China, El Salvador, Algeria, Belize, Cabo Verde, Malaysia and Islamic Republic of Iran) were successful in interrupting the malaria transmission and maintaining malariafree status till 2020, and only four countries (Paraguay, Algeria, El Salvador and China) were certified as malaria-free by WHO. While Bhutan and Timor Leste had reported a continuous decline in the number of locally transmitted malaria cases, both of these countries experienced malaria outbreaks in 2020 owing to the disruption in malaria interventions and responses because of COVID-19 pandemic. The article thus highlights the challenges faced by the countries in achieving malaria-free status despite a decline in the indigenous cases numbers. The learnings from the E-2020 initiative can thus be adopted by the countries targeting malaria elimination, as well as help in shaping the E-2025 initiative targeting malaria elimination in 25 countries by the year 2025.

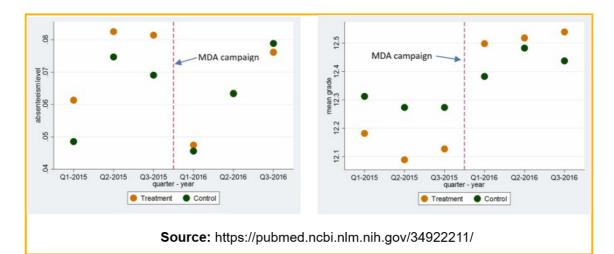
Bal M. *et al.*, *Malar J.*, 2021: Neglected malaria parasites in hard-to-reach areas of Odisha, India: implications in elimination programme



India is targeting malaria elimination by the year 2030. As such a foci-based approach for the *Plasmodium* infection prevalence is critical for targeted interventions. The authors of this study have looked for the distribution of *Plasmodium* infections in the hard-to-reach areas of the Indian state of Odisha, which has conditions highly conducive to malaria transmission and contributes to about 40% of India's malaria burden. While the existing diagnostic tools are capable of detecting the highly prevalent P. falciparum or P. vivax infections, the diagnosis of the other *Plasmodium* species is often missed because of low parasitemia or observational errors in microscopy. The authors tested 3557 blood samples for *Plasmodium* infections. While 170 samples were found to be positive for the presence of malaria parasites using RDT, PCR could detect infections in 282 samples. Out of the total PCR-positive samples, 168 samples showed mono-infections, while 114 showed mixed infections. While as expected the majority of the mono-infection cases were P. vivax (40.8%), the infections due to P. falciparum were 15.6%, due to P. malariae were 2.5% and due to P. ovale spp. were 0.7% of the total infections. Of the 114 mixed Plasmodium species infections detected, 82 were double infections. P. ovale spp. was detected in 27 of these 82 double infections, with the majority (22) of these being present with either P. falciparum or P. vivax infections. 10.3% of mixed Plasmodium infections with P. malariae were also detected. A total of 55.67% participants were asymptomatic.

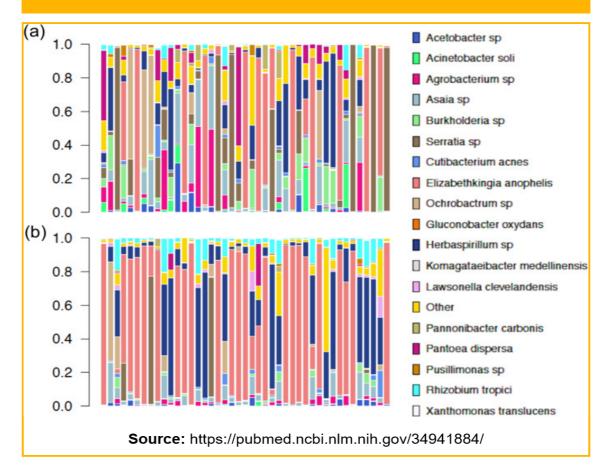
This study thus brings to attention the pressing need in India for devising plans for surveillance and management of the non-falciparum and neglected malaria species as well as the screening of asymptomatic individuals. Adoption of newer molecular tools and treatment protocols to address these challenges would be critical to successfully move towards the elimination goal.

Cirera L. *et al.*, *Economics & Human Biology.*, 2021: The impact of a malaria elimination initiative on school outcomes: Evidence from Southern Mozambique



The largest number of infections and deaths from malaria are observed in children, with the heaviest burden in the African Region. Cerebral malaria and repeated malaria infections result in impaired cognitive performance in children. In the above <u>study</u>, authors used a difference-in-differences approach to assess if a malaria elimination drive and positive health outcomes had any effect on the primary education outcomes in Mozambique. They analyzed the data of more than 9800 primary school students on absenteeism from school and the school grades in two different districts: Magude district (with a decrease in malaria incidence following a year of the malaria elimination initiatives, which included two rounds of MDA), and neighbouring district Manhica district (without any malaria elimination initiative as a control). The authors found that in the district with elimination drive, the absenteeism from schools decreased by 28%, while the school grades improved by 2%. This study thus provides evidence of the positive impact of malaria on the primary education outcomes, which could be due to improved health status of the students leading to their reduced absenteeism from the school and better assimilation of knowledge translating to improved performance at schools.

Ingham V A. *et al.*, *PLoS Genetics*, 2021: Integration of whole genome sequencing and transcriptomics reveals a complex picture of the reestablishment of insecticide resistance in the major malaria vector *Anopheles coluzzii* 



Resistance to insecticides in the mosquitoes is a major challenge worldwide for the malaria control and elimination efforts, and is also a key factor stalling the progress in the malaria elimination efforts. The studies looking into the causative factors behind the insecticide resistance in the mosquitoes collected from the field have been employing the mosquito colonies raised and maintained in the laboratories as control, resulting in confounding results due to varied genetic backgrounds between the colony of interest and the control colony. In this article, the authors have delved into the resistance mechanisms using an insecticide-resistant Anopheles coluzzii mosquito colony from Burkina Faso, a sensitive colony which evolved from the original resistant colony by loss of the resistance phenotype within six months, and a resistant colony raised by the authors from this sensitive population by re-selection using WHO deltamethrin tube selection regime method. The authors compared these three different populations with the same genetic backgrounds, (the original resistant, the sensitive, and the re-selected resistant colonies), using RNASeq and whole genome sequencing to look for the factors associated with resistance. The authors report an enhanced gene expression in the resistant populations for the oxidative phosphorylation pathway genes, which led to the increased respiratory rate phenotype. Additionally, the authors also report specific genomic changes observed in the resistant populations as compared to the sensitive mosquitoes. Further, the authors report the resistant populations to be associated with a specific microbiome profile. This study thus displays the complex interplay of multiple factors, at the transcriptomic, genetic and microbiome levels, associated with the insecticide resistance.

#### **Malaria Scientists to Watch**

#### An interview with Professor Sarita Kumar



<u>Professor Sarita Kum</u>ar Department of Zoology, Acharya Narendra Dev College, University of Delhi

1. Please share with our readers your journey from being a young science student to becoming a trained entomologist and your current position as Professor in Zoology at University of Delhi.

My passion and interest in Mathematics and Sciences was omnipresent in my being since my early school days. The interest started to increase further in class 11 with an exceptional biology teacher. I was keen to become a medical student but could not appear in entrance exams due to my persistent and unexplained fever for years. It was after many-many blood tests and investigations, that I got detected with chronic malaria and dormant *Plasmodium vivax* in my body that would resurface every few months and lead to sickness. That was my trigger to make up my mind on becoming an entomologist and working specifically on mosquito control alleviating associated diseases.

I was lucky enough to get an opportunity to work with Professor M.K.K. Pillai (an expert of Global repute in the field), I worked on the impact of synergists on the deltamethrin resistance in all three mosquito vectors – *Anopheles, Aedes* and *Culex;* under his guidance. I completed my doctorate and pursued the position of research associate investigating stress proteins in mosquitoes till I got a faculty position in a University college. However, my quest for malaria eradication was still unfinished. I knew that I wanted to pursue studies in the field of mosquito control and I continued working in the area.

My work targeted on mosquito management was primarily focused on the exploration and formulation of biodegradable and eco-friendly products to reduce the harmful impacts of synthetic chemicals. Setting up a research laboratory in an undergraduate college with limited space and finances was the biggest task which I could do with the support of my family and my first two PhD students. In the early years, we faced many challenges but as my lab grew with funding from UGC, DST, DU and ICMR, we could address these challenges and set up a well-equipped laboratory. We started identifying insecticide resistance mechanisms in mosquitoes and exploring eco-safe and novel mosquito interventions in the area of botanicals, IGR's and their synergistic combinations with other chemicals. Currently working with 6 doctoral students and two senior research fellows, it is highly rewarding to train these young minds, work with them and exchange ideas. As a Professor in an undergraduate college of the University of Delhi, I am continuing to work on a multi-pronged approach on mosquito interventions lighting up my passion for mosquito-borne diseases-free India. I am presently formulating a cutting edge ATSB under the aegis of a MERA-India project and am sure India will soon be malaria-free country.

#### 2. What motivated you to work in the field of malaria research?

Malaria is a highly complex disease with extensive genome plasticity in *Plasmodium*, multiple parasitic stages and varied host-parasite interactions. Though, several researchers have made significant contributions to understand and control malaria; such as discovery of artemisinin; identification of CSP as a potential immunogen, presence of NANP tandem repeats in CSP and recognition by antibodies formulating malaria vaccine; nothing can surpass the Laveran and Ross's work which will always remain the most significant one.

#### 3. According to you, what is the biggest challenge for malaria elimination in India?

The biggest challenges for malaria elimination in India stem from the lack of optimal disease surveillance system, multi-drug resistance in *Plasmodium*, insecticide resistance in the *Anopheles* as well as antimalarial drug resistance in the Indian population. In addition, the lack of community participation and under-reported malaria-related morbidities and incidences have challenged the actual estimate and spread of malaria. Socio-cultural hindrances and comparatively less investigated *P. vivax* than *P. falciparum*, probably due to causing relatively much less mortality and morbidity, are also leading factors.

# 4. What is one advice that you would like to give to young students and early-stage researchers?

My sincere advice to all research students is to keep single-minded focus on the job at hand, not be afraid of disruptive thinking, be patient and systematic, inculcate critical thinking, read extensively, communicate with peers and use imaginative approach to unleash the potential of existing ideas in order to innovate. Above all, work hard and do not limit your thoughts and imagination to what's already been done, achieved and published. Explore the possible solutions, discuss, analyses and think differently.

#### 5. Apart from science and research, which other activities interest you?

Music has always been my passion; it keeps me positive, calm and energetic. Also, I have great interest in cooking new and exotic dishes; watching sports and developing material/books for every level of education.

#### An interview with Dr CP Yadav



Dr CP Yadav Scientist-B Epidemiology and Environmental Biology Group ICMR-NIMR, Delhi

#### 1. What inspired you to become a scientist?

Genuinely speaking, I never thought that I could become a scientist. But after joining the AIIMS, Delhi for a PhD in Biostatistics and working with the best medical faculties, a thought came into my mind: why can't I be one of them? But it was like a fantasy at that time because I realized that I didn't have the knowledge and skills to become a scientist. Thereafter, I decided, though it is a long journey, to fulfil this ambition. I did whatever was needed to follow my dream. And believe me, I never left even a small stone unturned in the way of my dream after this determination.

#### 2. What are the challenges for infectious diseases surveillance in India?

As per my understanding of infectious disease surveillance, the biggest problem is the under-reporting of data, resulting in the true disease burden remaining underestimated, and thus leading to inadequate attention or intervention. There are multiple causative factors, which need to be identified and addressed collectively to deal with this challenge.

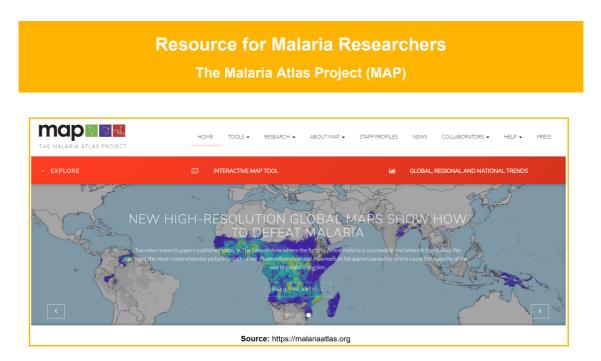
3. You have created a malaria dashboard at ICMR-NIMR. Please tell us more about this and how it will help India's malaria elimination programme.

Yes, we have developed a digital Malaria DashBoard (MDB) for easy retrieval and analysis of malaria epidemiological data. In India, NVBDCP collects data every year on a monthly basis about malaria parameters such API, SPR, ABER, AFI, species-specific cases, death due to malaria, etc. from the village to the country level. Along with this data, tons of other data on malaria and related to malaria are being published every year in the form of research articles, reports, and surveys. All this data needs to be studied in a systematic manner in order to understand malaria holistically. A digital dashboard is a major step in this direction. Our MDB helps the researchers to understand the malaria situation in India by analyzing malaria data in a simple, interactive, and efficient way. Even a layman can use this dashboard just by clicking some of the drop-down menus, and look at the malaria prevalence in India.

#### 4. What is the best career-related advice you have ever received?

We should be honest about our work, always work for the excellence, never compromise on the quality, and work smart. 5. How do you see your research developing, and where do you see yourself in five years from now?

In the next five years, I will try to develop excellence in my work in terms of my knowledge about biostatistics, epidemiology, programming and malaria, and develop some tools or techniques that will be impactful at the ground level with a direct impact in malaria elimination drive.



Launched in 2005, the <u>Malaria Atlas Project</u> (MAP) acts as a platform to provide up-to-date country-wise malaria-related information. MAP brings together a network of researchers across the globe, with a wide range of expertise in areas such as public health, mathematics, geography, and epidemiology. The MAP researcher network assembles global databases on malaria risk and intervention coverage and develops novel analysis methods to apply this data for addressing critical malaria-related questions including developing a better understanding of the malaria risk, its dynamics and an assessment of the impact of malaria interventions. MAP supports informed decision making by the national malaria programmes of the countries by evaluating burden, trends, and impact on a global level. MAP is also a WHO Collaborating Centre and provided support for the modelling, monitoring and evaluation activities of the WHO Global Malaria Programme, including building the country-level risk and incidence maps for *P. falciparum* and *P. vivax* malaria. The country profile maps in the WHO's annual World Malaria Report are also provided by MAP.

Professor Peter Gething of Telethon Kids Institute at Curtin University in Perth, Western Australia leads MAP. The funding for MAP is by the Bill & Melinda Gates Foundation, and it has also received support in the past from The Medical Research Council, UK and The Wellcome Trust.

To know and explore more about MAP, visit https://malariaatlas.org

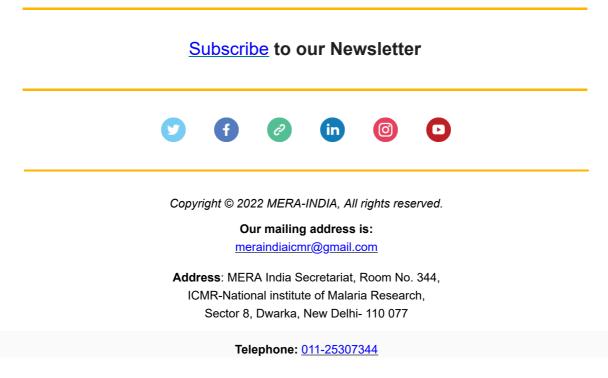


Dr N. Regina Rabinovich would be our next speaker in the "Lecture Series on Infectious Diseases". She is the ExxonMobil Malaria Scholar in Residence at Harvard TH Chan School of Public Health, and the Director of the Malaria Elimination Initiative at ISGLOBAL at the University of Barcelona.

She will be delivering the lecture entitled "Challenges and progress on endectocides for malaria control" at 10:00 IST on 17<sup>th</sup> January 2022.

**Talk abstract:** The stall in malaria control documented in 2017 has further been challenged by the health systems impact of COVID-19. Innovation in each aspect of the malaria toolbox will be critical to regain progress globally. Endectocides - particularly ivermectin - are being evaluated as a novel approach to addressing residual transmission. The key challenges to evaluation and progress to date will be reviewed.

To join this lecture, please click on this link: <u>https://bit.ly/Lecture08Jan</u>



Website: http://meraindia.org.in/