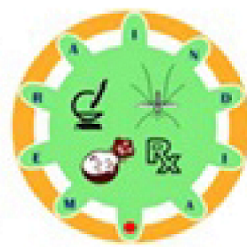




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Malaria Elimination Research Alliance India
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NEWS AND VIEWS

Issue 09, July 2021

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Division of Infectious Diseases
Johns Hopkins University, USA

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Early Career
Malaria Researcher

Malaria Elimination Research Alliance - India



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MERA-INDIA Newsletter 'News & Views' July 2021

Editorial

Dear readers,

MERA-India team presents to you the ninth issue of our newsletter.

Last month we successfully launched the Lecture Series on Infectious Diseases. The series will have twelve lectures, held on a monthly basis, from experts working in different infectious diseases. The opening lecture of the series was the Keynote Lecture delivered by Professor Adrian Hill, Director, The Jenner Institute, University of Oxford, who talked about the 'New Vaccines for Malaria Prevention'. We witnessed a huge attendance for the lecture from researchers all over the globe and we hope to continue to sustain your interest for the future lectures as well. A brief summary of the lecture is given in the 'NIMR Activities' section.

In the 'Guest Commentary' section, Professor Rajib Dasgupta (Chairperson, Centre for Social Medicine and Community Health, Jawaharlal Nehru University) has expressed the importance of social science in malaria elimination.

For the 'Malaria Scientist to Watch' section, we interviewed Dr Rajni Kant Srivastava {Director, ICMR-Regional Medical Research Centre (RMRC), Gorakhpur}. In the interview, you will get to know about the journey of Dr Srivastava as a young science student to his current position; the most significant and unexpected research findings from Dr Srivastava; his advice to the young researchers; and, his views about the significance of MERA-India.

In the 'Research in Spotlight' section, we have highlighted four recent research papers which we feel are significant to the field of malaria research. We compliment the authors of these studies on their crucial findings and outputs.

In the 'Upcoming Event' section, you will find the details of the second lecture of the 'Lecture Series on Infectious Diseases' being organized by NIMR & MERA-India. This lecture will be delivered by Dr Gyanu Lamichhane, Johns Hopkins University, on 19th July 2021 on the topic 'Atypical Cell Wall of Mycobacteria: Its Relevance to TB, Treatment and Drug-resistance' (<http://lectureseries.meraindia.org.in/>). We look forward to having all of you to join this lecture.

We are continuing to look for contributions from PhD students towards the 'Early Career Malaria Researcher' section in the newsletter. Please see the details in the 'Announcement' section.

If you have any feedback or suggestions towards the content of the newsletter, or would like us to interview any particular scientist working in the field of malaria, please write to us at meranewsletter@gmail.com. We hope all the readers enjoy reading this issue.

With best wishes
MERA-India team

ICMR-NIMR Activities: Launch of Lecture Series on Infectious Diseases



Launch of Lecture Series on Infectious Diseases. The NIMR & MERA-India virtual lecture series on infectious diseases (June 2021-May, 2022), was launched on 21st June 2021 with the Keynote Lecture of the series delivered by Professor Adrian Hill, Director, The Jenner Institute, University of Oxford. A large number of participants registered and participated in the event. Dr Amit Sharma, Director, ICMR-NIMR introduced the lecture series to the audience and thanked all the speakers for accepting our invitation to speak in the series. Dr Sachin Sharma, Chief Consultant, MERA-India introduced the speaker.

Professor Hill talked about the development of vaccines for malaria prevention. In his lecture, he highlighted that even though the malaria deaths have dropped from one million in the year 2000 to near about 0.4 million in 2016, the progress in malaria control has stalled. He pointed out that during 2020, there were almost four-fold higher malaria deaths in Africa than deaths due to the current COVID-19 pandemic. The increasing parasite drug-

resistance and the widespread insecticide resistance in vectors calls for new tools to control malaria and vaccine can be a significant intervention in this regard. He mentioned that the malaria vaccine research has been ongoing since 1910 and over 140 vaccine candidates have been tested so far in the clinical trials. However, the stage-specific antigen expression, and the antigenic variations and polymorphisms have been the major challenges in the development of an effective malaria vaccine. He described the different stages of the malaria parasite, and the current vaccine candidates against these specific stages. The safety and efficacy data from the clinical trials of the different vaccine candidates were also shown. Overall, Professor Hill in his lecture talked about the importance of the malaria vaccine research, the challenges in developing an effective malaria vaccine, and the progress that has been made till now.

The lecture was followed by answers to the audience questions. The session ended with a thanks from Dr Amit Sharma and Dr Sachin Sharma, on behalf of ICMR, NIMR and MERA-India, to the speaker and all the participants.

We hope to receive continued interest and participation from the scientific community towards the future lectures of the series as well, and we also hope that the participants would find these lectures inspiring and intellectually-stimulating.

Guest Commentary

Towards Malaria Elimination: Why Social Science Matters

[Professor Rajib Dasgupta](#) (MBBS, MPH, PhD)

Chairperson, Centre of Social Medicine and Community Health, School of Social Sciences, Jawaharlal Nehru University.

Email: dasgupta.jnu@gmail.com

In the final lap of any eradication/elimination programme, both technological and social science breakthroughs matter, but not in silos; they need to interact with and inform each other. Bivalent oral polio vaccine (bOPV) and social mobilization innovations worked in tandem to address the last-mile issues in polio eradication to achieve the final success. The strategy of 'demonstration vaccination' (the vaccinator revaccinates himself in front of villagers to allay anxiety about the vaccine) devised in a pilot project in Sultanpur, Uttar Pradesh in 1962 paid remarkable dividends in the adoption of technology as did the jet injector (in contrast to the 'standard' single point needle that required pressing the skin with the needle five times for a primary vaccination and fifteen times for a revaccination). The caveat: social science research in a disease control programme should not be reduced to social mobilization or behavioral modification tasks only; it should be integral to planning of public health programmes, based on a social determinants' framework, HIV/AIDS is a good example.

There is a rich history of social and behavioral sciences application in malaria control over the last two and a half decades. Integration of suitable insights from the social sciences into malaria control has been considered by Halima Abdullah Mwenesi of the USAID's NetMark Africa Regional Malaria Program "as an afterthought" as it gradually became apparent that the advances in biomedicine and technology were not adequately translating into results at the

individual, community, and health systems levels. These have enabled a richer explication of socio-economic, ecological, health systems and political processes that mediate the interface of programmatic intervention and vulnerable communities.

Social research contributions entail domains such as awareness generation, advocacy, case management, economic, programme evaluation, health systems and policy research -- translating in improvements in the design and implementation of malaria prevention, management and control strategies. Social science research was brought in to bridge this gap between 'efficacy' and 'effectiveness' of interventions. A diversity of social sciences and approaches including anthropology, political economy, geography of health, health economics and policy, social epidemiology and behavioral studies have provided deeper meaning and understanding of how populations interpret, perceive, prevent and respond to episodes of malaria fever. Deeper insights into aspects of vulnerability in terms of gender, socio-economic position, geographic access and social exclusions have led to better programmatic strategies on who to reach out to; what behavioral, economic, social and other contextual barriers must be negotiated in order for insecticides and drugs to have their desired effect, which policies and strategies will be most effective, and how to deploy suitable interventions and tools, in order to be able to reduce inequities that hinder programme effectiveness.

Randall M. Packard, Johns Hopkins Institute of the History of Medicine, considers it critical to "understand what politics looks like from the inside" in order to develop both a critical understanding of people's understandings of disease and how "history of misfortune" shapes epidemicity and endemicity of prevalent infections. His study of malaria in the South African context demystifies the notion that it is not the amount of rainfall in any particular year but whether the previous couple of years had exceptionally low levels of rainfall, which was related with hunger, crop destruction and migrant labour conditions and in some cases famine. His deconstruction of the malaria eradication programme points to geographical determinism and world views of development agencies (national and international) that shape land development and agriculture with significant bearing on malariogenic conditions.

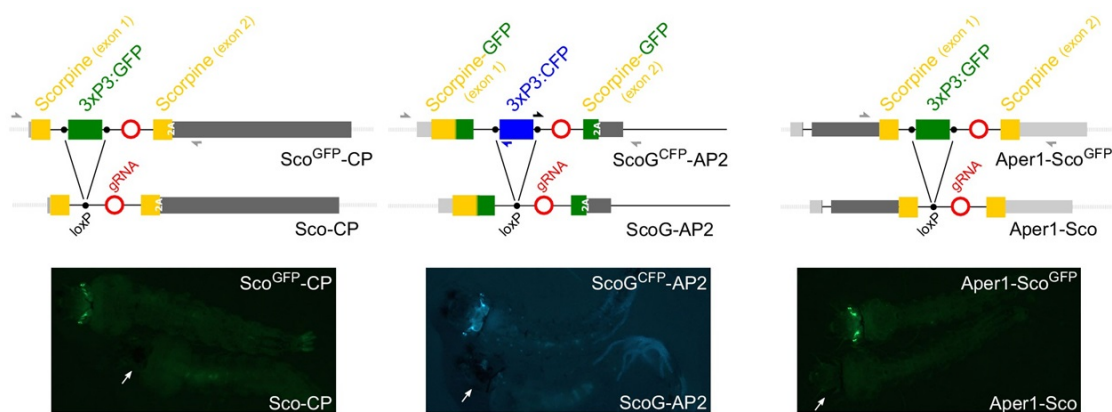
Sheila Zurbrigg, formerly Dalhousie University, in her seminal work examined the central role of hunger in the historical mortality burden of malaria in the sanitary records of nineteenth-century British India. She demonstrated that mortality rates during malaria epidemics in Punjab appear to have been highest amongst young children and the aged, those age groups most likely to be most malnourished; malnutrition as distinct from acute starvation. In this political economy analysis, she sought to demonstrate that under the impact of colonial economic policies, the agricultural economy of Punjab underwent significant shifts, the impacts of which were felt differently across social classes.

Kalinga Tudor Silva, formerly University of Peradeniya, researched on the 'folk concept of malaria' that contributed significantly to achieving malaria control in some of the most endemic areas in Sri Lanka. Interviews and observations of folk beliefs and practices, traditional healing methods and remedies and other behavioral determinants of malaria control and transmission in local contexts provided deep insights into conventional epidemiological models. His explorations revealed how folk practices of the disease were shaped by local environmental and cultural markers. To some extent such folk remedies were seen to be influenced by the Siddha tradition rather than the Ayurveda tradition. In local perceptions, there was no association between mosquito and malaria though there was a correct indirect association with the flowering season and endemic periods. These are some examples of the local perceptions that shaped the community-wide cooperation in the Sarvodaya (research cum action) programme that eventually became a self-supported initiative supported by local populations. This successful venture in the 1980's demonstrated how community action could contribute positively to disease surveillance, promoting and sustaining a primary healthcare approach to malaria control, prevent and control outbreaks and forge local models of intersectoral collaboration.

This short commentary is by no means an exhaustive account of a roadmap of social research informing the malaria elimination target in its current stages in India. The effort instead has been to offer a thumbnail view of some of the scholarly work and the myriad possibilities that social sciences offer and the imperative to invest in it.

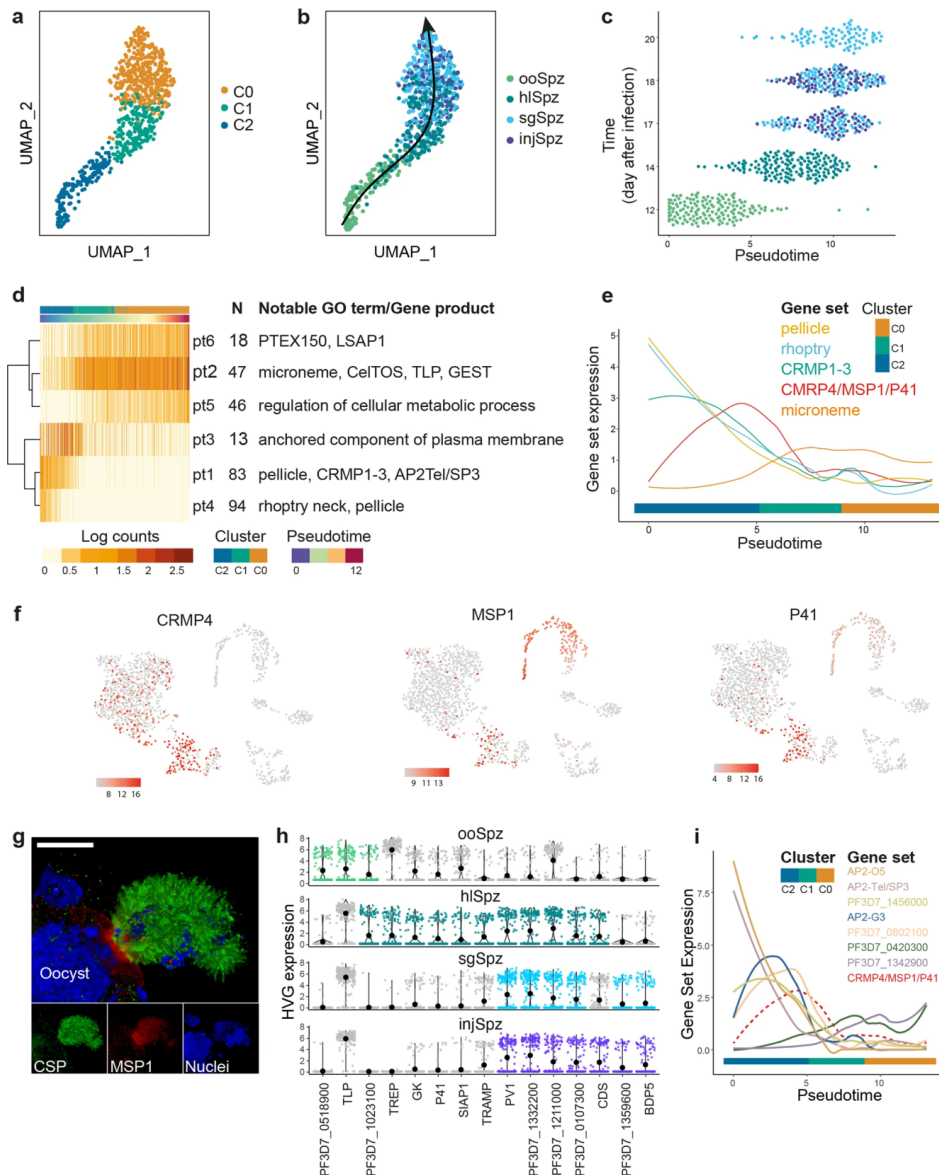
Research in Spotlight

Hoermann A. *et al.*, eLife (2021): Converting endogenous genes of the malaria mosquito into simple non-autonomous gene drives for population replacement.



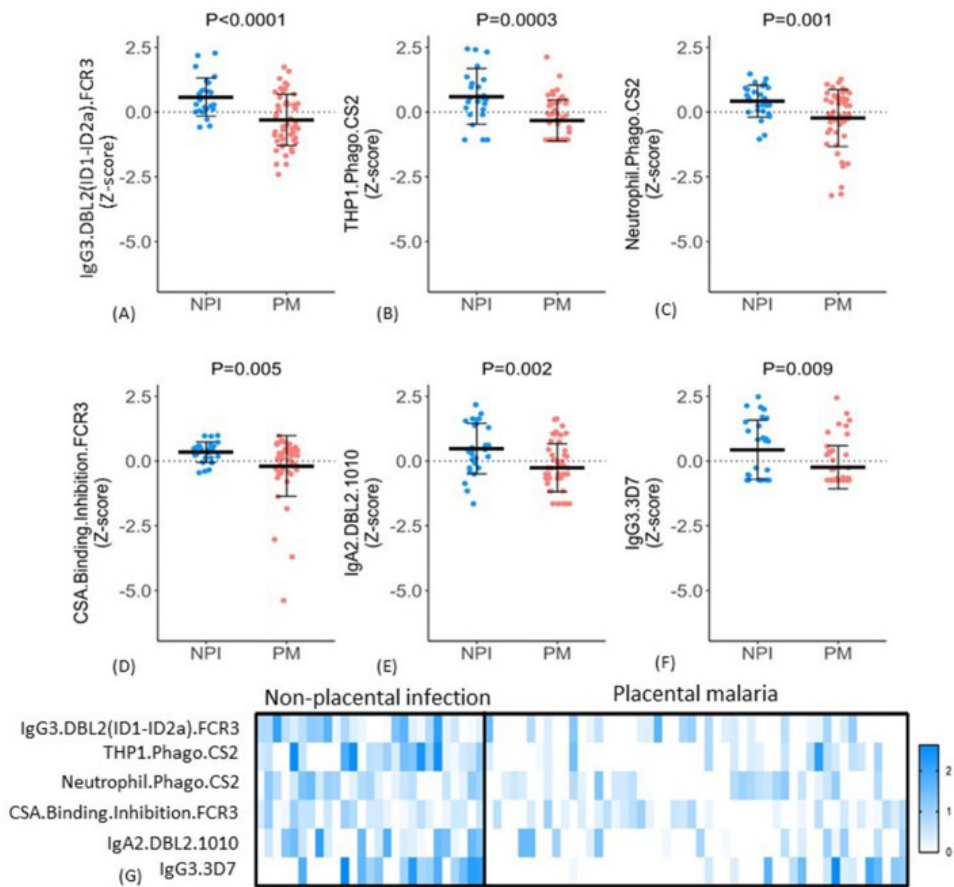
In the above study by [Hoermann A. *et al.*](#), the authors converted three endogenous genes of the vector *Anopheles gambiae* into non-autonomous gene drives, by using CRISPR/Cas9 mediated gene editing, to express an anti-Plasmodium effector molecule, Scorpine. The authors showed that these minimal genetic modifications did not affect the fitness or the viability of the mosquitoes. This non-autonomous gene drive could be converted to an active gene drive by crossing with vectors expressing Cas9 under a germline-specific promoter, and a high homing rate was observed. Because of the minimal genetic modifications and passive gene drives that may be converted to active gene drives, such genetically modified vectors could be safely used to test the efficacy of effector molecules against the polymorphic parasite isolates in the endemic settings. This strategy can thus be used to replace the wild type vector population with the genetically modified mosquitoes expressing an anti-malarial effector molecule.

Real E. *et al.*, Nature Communications (2021): A single-cell atlas of *Plasmodium falciparum* transmission through the mosquito.



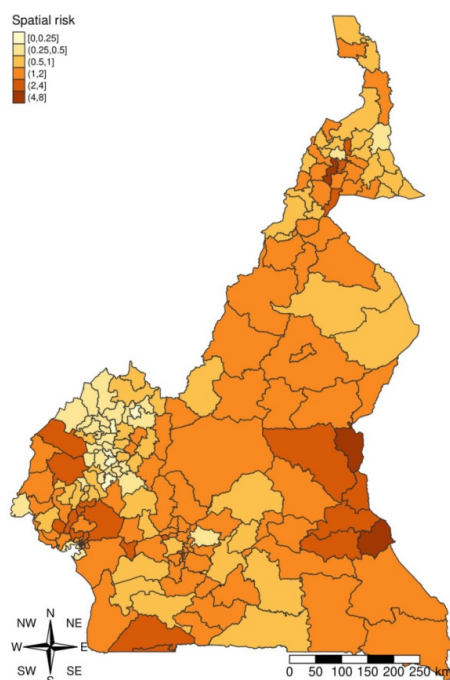
In the study by [Real E. *et al.*](#), the authors have used single-cell transcriptomics to identify the gene expression during the transmission cycle of the malaria parasite *P. falciparum*. The authors have also compared the gene usage between *P. falciparum* and the rodent parasite *P. berghei* to identify the species-specific adaptations to their specific hosts. Such data can help to identify novel drug and vaccine targets for prevention of malaria disease and transmission. The data from this study is provided on the website (<https://www.malariacellatlas.org/mca/>).

Aitken, EH. et al., eLife (2021): Developing a multivariate prediction model of antibody features associated with protection of malaria-infected pregnant women from placental malaria



VAR2CSA protein expressed on *P. falciparum* infected erythrocytes bind to placental chondroitin sulfate A, which leads to placental malaria. In the above article by [Aitken, EH. et al., \(2021\)](#), the authors have employed systems serology and machine learning approach that involves elastic net-regularized logistic regression and partial least squares discriminant analysis to develop a model that predicts whether a woman would be protected from placental malaria. This approach identified six unique antibody features towards VAR2CSA that could predict the occurrence of placental malaria at delivery with 86% accuracy. These antibody features were associated with inhibition of placental binding and/or opsonization for phagocytic clearance. Correlation network analysis suggested the involvement of not one but multiple pathways in the protective immunity against placental malaria. This study can be extrapolated to different geographical settings, to predict protection from adverse pregnancy outcomes and also to develop pregnancy malaria-specific therapies.

Celestin D. *et al.*, *Sci Rep* (2021): Fine scale analysis of malaria incidence in under-5: hierarchical Bayesian spatio-temporal modelling of routinely collected malaria data between 2012–2018 in Cameroon.



In this [study](#), the authors aimed at fine-scale spatiotemporal analysis of symptomatic malaria incidence among children under-5 in Cameroon between 2012 and 2018 and its association with environmental factors in order to set up district specific preventive interventions. An upward trend in incidence rate over time was observed probably due to increased malaria diagnostic capacity, efficiency of health reporting system and of course due to underuse of preventive measures. Besides the assessment of trend of malaria cases and time series decomposition to extract the seasonal variation, the study also presents a spatial malaria risk map based on Bayesian model with the lowest DIC. This map showed a heterogeneous risk of malaria across the country and there is a strong correlation of malaria burden with temperature and rainfall. Such study can guide policy makers in adopting apt interventions specific to each geographical unit.

Malaria Scientist to Watch

An Interview with Dr Rajni Kant Srivastava



[Dr Rajni Kant Srivastava](#),

Director,

ICMR-Regional Medical Research Centre (RMRC),
Gorakhpur

1. Please share with our readers your journey from being a young science student to your current position as Director, ICMR-RMRC, Gorakhpur.

This has been a very fascinating, enriching, rewarding and adventurous journey. As a student, I was always inclined towards biological sciences as it deals with the living beings which enabled me to pursue my career in Life Sciences. After completing my MSc in Zoology (Entomology) from Allahabad University, I worked for a year in a project involving community engagement at Allahabad University. That ignited me to do something for the society. Soon, I got an opportunity as a young Scientist in ICMR-Malaria Research Centre (now National Institute of Malaria Research), Delhi and was posted at its field station in Nadiad, Gujarat. That provided immense opportunities to work on community-based malaria control through bio-environmental methods. Working in field, laboratory and dealing with different departments like PWD, Railways, Irrigation, Education, Fisheries, Urban Development etc. helped in building firm foundation and decision making. During this period, I also worked for an ecological succession of mosquito breeding in paddy fields and demonstrated their control using *Bacillus sphaericus*, *Azolla* and larvivorous fishes like Guppy and Gambusia. This later also helped me to get PhD. Kheda Project got global recognition and many of the components of this project were later included in National Malaria Control Program. After serving for 12 years in a field station at Nadiad in Gujarat and successfully demonstrating the malaria control without the use of insecticides, I switched over to ICMR Hqrs. This provided an opportunity to work closely with the higher leadership, policy makers and understand how it is important to translate research into policy making. I worked to develop an early warning system with the support from ISRO using space technology tools to control vector-borne diseases as well as worked in a DST sponsored project to develop a Global Database of Malaria for 50 Years. I also learnt the importance and intricacies of scientific publishing and Information, Education, Communication, and dissemination. The biggest achievement at this moment in time was that I was instrumental in digitizing the 100-year-old Indian Journal of Medical Research (IJMR) since its inception *i.e.* since 1913. All the articles published in IJMR since 1913 were made available as pdf documents in a searchable interface as an IJMR Archive. Working in ICMR Hqrs helped me

to understand the Policy and Planning related issues and I was deeply involved in preparation of 12th Five Year Plan, ICMR Strategic Plan, Coordinating the activities of Performance Evaluation, developing Coffee Table Book "Touching Life" on Landmark success stories of ICMR as well as working and coordinating with NITI Aayog for various policy related issues. Heading the Division of Research Management, Policy, Planning and Coordination at ICMR provided me an opportunity to interact and get to know the activities of all the ICMR Institutes that also helped in dealing with PQs, Parliamentary matters, coordination with DHR and other policy related issues. To mark the 150th birth Anniversary of Mahatma Gandhi, I was instrumental in bringing out a special issue of IJMR on Gandhi and Health@150 highlighting the health file of Mahatma Gandhi as well as his health seeking behavior and his medical legacy. This was released by His Holiness the Dalai Lama. I also tried to translate his teaching to students through a program 'Mission SHAKTTI' (School based health awareness knowledge test and training) in 36 schools of Delhi as a pilot project. While dealing with COVID-19, we have realized the importance of people awareness and science dissemination to media as well as to other stakeholders. As a Head of ICMR Communication Unit, I have been able to develop an Ecosystem of Health Communication across the ICMR Institutions that is helping in enhanced and better communication and brand building.

Japanese Encephalitis (JE) is another vector borne disease of serious public health importance, which used to cause havoc in Gorakhpur and adjoining areas. A field unit of NIV was set up in 2008 to deal with this scourge. However, to steer forward the research and expand research horizon in other areas, I was instrumental in setting up a new Regional Medical Research Centre (RMRC) at Gorakhpur which was officially inaugurated in September 2018. The work done here has helped to understand the role of Scrub Typhus as the major cause of Acute Encephalitis (AES) in the region. As the Director of ICMR-RMRC, Gorakhpur, on one hand when this is a greatest satisfaction to do something good for the society, on the other hand it is challenging, as this area has been most neglected with less development, poverty and illiteracy and had intermittently faced the outbreak of JE/AES in past. Hence, setting up an ICMR Institute in this part of the Country may prove as a boon not only for doing health research, providing policy solutions as well as for developing network and strengthening health research capacity of the region through collaborative research with medical colleges and other institutions. As a Head of the Institution, I am expanding its horizon to work in the areas of social determinants of health, nutrition, non-communicable diseases, health policy, health economics and health diplomacy as well as striving hard in setting up a state level viral diagnostic laboratory to tackle emerging and re-emerging infections and combat outbreaks/epidemics.

2. What has been your most surprising and unexpected research finding?

The most surprising and interesting research finding was controlling malaria through environment-friendly community-based approaches in an area which was prone to insecticide and drug resistance as well as had witnessed epidemics and outbreaks. We never knew that our research work/experience will get global recognition and Kheda Project became a role model for malaria control, which was replicated/expanded in other eco-epidemiological conditions of the country. The unexpected findings were getting an access to and publishing the health record of Mahatma Gandhi including his ECG and knowing that he was hypertensive and suffered from malaria thrice in his life. These unknown facts also got national and international appreciation.

3. If you were to pick one scientific discovery that has been crucial to our current understanding of malaria, which one would that be?

I think testing is an important strategy in early diagnosis and prompt treatment. Even though microscopy is the gold standard for diagnosis under normal conditions, the development and availability of Rapid Diagnostics Tests (RDTs) has revolutionized the testing for malaria globally as using microscopy is time consuming and requires skilled manpower and in fire-fighting situation, it has its own limitations. However, we can also not ignore the use of LLINs and ACTs in malaria control which has made significant impact in bringing the malaria down to a large extent world over.

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

I would like to advise there is no shortcut to success and working in the field is equally important as working in the lab that will help in realizing the ground reality and may lead to better translation of research. It is also important to expand your horizon and try learning other areas of research as well. Time to time training and mentoring plays a greater role. There should be no room for complacency, and one should always keep on trying to do something differently. Keep faith in yourself, hard work will never go waste. Punctuality, honesty, and dedication (PHD) is the key.

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

MERA India is a unique platform where all the stakeholders can discuss, interact, and plan what is needed for India in a short-term, mid-term and long-term basis. There is also a need to identify the gaps and act accordingly. Few demonstration projects like CCMP in Odisha and Malaria Elimination in Mandla, MP need to be scaled up. Vector biology is losing its shine, which needs to be geared up as without the proper knowledge of vector bionomics it would be difficult to achieve the desired results.

Upcoming Event

Lecture Series on Infectious Diseases: Lecture 02

ICMR NIMR NIMR & MERA-India present
Lecture Series on Infectious Diseases
June 2021 - May 2022

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Malaria Elimination Research Alliance India
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Prof Adrian Hill
University of Oxford, UK

Dr Tavpritesh Sethi
IIT Delhi, India

Prof Adrianus Dondorp
MORU, Thailand

Prof Anuradha Chowdhary
VPCI, University of
Dewri, India

Dr Gyanu Lamichhane
Johns Hopkins University
USA

Dr N Regina Rabinovich
Harvard T.H. Chan,
USA

Dr Saman Habib
CDRI, India

Prof Dominic Kwiatkowski
University of Oxford,
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ICMR NIMR NIMR & MERA-India present
Lecture Series on Infectious Diseases

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Lecture No.: 02

*“Atypical Cell Wall of Mycobacteria:
Its Relevance to TB, Treatment and Drug-resistance”*

Dr Gyanu Lamichhane,
Division of Infectious Diseases,
Johns Hopkins University, USA

Registration link: <http://lectureseries.meraindia.org.in/>

Monday, 19th July, 2021 | 09:30 IST

@meraindia.org.in @MERAIndiaICMR @meraindiaicmr @meraindiaicmr meraindia.org.in meraindiaicmr@gmail.com

The second lecture of the series will be by Dr Gyanu Lamichhane, Johns Hopkins University, on 19th July, 2021, on the topic “Atypical Cell Wall of Mycobacteria: Its Relevance to TB, Treatment and Drug-resistance”.

To register for this lecture, please visit: <http://lectureseries.meraindia.org.in/>.

Announcement

Early Career Malaria Researcher: Call for Graphical abstracts from PhD students

We are starting a section, ‘Early Career Malaria Researcher’, in the newsletter to specifically highlight the research findings from the PhD students working in the field of malaria. This section would include a graphical abstract and a brief description (about 150 words), along with a picture of the PhD student and the supervisor. The graphical abstract should be original and can be based on the findings of the entire PhD thesis or any specific section. The purpose of this section is to provide the PhD students a platform to share their research findings with the global scientific community.

To submit your contributions for this section or in case of any queries please write to us at meranewsletter@gmail.com.

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