NEWS & VIEWS

Issue 01, Nov. 2020

ICMR
INDIAN COUNCIL OF MEDICAL RESEARCH
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Launch of
MERA-India Newsletter

Collection of (from 1947)
Indian Journal of Malariology

Lecture Course Award 2020
INDIA | EMBO

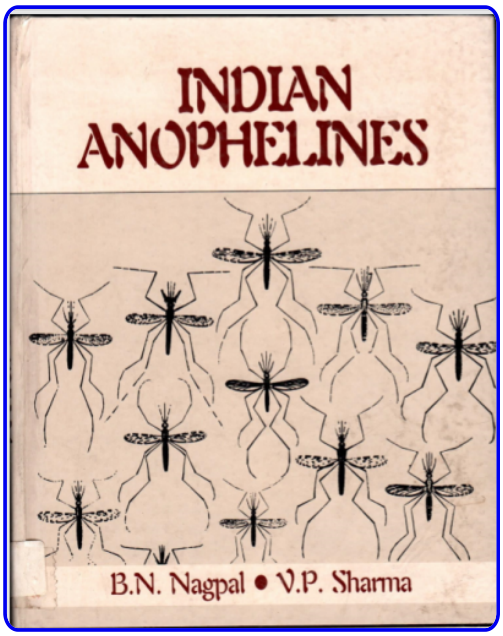
Malaria Scientist to watch this month

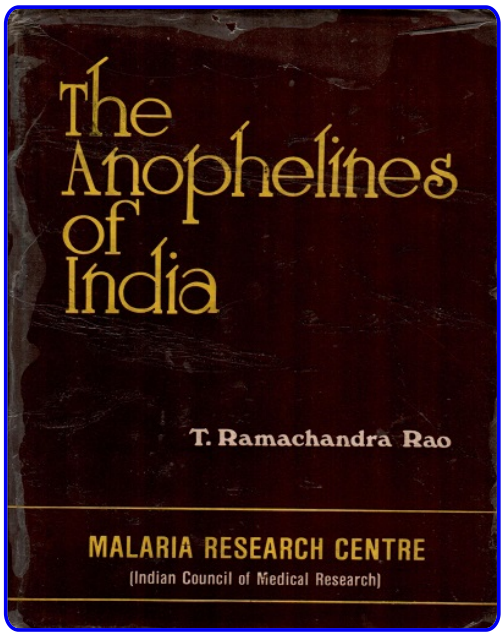
Featured Scientific Publications in Malaria

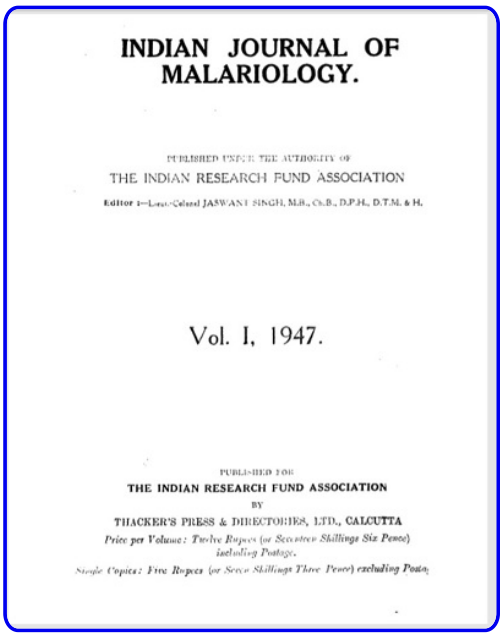
MERA-India Malaria Elimination Research Alliance-India
MERA-India Secretariat,
Room no. 344, ICMR-NIMR,
Sector 8 Dwarka, New Delhi-110077

Launching MERA-India Newsletter 'News & Views' November 2020

MERA-India is launching a malaria-centric scientific newsletter **(MERA-India Newsletter 'News & Views')** on the occasion of ICMR-NIMR Annual Day 2020. It is a valuable opportunity for malaria researchers to generate the impact of their research.



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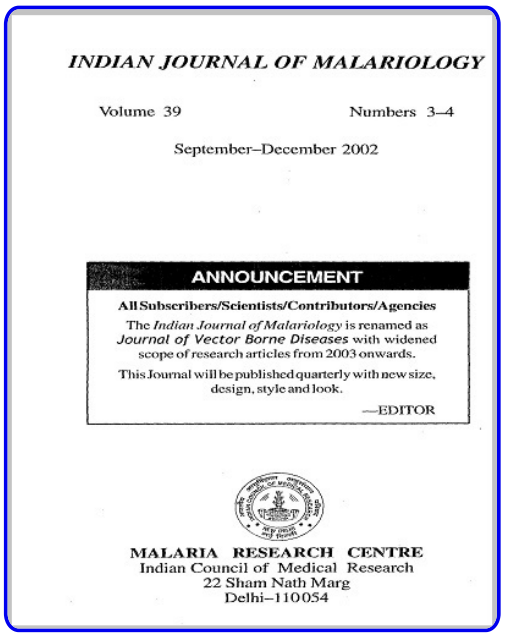
INDIAN JOURNAL OF MALARIOLOGY

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ANNOUNCEMENT

All Subscribers/Scientists/Contributors/Agencies

The *Indian Journal of Malariology* is renamed as *Journal of Vector Borne Diseases* with widened scope of research articles from 2003 onwards.

This Journal will be published quarterly with new size, design, style and look.

—EDITOR

MALARIA RESEARCH CENTRE
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(Source: A precious collection of classic literature, the first picture is of a recently digitized old book penned by eminent authors, Dr. B.N. Nagpal and Dr. V.P. Sharma in 1995, providing keys to identification of all Anopheles mosquitoes reported from India, geographical distribution and their role in disease transmission; the second picture is the soft copy of another classic book called Anophelines of India written by T. Ramachandra Rao as a revised edition, to provide an updated information about distribution, ecology, bionomics and control of malaria, the third and fourth pictures depict the priceless first and last digitized versions of hard copies of Indian journal of Malariology with its first volume being published in 1947. Post 2002, online versions are available for everybody's perusal)

A monumental effort was made by officials from **Indian Council of Malaria Research (ICMR)- National Institute of Malaria Research (NIMR)** to transform the hard version of the valuable literature into a soft copy or digitized version, available to the modern readers. (Click here for PDF version of books/Journals).

Malaria Elimination Research Alliance-India (MERA-INDIA)

Overview of Malaria burden

. Malaria is considered to be one of the highly prevalent infectious diseases and the most common cause of deaths after tuberculosis. Malaria is caused by protozoan parasites (*Plasmodium* species) and is transmitted from one human to another by the bite of infected *Anopheles* mosquitoes.

. The malaria parasite *Plasmodium* has a complex, multistage life cycle occurring within two living beings, the vector *Anopheles* mosquitoes and the vertebrate hosts. It is transmitted from one human to another by the bite of infected mosquitoes during a blood meal, which inoculates sporozoites into the human host. Sporozoites infect the liver cells where they multiply asexually over the next 7-10 days (causing no symptoms), mature into schizonts which further rupture to release another form, the merozoites. Merozoites infect red blood cells and are responsible for the clinical manifestations of the disease such as anemia. Some merozoites differentiate into sexual erythrocytic stages (gametocytes).

. The gametocytes, male and female, are ingested by an *Anopheles* mosquito during

another blood meal. The parasites' multiplication in the mosquito is known as the sporogonic cycle generating zygotes. The zygotes invade the midgut wall of the mosquito where they develop into oocysts which grow, rupture, and release sporozoites after 8-10 days, which further make their way to the mosquito's salivary glands. Subsequent inoculation of the sporozoites into a new human host during a fresh bite perpetuates the malaria life cycle.

. The key risk factors that have been identified for malaria are environmental, parasite, host nutritional status, *etc.* that influence the severity and recrudescence of the disease. In particular, malaria infection in pregnancy, anemia and nutritional deficiencies further increases the risk for adverse outcomes in malaria patients.

. Early diagnosis followed by prompt treatment is of the utmost importance. An increasing drug resistance against malaria is one of the major global concerns that arise during the control and prevention of this fatal disease. In addition, insecticide resistance, climate change and lack of information on true disease burden also pose a challenge in India.

Malaria in India

. India has the largest population in the world at risk of malaria, with 85% living in malarious zones endemic for both *P. falciparum* and *P. vivax* malaria. An estimate of 13 million cases and 24,000 deaths occur each year in India due to malaria according to WHO 'World Malaria Report 2019'. According to National Vector Borne Disease Control Programme (NVBDCP), malaria burden has declined in India by over 65% from 01 million cases in 2016 to 0.34 million in 2020 (till September), and deaths caused by malaria also declined by over 85% from 331 deaths in 2016 to 47 in 2020 (till September). The success of India in malaria control cases, provided foundation for leadership commitment towards Malaria free country 2027 and elimination by 2030. The WHO report also appreciated India's research for decline in malaria.

. *P. falciparum* has typically been associated with more severe malaria particularly among immune-compromised individuals than *P. vivax.* There are six recognized primary vectors of malaria in India with *A. culicifacies* being the most prevalent species. The high burden Indian populations are living in the remote areas of the states like Orissa, Jharkhand, Madhya Pradesh, West Bengal, Chhattisgarh and the North Eastern states (National Framework of Malaria Elimination 2016-2030) which contribute towards bulk of morbidity and mortality due to malaria in the country.

. ***Diagnosis of malaria***: Early diagnosis and prompt treatment is essential to control and prevent malaria. Various diagnostic tools currently available for identification of *Plasmodium* species in human blood samples are point-of-care Rapid Diagnostic Test (RDT), microscopy and PCR based methods.

. ***Control of malaria***: India has successfully limited malaria exposure through rigorous use of indoor residual spray (IRS) and Long-Lasting Insecticide impregnated Nets (LLINs) distributed under National Programme. Approximately 50 million LLINs have been distributed throughout the country to control malaria in India through the support of Global Fund. In areas of moderate to high transmission, chemoprevention of high-risk groups is recommended.

. ***Treatment of malaria***: In the majority of cases in India to treat malaria, artemisinin-based combination therapy (ACT) is used since 2011 as an effective first-line treatment. The present drug policy recommends treatment of *P. vivax* with 3-day chloroquine and 14-day primaquine. *P. falciparum* is treated with ACT-AL (artemether-lumefantrine) in North Eastern states and ACT-SP (Artesunate+Sulfadoxine-Pyrimethamine) in rest of India.

. ***Future strategies***: The key strategy is to strengthen the surveillance system in order to determine the disease pattern and strategize preventive and therapeutic interventions. Similarly, prompt diagnosis and treatment services in low transmission and high endemic areas and bahavioral activities for public engagement and awareness could be gamechanger.

MERA-India

The Director-General of **Indian Council of Medical Research (ICMR)** launched '**Malaria Elimination Research Alliance**' **(MERA-India)**, with the aim to scale up and strengthen Malaria research ecosystem to support malaria elimination from India by 2030 program on the eve of World Malaria Day in 2019. This initiative of ICMR was well received by Ministry of Health and Family Welfare, Government of India. WHO-SEARO (South-East Asia Regional Office) has pledged all support and their partnership in this strive. The MERA-India secretariat is located at ICMR-National Institute of Malaria Research (NIMR), New Delhi and works under the guidance of the Director ICMR-NIMR.

Purpose of MERA-India

The key objectives of **MERA-India** are to identify, articulate and prioritize research needs in a timely manner to have tangible impact on Malaria elimination from India. It also harmonize the cross-talk and a shared-learnings amongst the research communities to escalate translational research. **MERA-India** does not intend to duplicates efforts rather compliments this a national scale, and simultaneously contributing to broader global agenda. **MERA-India** encourages trans-institutional coordination and collaboration around shared research agenda, which responds to programmatic challenges and proactively contributes to targeted research.

Journey till date

The leadership conducted few meetings of different **thematic working groups (TWGs, distinguished malaria researchers)** after launch of **MERA-India** last year. The meetings were mostly to discuss and strategize key areas of malaria like parasite biology, vector control and epidemiology. **MERA-India** launched a call for proposal and received an overwhelming response from researchers globally (map). As per one of the mandates, **MERA-India** fosters multicentric studies in thematic areas so as to provide a platform for pan-India data. More than 175 concept notes were received globally and shortlisted proposals were categorized in the following thematic areas-

a) Low density infection and transmission potential
b) Vector biology and control
c) Community behaviour
d) Geographical information system
e) Migration
f) Artificial intelligence

A committee of experts of each theme was constituted to supervise shortlisted applicants. A two-days round table discussion, Brainstorming meeting, between experts and applicants was held early this year at **ICMR Headquarters** to provide a platform to discuss all **six themes** and encourage cross-talk among researchers. The **Brainstorming meeting** turned out a successful experiment and the office enthusiastic feedback received from the participants. On the experts' recommendations, Artificial Intelligence and Migration themes were dropped and rest of the 04 themes with further shortlisted applicants from **ICMR** and **non-ICMR institutions** were taken forward. The applicants of **Artificial Intelligence and Migration were encouraged** to **join other themes** to contribute in developing the full applications. Based on **malaria epidemiology**, types of parasite, vector prevalence and Pan India approach, several sites at 07 states (Uttar Pradesh, Rajasthan, Gujarat, Goa, Tamil Nadu, Chhattisgarh and Assam) were shortlisted for the studies (Map). With the help of experts, common objectives protocols and methodologies were developed for all sites in order to maintain research quality and uniformity of data generation. All the proposals, developed with the help of experts, are in process of funding. All the investigators will work under the guidance of experts for the entire duration of the funding and the progress of all projects will be evaluated frequently within specific time duration.

History of ICMR-National Institute of Malaria Research (ICMR-NIMR) Glimpses from the past

ICMR-NIMR building was established in 2005.

ICMR-NIMR was established in 1977 as 'Malaria Research Centre', which was renamed as 'National Institute of Malaria Research' in November 2005, to undertake basic, applied and operational research on malaria, as well as to provide much needed support in epidemiological research, situation analysis, capacity strengthening and containment of malaria epidemics. The field units of **ICMR-NIMR** are now functionally operating in 10 malaria-endemic localities in India. The Institute plays a key role in man power resource development through trainings/workshops and transfer of technology. The major areas of research carried out over the years are on mosquito fauna surveys, development of genetic and molecular markers for important malaria vectors and parasites, cytotaxonomic studies identifying major vectors as species complexes and laboratory and field studies to examine the biological variations among sibling species. The development of molecular

identification techniques for sibling species, monitoring of insecticide resistance through space and time, preparation of action plans, etc. have yielded valuable information.... Read More.

ICMR-NIMR Activities

Establishment of Institution of National Importance

ICMR-NIMR and **Academy of Scientific Innovative Research (AcSIR)** - established as an 'Institution of National Importance' with a view to maximize the number of qualified researchers and professionals of impeccable quality in the domain of science engineering. An admission program **(NIMR_AcSIR PhD program)** August 2020 session was launched. Approximately 600 applications were received for the session. After screening of the eligible candidates, 150 applicants were invited for online/virtual interview. The interview was conducted by 4 parallel committees for 5 days. The final scores were then normalized and a merit list was prepared based on AcSIR and UGC guidelines. A total of 37 students have been admitted for the current PhD session, against the advertised 41 seats.

Covid-19 Activities

ICMR-NIMR has been actively involved in management of the **COVID-19 pandemic**. The institute established and managed the Central and Regional Depot for COVID-19 diagnostic reagents and also mentored other depots. Apart from COVID-19 testing, the institute is also involved in quality assurance of COVID-19 diagnostics in the form of **RT PCR kits, VTMs, RNA extraction kits and antibody RDTs.** Biorepository of blood samples and VTMs from COVID-19 patients has also been established. The institute provided support to the **National Institute of Biologicals (NIB)** for COVID-19 reporting and data management. ICMR-NIMR coordinated the COVID-19 testing during the monsoon session of the Parliament of India. Scientists of ICMR-NIMR also undertook various research projects on COVID-19.

Mentoring, Screening and Depot

Public Engagement Activities

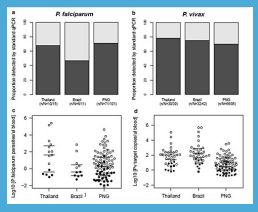
ICMR-NIMR encourages public engagement activities to spread awareness among people regarding the causes, the control, the prevention and treatment strategies of malaria in an attempt to reduce the mortality and morbidity among Indian population. The strategies were developed around four decades ago and have evolved at a faster pace working in a collaborative manner to achieve the final goal of **malaria elimination** by 2030 from India.

Achievements/Awards

India | EMBO Lecture Course 2020 Award

Dr Abhinav Sinha, Scientist 'E', ICMR-NIMR received EMBO and **DBT/Wellcome Trust India Alliance** funded lecture course award 2020. The principal objective of the meeting is to collate and transfuse the state-of-the-art principles, practices and understanding of the central theme between the experts in malaria (and beyond) and the current and future torchbearers of malaria elimination (and finally, eradication). In addition to the coursework, the participants will be benefited from a practical simulation exercise, networking sessions in the form of scientific writing, work-life balance, career guidance, and more interactive and entertaining programs such as the icebreaking, quiz, and a game.

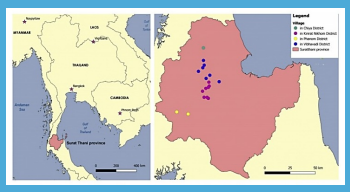
Scientific Contributions by Scientists/Researchers in the field of Malaria Research



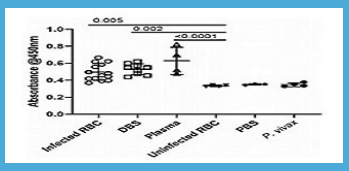
Utility of ultra-sensitive qPCR to detect *Plasmodium falciparum* and *Plasmodium vivax* infections

Gruenberg *et al*., Malaria J., 2020,- This study compared the gains in parasite prevalence obtained by the use of ultra-sensitive (us)-qPCR as compared to standard qPCR in cross-sectional surveys conducted in Thailand, Brazil and Papua New Guinea (PNG). The compared assays differed in the copy number of qPCR targets in the parasite genome.

Malaria cross-sectional surveys identified asymptomatic infections of *Plasmodium falciparum*, *Plasmodium vivax*, and *Plasmodium knowlesi* in Surat Thani, a southern province of Thailand



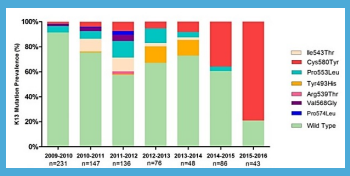
Shimizu *et al.*, International Journal of Infectious Diseases, 2020,- This study reported that despite the very low incidence rate in Surat Thani, most malaria infections were asymptomatic. Outdoor mosquito biting at night-time is likely an important mode of malaria transmission. Unexpectedly, asymptomatic *Plasmodium knowlesi* infection was found, confirming previous reports of such infection in mainland Southeast Asia.



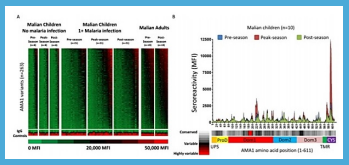
Glutamate dehydrogenase: a novel candidate to diagnose *Plasmodium falciparum* through rapid diagnostic test in blood specimen from fever patients

Kori *et al.*, Scientific Reports, 2020. Researchers at ICMR-NIMR has identified PfGDH as a novel biomarker for diagnosis of *falciparum* malaria and use it to develop RDT. PfGDH antibodies are 96.30% sensitive and 100% specific for PfGDH antigen.

K13 Propeller Mutations in *Plasmodium falciparum* Populations in Regions of Malaria Endemicity in Vietnam from 2009 to 2016.



Thuy-Nhien *et al.*, Antimicrobial Agents and Chemotherapy. 2017. In this study, the propeller domain gene of K13, a molecular marker of artemisinin resistance, was successfully sequenced in 1,060 *P. falciparum* isolates collected at 3 malaria hot spots in Vietnam between 2009 and 2016. Eight K13 propeller mutations including several that have been validated to be artemisinin resistance markers were reported.



Microarray analyses reveal strain specific antibody responses to *Plasmodium falciparum* apical membrane antigen 1 variants following natural infection and vaccination

Bailey *et al.*, Malaria J., 2020, - In this study, protein and peptide microarrays representing

hundreds of unique AMA1 variants have been designed and are critical to seroreactivity to peptides in a region of AMA1 associated with strain- specific vaccine efficacy.

Malaria Scientists to watch: An interview with Dr. Shweta Pasi


Dr. Shweta Pasi

Dr. Shweta Pasi is currently working as '**Scientist B**' at **ICMR-NIMR** where she primarily acts as a co-investigator in projects related to understanding the impact of climate change on vector borne diseases. It is our honour to initiate this column in our first newsletter with Dr. Pasi's interview as given below:

1. Your origin story: Can you please describe your research background?

Like many biology students, I had dreamt of becoming a medical doctor after school but destiny had something else for me. I could not clear the medical entrance exams and so my father advised that instead of preparing at home for the medical entrance I should pursue graduation. So, I got enrolled into the graduation program in Biomedical Science at University of Delhi in 2003. After graduation, I did my masters in Biotechnology from the **AIIMS**, New Delhi in 2008. I completed my Ph.D. from **NII,** New Delhi in 2014 under the esteemed guidance of Prof. Avadhesha Surolia. My doctoral work was focused on developing protein therapeutics for chronic auto-inflammatory disorders in particular rheumatoid arthritis.

2. What was the biggest motivation in your life that made you become a scientist?

I had always felt that being financially independent is very important in life. Although I had never planned my career but getting a job was always on my mind. Moreover, research has its own charm. In 2014, ICMR had advertised 60 Scientist-B posts. So, I filled up the form and I was fortunate that I got selected for a post of Scientist-B at ICMR.

3. Enlighten us about your line of research and what has been the importance/impact of your research?

I have been mostly involved as a co-investigator in projects related to understanding the impact of climate change on vector borne diseases. As we know, that VBDs are climate sensitive and with rise in global temperature they are rapidly expanding to cooler regions. In India, the Himalayan states are particularly vulnerable to the spread of VBDs. So there is a need for determining the regions likely to be affected by VBDs in near future and prepare the communities in those areas for future challenges. We have established field sites in the states of Uttarakhand and Himachal Pradesh, where we are carrying out routine entomological surveillance and also recording monthly climatic data. We are also studying the expression of heat shock proteins in malaria vectors to understand their adaptability with rising temperatures. A DST-ICMR-Centre of Excellence for Climate change and Vector Borne Diseases has also been set up at ICMR-NIMR with objectives to identify the climatic thresholds for the transmission of VBDs, modelling VBDs and disease

vectors in projected scenario of climate change, to determine the link between disasters and VBDs, and to develop an early warning system for malaria and dengue. I have also worked on an ICMR funded project wherein we were trying to find out the vector and parasite of cutaneous leishmaniasis in a focal area in Himachal Pradesh and other ecological determinants that have perpetuated the disease in those regions. Further, I am also studying the effect of blood meal on life-history traits of mosquitoes other than oogenesis. Among mosquitoes only the female takes blood which it requires for oogenesis. The male survives on plant nectars and has no role in disease transmission. When compared in terms of life-span, male mosquitoes which feed exclusively on plant-sugars live for significantly short durations than their female counter-parts. It appears that blood-meal besides being essential for egg development may also prolong survival in mosquitoes. So, in this study I am trying to identify the molecular basis of this disparity in the life-span of male and female mosquitoes by comparing the effects of sugar and blood feeding on mosquito ageing and longevity.

4. What got you interested in starting a career at ICMR-NIMR and how has been your journey till date?

After selection at ICMR, I was posted to ICMR-NIMR in December, 2016. My journey since then has been challenging. I was an **immunologist** by training and after joining I was deputed to the environmental epidemiology division. So, it was a totally different field and administrative responsibilities also came along. But I have been lucky in getting a very supportive staff, colleagues and mentors in the **Environmental Epidemiology Division**. So, on the whole it has been an educational journey so far.

5. Other than malaria research, did/do you have any other research interests?

I am interested in developing adjuvant free vaccination. All proteins have an inherent propensity to aggregate and I feel that this property of proteins can be harnessed to develop adjuvant free vaccination as protein aggregates have been shown to be immunogenic.

6. Finally, on a lighter note, do you have any hobbies other than science that keeps you going on even during challenging times during your research career?

Being a mother of two kids gives me very little scope for hobbies. Moreover, spending time with children is itself is environmental enrichment that keeps stress at bay. Still, I like to listen to retro songs sung by Lata Mangeshkar and Kishore Kumar.

Upcoming Events

Second call of proposals: MERA-India will be announcing the second round for submission of applications seeking funding of malaria centric research proposals. MERA-India aims to create a competitive environment, a harmonized assessment and consideration process with a view of selecting and awarding grants to those proposals that meet the objectives of MERA-India, in an optimal way.

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