

Plasmodium



Newsletter of the National Institute of Malaria Research, Delhi

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From the Director's Desk

Dear Readers,

Year 2008 started with all-round developments at the institute. The period under report was like a dream come true for NIMRians since we started the long awaited shifting process to our new state-of-the-art building at Dwarka, New Delhi. Our field units at Chennai, Bangalore and Sonapur shifted to new strategic locations, which would definitely improve the output of these units. NIMR scientists published 29 papers during the past six months in international journals with high impact factor. We continued trials with different Artemisinin-based combination therapies and new insecticides.

NIMR successfully organised the IX International Symposium on Vectors and Vector Borne Diseases and an International Workshop on Insecticide Resistance in February at Puri, Orissa. In the front of capacity building, we conducted training programmes in the fields of diagnosis of malaria, molecular epidemiology, basic malaria parasitology and entomology, *in vitro* culture, etc. I am happy to mention here that NIMR would be the nodal agency to impart training to scientists and technicians from African countries under the Indo-African Programme.

The Scientific and Research Advisory Committee meetings were very successful and will definitely provide new dimensions to the future research at the Institute. We celebrated Annual Day of the Institute in our own campus. Prof. Syed Hasnain, Vice-Chancellor, University of Hyderabad, Hyderabad delivered the annual day oration. We also observed the National Science Day and the World Malaria Day. On academic front, we are in the process of affiliation to some new universities: Maharshi Dayanand University, Rohtak and Goa University, Goa.

A P Dash



National Institute of Malaria Research

(Indian Council of Medical Research), 22 Sham Nath Marg, Delhi-110 054

Telephone: +91-11-23981690, 23915658; Fax: +91-11-23946150

Scientists create T-shirts, socks with built-in mosquito repellent

Source: Medindia.com

Had enough with new bug-killing solutions to avert that disgusting smell in T-shirts and socks? Well, now make sure to smell good by wearing clothes that have in-built mosquito repellent. Developed by Tesco, these T-shirts and socks would also smell of different types of scents, as they are woven with extracts of lemon eucalyptus and lavender. Boffins have also coated these clothing items with a special layer to lock in the smell mozzies hate. Going on sale, these cotton items are reasonably priced. While the T-shirts cost 8 pounds (children's 5–6 pounds), the socks are priced at 4 pounds a pack. In fact, the scientists have promised that the repellent will remain active for up to six washes.

Rapid technique to detect malaria developed

Source: Medindia.com

Researchers from the Universities of Exeter and Coventry, have developed a new test that will make diagnosing malaria a matter of minutes. Currently, the team is working on a non-invasive version of the device, which will soon go under trial in Kenya later this year. The technique took two years in the making, and uses magneto-optic technology (MOT) to detect haemozoin, a waste product of the malarial parasite, in the blood. The new method comes out with a precise reading of the presence of haemozoin in a small blood sample. In fact, the team has also created a device, which gives a positive or negative reading for malaria in less than a minute. The new device has a totally different approach from RDTs and high-power microscopy for malaria diagnosis. While high-power microscopy is time-consuming and requires expensive equipment and specialist medical skills, RDTs allow for faster diagnosis in the field, but these are too costly to be viable for developing countries. We expect to ultimately produce a sensitive non-invasive device that will be cost-effective and easy to use, which will soon go under trial in Kenya later this year" said Professor Dave Newman of the University of Exeter's School of En-

gineering, Computing and Mathematics. The results of the study are published in the Biophysical Journal.

Gene knock out technology knocks out malaria parasite channel

Source: Medindia.com

A research team consisting of scientists at the University of Copenhagen and Johns Hopkins University, Baltimore, has genetically altered the malaria parasite through gene knock-out technology, thus preventing the parasite from going through the normal stages of its life cycle and developing a cyst (egg-like structure or oocyst), which spawns new infectious parasites. "As it is exclusively the parasites from these oocysts that can infect new individuals, we were able to prevent the disease from being transmitted to the animals in the tests", explained Assistant Professor, Peter Ellekvist from the University of Copenhagen.

The malarial parasites have a complex life-cycle. As the malarial parasites can reproduce both through sexual reproduction when they inhabit a mosquito (and are transmitted to the host) and via asexual reproduction when they reside in the human body (replication in the host), the scientists have to deal with both types of transmission to successfully counteract malaria.

Genes of potassium channels, a subtype of ion channel, found in all cells play a crucial role in many biological processes, e.g. influencing the ability of the nerves to send electrical signals and the heart muscle to contract rhythmically.

Ellekvist explained that the only parasites that were unable to reproduce sexually were those with non-functioning potassium channels."

The researchers are now planning to examine the reaction of parasites with non-functioning potassium channels to anti-malaria drugs which would allow to break the second phase of the infection cycle and preventing the asexual reproduction of the malaria parasites residing in the human body.

The findings have been published in the scientific journal Proceedings of the National Academy of Sciences, USA. 500 Million Malaria Patients may Get Drugs at a 10th of Current Cost. Scien-

tists at the University of California, Berkeley, are wheeling in methods of "Synthetic biology" to genetically engineer microbes with artificial chromosomes containing genes from the Chinese plant *Artemisia annua* (sweet wormwood), extracts of which are used to manufacture drug called artemisinin. These microbes will be grown on an industrial scale in bioreactors built by sanofi aventis a French company, to produce semi-synthetic form of the drug to treat 500 million people a year at 1/10th of current cost. According to Professor Jay Keasling of the University of California, Berkeley, the low price and wide-spread availability could undermine the counterfeit market of the drug.

Global Warming Fuelling the Need for Malaria Vaccine

Source: Medindia.com

Global warming has led to a rapid increase in the number of malaria cases, thereby fuelling the need for lifesaving vaccinations to those in need, says an expert. Experts fear that the drastic changes in the climate may further increase the number of cases in the coming years. "Forty-one percent of the human race lives in areas of high malaria transmission," said Dr. Sylvain Fleury, Chief Scientific Officer at Mymetics, a Swiss vaccine biotech currently developing a vaccine with the potential to control malaria in developing countries. "Because Europe, North America, and North Asia are now significantly colder than regions of high malaria incidence, developed nations have felt immune from the malaria threat, but that sense may soon be up-ended," Fleury added. Studies have shown that even a modest temperature increase can extend the proliferation of malaria-bearing mosquitoes.

Therefore, as temperatures rise, billions of people could find themselves living in regions of high malaria incidence. "The best way to prevent the spread of malaria into warming areas of the globe is to find a solution before the situation worsens," said Dr. Fleury.

"If we can begin to curb the spread of malaria in high threat areas, the eventual reach of the disease will be seriously limited," he added. Due to glo-

(contd. on p.11)

Use of quantitative proteomics to investigate mosquito-parasite biology in malaria

Dr. Akhilesh Pandey

Johns Hopkins University, USA

World Health Organization has reported the re-emergence of malaria as the 'Number 1 infectious killer' and 'Number 1 priority tropical disease'. An understanding of parasite-vector relationship in the context of malaria will help evolve strategies to combat transmission of malaria. The genome of the major African malaria vector, *Anopheles gambiae* is now complete with the sequencing of genomes of other *Anopheles* species in progress. The sequencing of the genomes of malarial parasites, *Plasmodium falciparum* and *P. vivax*, has already provided the scientific community insights into the mosquito-parasite physiology and behavior. Identification of mosquito genes involved in the transmission of parasite, development of resistance to insecticides, functioning of the olfactory system and the ability to choose humans as the source of blood would eventually help in defining ways to control the transmission of malaria.

Malaria vectors are uniquely present in the *Anopheles* genus but not all anopheline species are considered major vectors of malaria. Also, there is a plethora of sibling species all of which are not involved in malaria transmission. Multiple anopheles genomes would give us a framework to have an in-depth understanding of the malaria parasite-vector relationship, and also answer certain questions like why only certain species are involved in transmission while others are not. In short, we need to know what exactly decides the productive "vector traits" in a species complex. Proteomics can help in such scenarios. With the use of high-resolution quantitative mass spectrometry, one can simultaneously identify and determine the relative expression levels of proteins in different proteomes. The

proteomes of mosquito vectors and non-vector sibling species need to be characterized in order to identify molecular differences associated with vector-parasite interactions that may be facilitating malaria transmission. Proteomic characterization of *P. falciparum* has been carried out by two major proteomic groups, that of Matthias Mann and John Yates [1-3]. Characterization of the mosquito proteomes, however, has largely lagged behind. Our group has analyzed *An. gambiae* salivary gland proteome, which led to the identification of several unique proteins of which 57 were novel [4]. We also carried out a functional annotation of proteins identified in this study through a detailed bioinformatics analysis [5]. Subsequently, we have also identified and characterized a novel protein named Saglin as a target of monoclonal antibodies, which hinder the ability of *Plasmodium* sporozoites to infect salivary glands of vector mosquitoes [6].

India provides an attractive platform to understand the molecular mechanisms involved in vector-parasite interactions. There are more than 50 different mosquito species with ability to transmit malaria. Fur-

ther, even geographical and climatic differences have been observed to affect the parasite carrying ability of these vectors. The genomes of the major malaria vectors prevalent in India such as *An. stephensi*, *An. culicifacies*, *An. dirus* and *An. fluviatilis* have not been sequenced. There are still a number of questions yet to be answered which are essential for the discovery of targets for altering the malaria transmission capacity. The availability of the complete genome sequences of *Aedes aegypti* and *An. gambiae* as reference models will provide an ideal platform for proteomic studies on malaria vectors relevant to India. The widespread distribution of the vector species in different ecological paradigms, prevalence of vector and non-vector sibling species, drug resistance among parasites and development of insecticide resistance among the vectors add to the complications.

In recent years, mass spectrometry has become a powerful tool to rapidly identify thousands of proteins. The sensitivity and specificity of protein identification has improved even further with the introduction of very high resolution Fourier transform

(contd. on p. 5)

Akhilesh Pandey, M.D., Ph.D. is an Associate Professor at Johns Hopkins University, USA where he directs a team of molecular biologists, chemists and bioinformaticians whose goal is to use genomic and proteomic approaches to study human diseases. He is also the founder of the Institute of Bioinformatics (<http://www.ibioinformatics.org>), a non-profit research institute that was established about six years ago in Bangalore, India. This Institute is involved in interdisciplinary research to find biomarkers for cancers, tropical diseases and neurological disorders and in developing resources and tools for systems biology research. Dr. Pandey is on the Editorial Board of several journals including *Journal of Proteome Research* and *Clinical Proteomics*.



Histidine-rich protein 2 in *falciparum* malaria diagnosis – ‘some insight’

Malaria diagnosis is the biggest challenge faced by the clinicians, even though many diagnostic approaches are available now-a-days. Changing patterns of accepted morphological appearances of malaria species, possibly due to drug pressure (also responsible for the emergence of drug-resistance), strain variation, or approaches to blood collection, have created diagnostic problems that cannot easily be resolved merely by reference to an atlas of parasitology. Globally, early diagnosis and prompt treatment is a basic tenet of current malaria control policy. Therefore, deployment of reliable rapid diagnostic tests (RDTs) remains a priority. As per WHO recommendations on non-microscopic RDT, sensitivity should be above 95% compared to microscopy, and the detection of parasitaemia, such that levels of 100 parasites/mL (0.002% parasitaemia) should be detected reliably with a sensitivity of 100%. Quantitative or semi-quantitative

information on parasite densities in circulating blood, the ability to distinguish viable parasites from parasite products such as antigens or nucleic acids not associated with viable organisms and also to indicate the prediction of treatment outcomes or resistance to common antimalarial drugs was considered essential.

HRP 2 (M_r 60,000 to 105,000) is a water-soluble protein, species-specific and heat stable molecule produced by asexual stages and young gametocytes of *P. falciparum*. It is expressed on the RBC membrane surface, and because of its abundance in *P. falciparum*, it was the first antigen to be used to develop an RDT for falciparum malaria detection. PfHRP2 are not expressed due to effect of chloroquine and demonstrate false negative results [1]. PfHRP2 concentration may reflect the total parasite biomass in falciparum malaria [2]. However, genetic variation of *P. falciparum* strains likely has a major effect on the bind-

ing affinity of the antibodies and target antigen. Therefore, the genetic diversity of *P. falciparum* strain likely has a major effect on performance of RDTs especially sensitivity and reliability [3]. The present rapid diagnostic test has its own limitations and disadvantages. The major drawbacks in the use of all the RDTs are that the results are essentially qualitative, not quantitative thus fail to provide information of possible prognostic importance and are not suitable for monitoring drug treatment results.

References

1. Ghosh SK *et al.* *Japanese J Trop Med Hyg* 2002; 30(1): 7–13.
2. Dondorp *et al.* (2005). *PLoS Medicine* 2005; 2(8): 788–96.
3. Baker J *et al.* *J Infect Dis* 2005; 192: 870–7.

AS Pradeep

Junior Research Fellow
NIMR Field Unit, Bangalore

Is artemisinin resistance a threat?

Resistance of *P. falciparum* to drugs such as chloroquine and sulphadoxine-pyrimethamine (SP) is a major problem in malaria control. Artemisinin derivatives, particularly in combination with other drugs, are increasingly used to treat malaria, reducing the probability that parasites resistant to the components will emerge. Although stable resistance to artemisinin has yet to be reported from laboratory or field studies, its emergence would be disastrous because of the lack of alternative treatments.

Chloroquine and other antifolate drugs gave successes in treating falciparum malaria for long time. However, by the time the molecular

markers for resistance to chloroquine and the antifolate combination sulphadoxine-pyrimethamine were established as tools for predicting clinical treatment outcomes, resistance had already severely compromised the efficacy of these drugs in most parts of the world. The emergence and spread of resistance to chloroquine and SP has led to recommendations that they be replaced with ACTs, which offer much-improved efficacy. However, the development of resistance to artemisinins or their partner drugs may severely limit the utility of ACTs, and reliable markers for monitoring resistance to ACTs are needed. For that we need to avoid unacceptably long delays in

identifying, validating and deploying molecular markers of ACT resistance. There is a critical need to detect and confirm resistance to the component drugs in ACTs, and to the artemisinins in particular, as soon as it emerges, and then to develop and validate tools to monitor resistance. These tools can then be applied in real time to help establish rational treatment policies and to design and deploy drug combinations that will deter resistance.

It has been postulated that artemisinins inhibit various enzymes in *P. falciparum*. Further, certain mutations are also associated with artemisinin resistance. This suggested that documentation of these

mutations may indicate emergence of artemisinin resistance in *P. falciparum* in the field. The increase in *P. falciparum* multi-drug resistance-1 (Pfmdr-1) copy number is

believed to reduce parasite sensitivity to some quinoline antimalarials. Therefore, ATPase6 genotype and pfmdr1 copy number could make early warning signals for emergence

of ACT resistance.

Prakriti Srivastava

Senior Research Fellow, NIMR
Delhi

Use of proteomics...(contd. from p. 3)

mass spectrometers such as the Orbitrap. In addition, techniques such as electron transfer dissociation (ETD) provide the ability to definitively localize labile post-translational modifications such as serine and threonine phosphorylation. Use of stable isotope containing 'tags' allows one to obtain relative quantitation of protein abundance across multiple samples. The most popular of these methods are SILAC for *in vivo* labeling and iTRAQ for *in vitro* labeling. The iTRAQ method allows multiplexed analysis of up to 8 samples simultaneously. There are several scenarios in which the power of mass spectrometry could be used to investigate mosquito vectors of relevance to India as well as to study the interaction of the malarial parasites with the mosquitoes, especially the gut and the salivary glands. First,

mass spectrometry could be used to characterize mosquito vectors of relevance to India, which would be helpful for annotation of their genomes, once they are sequenced. This is important because genome annotation is normally carried out by gene prediction programs, which are coupled with a number of problems including false positives and false negatives. Second, mass spectrometry could be used to compare the proteomes of transmission capable species with their sibling species that cannot transmit malaria. This would provide the molecular differences at the protein level that might be responsible for their differential ability to act as vectors of malaria. Third, the development of oocysts in the gut of the mosquito vector could be studied using quantitative proteomics, which would reveal protein changes

in the oocyst as well as the host as the parasite develops. This information could be used to design transmission-blocking strategies. In conclusion, mass spectrometry-driven proteomic approaches will be invaluable in understanding the molecular pathogenesis of malaria, especially as it relates to transmission.

References

1. Hall *et al.* *Science* 2005; 307: 82.
2. Florens *et al.* *Nature* 2002; 419: 520.
3. Lasonder *et al.* *Nature* 2002; 419: 537.
4. Kalume *et al.* *Proteomics* 2005; 5: 3765.
5. Kalume *et al.* *BMC Genomics* 2005; 6: 128.
6. Okulate *et al.* *Insect Mol Biol* 2007; 16: 711.

New addresses of three field units of NIMR

Three field units of NIMR viz. Sonapur, Bangalore and Chennai have started functioning from new campuses. Their addresses are as under.

Sonapur: Integrated Disease Vector Control Project Field Unit
Chachal, VIP Road, Sixth Mile,
Guwahati – 781 022, Assam
Ph: +91-94353-45154

Bangalore: Integrated Disease Vector Control Project Field Unit
Nirmal Bhawan, ICMR Complex, Poojanahalli
Kannan Mangla post, Devanhalli Taluk
Bangalore – 562110, Karnataka
Ph: +91-9845054366

Chennai: Integrated Disease Vector Control Project Field Unit
National Institute of Epidemiology Campus
2nd Main Road, TNHB, Ayapakkam
Chennai – 600 077, Tamil Nadu
Ph: +91-44-26820600/1700

IX International symposium on vectors and vector borne diseases

NIMR successfully organised the IX International Symposium on Vectors and Vector Borne Diseases at Puri under the auspices of the National Academy of Vector Borne Diseases from 15–17 February 2008. More than 500 delegates across the globe attended the same. Sh. Sanatan Bisi, Hon'ble Minister of State for Health and Family Welfare, Govt. of Orissa presided over the function. Sh. Debasis Nayak, Minister of State, Information & Public Relations, Sports and Youth Service was the guest of honour. Dr. S. Habayab, WHO-Representative to India, Dr Altaf Lal, Health Attache, US Embassy, India, Dr V.P. Sharma, former Director, NIMR, Dr G.P.S. Dhillon, Director, NVBDCP were also present to grace the inaugural function. There were various scientific sessions on vector biology and control, parasite



Inaugural function



Prof. G. Padmanabhan delivering the plenary lecture



Dr J.P. narain presenting award to Ms Gauri Awasthi



Dr Altaf Lal presenting citation to Dr Ekta Gupta



Dr. JP Narain presenting award to Mr L.C. Mishra

biology, molecular biology, epidemiology, drug discovery, vaccines etc. There were about 100 oral presentations and more than 200 posters focussing different areas of malaria research.

The National Academy of Vector Borne Diseases conferred several awards in recognition of outstanding research contributions in the field of vector borne diseases. Dr Sukla Biswas (2004) and Dr Hema Joshi (2007), NIMR received award for their contributions to Molecular Biology. Dr S.K. Sharma, NIMR received award for outstanding contributions in the field of vector biology. The award for contribution in clinical aspects was given to Dr Ekta Gupta of Maulana Azad Medical College, New Delhi.

The Bayer Environmental Science award was given to Dr D.T. Mourya, NIV, Pune. The Biotech International Life-time achievement award was given to late Dr M.A. Ansari, former Director, RMRCT, Jabalapur for his contributions in the field of vector borne diseases. Dr Arun Sharma, NIMR won the best poster award in the senior category. Under junior category awards were won by Mr Manoj Chug, MD University, Rohtak (First), Ms Gauri Awasthi, NIMR (Second), Ms Sharmila Pahwa and Mr Prashant Mallick, NIMR, Mr Manas Sarkar, DRL, Tezpur and Ms Arkeja Kumar, DRDE, Gwalior and Mr. L.C. Gupta, University of Delhi (Third).

Workshops and training courses organised

1. International Workshop on Insecticide Resistance

An International Workshop on 'Insecticide resistance' focussing on insecticide resistance in malaria vectors, management of resistance by new insecticides and other tools was held at Puri on 14 February 2008. More than 50 delegates participated in the workshop.

2. Workshop on Basic Malaria Parasitology and Entomology

A five-day workshop was organized by NIMR during 28 April to 2 May 2008 on "Basic malaria parasitology and entomology" under NYU-NIMR collaboration and was coordinated by Dr Hema Joshi and Dr Nutan Nanda. Course curriculum included lectures and demonstrations on various aspects of malaria parasitology, entomology and epidemiology including national drug policy etc. Scientists and students of NIMR participated in the workshop.

3. Training courses

Two training courses on malaria and other vector borne diseases for Medical Officers of various districts of Madhya Pradesh were organized at NIMR Field Unit, Jabalpur in January and February 2008.

Six re-orientation training courses for Laboratory Technicians in malaria microscopy were organized in collaboration with Commissionerate of Health, Govt. of Gujarat at NIMR Field unit, Nadiad during February and March 2008.



Valedictory function (on the dias from left Dr Nutan Nanda, Prof. A.P. Dash, Dr Altaf Lal, Dr J.P. Narain, Dr S. Pattanayak and Dr V.P. Sharma



Prof. A.P. Dash welcoming the delegates



Workshop on malaria & other vector borne diseases organised at NIMR FS, Jabalpur



Workshop on 'Basic malaria parasitology and entomology' organised at NIMR, Delhi

New extramural grants received

- Assessment of the Impacts of climate change on malaria and dengue at National scale and adaptation strategies
- Impact of climate change on dengue in Delhi
- A Phase III clinical trial of a fixed-dose formulation of oral pyronaridine artesunate versus chloroquine in children and adult patients with acute *P. vivax* and *falciparum* malaria
- Studies on the genetic diversity at the antigenic vir gene of Indian *Plasmodium vivax*
- Operational research on drug use practice in children in Jharkhand state.

National Science Day celebrated

The National Science Day was celebrated in Gyan Bharati School, Shankar Road, New Delhi on 23 February 2008. Information on control of mosquitoes and mosquito borne diseases was imparted to the senior secondary school children. Students took active part in debates and discussions. In addition to live demonstration of various stages of vector mosquitoes, larvivorous fish; EPS beads, biocides and rapid diagnostic kits were also demonstrated.



Dr MS Malhotra, NIMR delivering the lecture on malaria and its control



Demonstration of mosquito larvae to school children

World Malaria Day observed

The World Malaria Day was observed by WHO-SEARO on 25 April 2008. NIMR participated in the same by arranging an exhibition figuring diagnosis, prevention of malaria through demonstrations, slide shows, posters, video films, etc.



Dr T. Krongthong during the exhibition



Demonstration of malaria parasites

Conferences/meetings/seminars attended

Dash AP attended meeting on 'Ongoing collaboration activities between NIMR and CDC' at CDC, Atlanta from 2 to 5 March 2008.

Dash AP attended the 'II Scientific Advisory Committee (SAC)' meeting at Geneva from 31 March to 4 April 2008.

Dash AP attended the 'Coordination meeting on the Impact of vector control interventions in areas where vectors are resistant to insecticides' at Geneva from 25–29 March, 2008.

Dash AP attended the 'Scientific Advisory Committee' meeting of the Centre for Research in Medical Entomology, Madurai on 11–12 January 2008.

Dash AP delivered the 'Foundation Day Oration' at Institute of Life Sciences, Bhubaneswar on 11 February 2008.

Dash AP, Valecha Neena and Ghosh SK attended a meeting to discuss the results and publications of the 'DHA-Piperaquine (Artekin) trial' at Bangkok, Thailand on 5 February 2008

Dash AP attended the 'Scientific Advisory Committee' meeting of the Institute of Life Sciences, Bhubaneswar on 1 and 2 May 2008.

Dhiman RC delivered an invited lecture on 'Climate change and its impact on malaria and other vector borne diseases' at the School of Public Health, PGIMER, Chandigarh on 7 April 2008 on World Health Day.

Dhiman RC delivered invited lecture on

'Climate change and threat of vector-borne diseases' at International Symposium in Bangalore on the occasion of World Malaria Day on 25 April 2008.

Ghosh SK and Tiwari SN attended a 'Two-day workshop on AYUSH as a participatory role in public health' at FRLHT from 10–11 February 2008.

Ghosh SK and Tiwari SN attended the 'IX Sir Dorabji Tata symposium on antimicrobial resistance' at Bangalore, India from 10–11 March 2008.

Mishra Neelima and Sneh Salini attended a WHO-ICMR sponsored training programme on 'Good Clinical laboratory practices' at RMRI, Patna during 27–30 May 2008.

Mittal PK attended the dissemination workshop on "Profile of health research" organized by NISTADS, New Delhi on 30 May 2008 and chaired the session.

Sharma SK visited Bhutan from 21 December 2007 to 5 January 2008 as a short-term consultant to review and support the malaria control programme of Govt. of Bhutan.

Sharma SK delivered a key note address on 'Problems of malaria in Orissa and control strategies' in annual life science seminar at Rourkela on 8 February 2008.

Singh Neeru attended NIH meeting on 'Iron and malaria' at Washington, USA on 24 and 25 April 2008 as member of technical working group.

Singh Ruchi delivered a talk and mod-

erated the panel discussion under UNESCO L'OREAL for women in Science programme on 11 January 2008 at Nagpur University, Nagpur.

Valecha Neena attended a meeting focused on the choice of the best drug(s) to be combined with tafenoquine at Oxford, UK on 29 April 2008.

Valecha Neena attended a meeting on 'world antimalarial resistance network (WARN)' at Oxford, UK from 3–6 January 2008.

Valecha Neena attended the 'DND/FACT Advisory Group Meeting' at Geneva, Switzerland on 22 April 2008.

Valecha Neena attended the 'World Antimalarial Resistance Network (WARN)' at Paris from 16–19 April 2008.

Valecha Neena attended the 'XIII International congress on infectious diseases' at Kuala Lumpur, Malaysia. Invited speaker for 'DNA symposium' Malaysia from 19–22 June 2008.

Valecha Neena delivered a guest lecture on 'Drug resistance and new options for chemotherapy' in IAPSM Conference at Ahmedabad from on 18 January 2008

Valecha Neena, Joshi Hema and Singh Ruchi attended the 'Indo-US Vaccine Action Program Workshop' at New Delhi from 17–18 June 2008.

Yadav RS participated in IAPSM Conference on 'Vector Borne Diseases' at Ahmedabad on 18 January 2008.

NIMR's Director honoured

Prof. AP. Dash, received Rajiv Gandhi Sadbhawna Award 2008 by Rajiv Gandhi Forum, Orissa as best personality in health service on 21 May on the occasion of 17th Death Anniversary of Bharat Ratna Rajiv Gandhi by His Excellency Hon'ble Governor of Orissa, Sh. Muralidhar Bhandare.



Research papers published (January–June 2008)

1. Alam MT, Bora H, Mittra P, Singh N, Sharma YD. Cellular immune responses to recombinant *Plasmodium vivax* tryptophan-rich antigen (PvTRAg) among individuals exposed to vivax malaria. *Parasite Immunol* 2008; 30: 379–83.
2. Bajaj R, Mohanty S, Dash AP, Das A. Fine-scale genetic characterization of *Plasmodium falciparum* chromosome 7 encompassing the antigenic var and the drug-resistant pfcrt genes. *J Genet* 2008; 87: 59–64.
3. Biswas S, Seth R, Sharma G, Dash A. A longitudinal investigation of *Plasmodium falciparum* malaria in children in northern India. *Scand J Infect Dis* 2008; 40: 159–66.
4. Biswas S, Seth RK, Tyagi PK, Sharma SK, Dash AP. Naturally acquired immunity and reduced susceptibility to falciparum malaria in two subpopulations of endemic eastern India. *Scand J Immunol* 2008; 67: 177–84.
5. Dev V, Dash AP, Hojai D. Fishing out malaria in Assam, northeastern India: hope or hype? *Trans R Soc Trop Med Hyg* 2008; 102: 839–40.
6. Dixit R, Sharma A, Patole MS, Shouche YS. Molecular and phylogenetic analysis of a novel salivary defensin cDNA from malaria vector *Anopheles stephensi*. *Acta Trop* 2008; 106: 75–9.
7. Hawkins VN, Auliff A, Prajapati SK, Rungsahirunrat K, Hapuarachchi HC, Maestre A, O'Neil MT, Cheng Q, Joshi H, Na-Bangchang K, Sibley CH. Multiple origins of resistance-conferring mutations in *Plasmodium vivax* dihydrofolate reductase. *Malar J* 2008; 7: 72.
8. Jain V, Armah HB, Tongren JE, Ned RM, Wilson NO, Crawford S, Joel PK, Singh MP, Nagpal AC, Dash AP, Udhayakumar V, Singh N, Stiles JK. Plasma IP-10, apoptotic and angiogenic factors associated with fatal cerebral malaria in India. *Malar J* 2008; 7: 83.
9. Joshi H, Prajapati SK, Verma A, Kang'a S, Carlton JM. *Plasmodium vivax* in India. *Trends Parasitol* 2008; 24: 228–35.
10. Mohanty SS, Raghavendra K, Rai U, Dash AP. Efficacy of female *Culex quinquefasciatus* with entomopathogenic fungus *Fusarium pallidoro-seum*. *Parasitol Res* 2008; 103: 171–4.
11. Sharma A, Raghavendra K, Adak T, Dash AP. Determination of nitric oxide metabolites, nitrate and nitrite, in *Anopheles culicifacies* mosquito midgut and haemolymph by anion exchange high-performance liquid chromatography: plausible mechanism of refractoriness. *Malar J* 2008; 7: 71.
12. Shukla RP, Sharma SN, Nanda N, Dhiman RC, Dash AP. Malaria persistence in Kumaon foothills of District Nainital, Uttarakhand, India. *J Am Mosq Control Assoc* 2008; 24: 214–8.
13. Siddiqui AA, Bora H, Singh N, Dash AP, Sharma YD. Expression, purification, and characterization of the immunological response to a 40-kilodalton *Plasmodium vivax* tryptophan-rich antigen. *Infect Immun* 2008; 76: 2576–86.
14. Singh RK, Das MK, Dhiman RC, Mittal PK, Sinha AT. Preliminary investigation of dengue vectors in Ranchi, India. *J Vector Borne Dis* 2008; 45: 170–3.
15. Sinha S, Mishra SK, Sharma S, Patibandla PK, Mallick PK, Sharma SK, Mohanty S, Pati SS, Mishra SK, Ramteke BK, Bhatt R, Joshi H, Dash AP, Ahuja RC, Awasthi S. Indian Genome Variation Consortium, Venkatesh V, Habib S. Polymorphisms of TNF-enhancer and gene for FcγRIIIa correlate with the severity of falciparum malaria in the ethnically diverse Indian population. *Malar J* 2008; 7: 13.
16. Sohail M, Kaul A, Bali P, Raziuddin M, Singh MP, Singh OP, Dash AP, Adak T. Alleles -308A and -1031C in the TNF-α gene promoter do not increase the risk but associated with circulating levels of TNF-α and clinical features of vivax malaria in Indian patients. *Mol Immunol* 2008; 45: 1682–92.
17. Srivastava HC, Yadav RS, Joshi H, Valecha N, Mallick PK, Prajapati SK, Dash AP. Therapeutic responses of *Plasmodium vivax* and *P. falciparum* to chloroquine, in an area of western India where *P. vivax* predominates. *Ann Trop Med Parasitol* 2008; 102: 1–10.
18. Swain V, Mohanty SS, Raghavendra K. Sunlight exposure enhances larval mortality rate in *Culex quinquefasciatus* Say. *J Vector Borne Dis* 2008; 45: 70–2.
19. Swain V, Seth RK, Mohanty SS, Raghavendra K. Effect of temperature on development, eclosion, longevity and survivorship of malathion-resistant and malathion susceptible strain of *Culex quinquefasciatus*. *Parasitol Res* 2008; 103: 299–303.
20. Schug MD, Baines JF, Killon-Atwood A, Mohanty S, Das A, Grath S, Smith SG, Zargham S, Mcevey SF, Stephan W. Evolution of mating isolation between populations of *Drosophila ananassae*. *Mol Ecol* 17: 2706–2721.
21. Valecha N, Reetha AM. Comment: Presumptive Treatment: A step backward. *Malaria J* 2008; 7: 75.

Epubs ahead of print

22. Alam MT, Bora H, Singh N, Sharma YD. High immunogenicity and erythrocyte-binding activity in the tryptophan-rich domain (TRD) of the 74-kDa *Plasmodium vivax* alanine-tryptophan-rich antigen (PvATRAg74). *Vaccine* 2008 Jun 10.
23. Awasthi G, Singh S, Dash AP, Das A. Evolutionary inference of TNF-α gene with computational analyses. *Braz J Infect Dis* 12(5), (in Press).

Forthcoming events

European Multicollloquium of Parasitology (EMOP X)

Satellitesto Microsatellites
Paris, 24–28 August 2008
Organizers: Française de Parasitologie and the European Federation of Parasitology
Venue: Cité Internationale Universitaire de Paris.

International Congress for Tropical Medicine and Malaria

Jeju Island, Korea, during September 29 - October 3, 2008.

Details: <http://www.ictm17.org/index.asp>

57th Annual Meeting – ASTMH

December 7-11, 2008
Sheraton New Orleans
New Orleans, Louisiana, USA

Theoretical and Practical Course “Molecular Methods in Malaria Research”

17-28 November 2008, New Delhi, India
Organisers: Chetan E. Chitnis, Pawan Malhotra and Asif Mohammed

(ICGEB, New Delhi, India)

Requests for information and applications directly to: Ms. H.S. Narayanan
ICGEB - New Delhi Component
Aruna Asaf Ali Marg, New Delhi - 110 067, India
Tel.: +91-11-26742356
Fax: +91-11-26742316
E-mail: shubha@icgeb.res.in
Deadline for receipt of applications at ICGEB New Delhi: 30 August 2008

(Research papers contd.. from p.10)

24. Dhamodharan R, Das MK, Hoti SL, Das PK, Dash AP. Genetic variability of diurnally sub-periodic *Wuchereria bancrofti* in Nicobarese tribe of Nicobar group of Islands, Andaman and Nicobar Islands, India. *Parasitol Res* 2008, Mar 6.
25. Ghosh SK, Tiwari SN, Raghavendra K, Sathyanarayan TS, Dash AP. Observation of sporozoites in naturally infected sibling species of *Anopheles culicifacies* complex and variance of *An. stephensi* in Karnatka, India. *J Biosci.*
26. Lalitha PV, Biswas S, Pillai CR, Saxena RK. Immunogenicity of a recombinant malaria vaccine candidate, domain I+II of AMA-1 ectodomain, from Indian *P. falciparum* alleles. *Vaccine* 2008 Jun 27.
27. Lucchi NW, Tongren JE, Jain V, Nagpal AC, Kauth CW, Woehlbier U, Bujard H, Dash AP, Singh N, Stiles JK, Udhayakumar V. Antibody responses to the merozoite surface protein-1 complex in cerebral malaria patients in India. *Malar J* 7: 121, 2008.
28. Mohanty SS, Raghavendra K, Dash AP. Induction of chymoelastase (Pr1) of *Metarhizium anisopliae* and its role in causing mortality to mosquito larvae. *World J Microbiol Biotechnol.*
29. Sharma SK, Tyagi PK, Upadhyay AK, Haque MA, Adak T, Dash AP. Building small dams can decrease malaria: A comparative study from Sundargarh District, Orissa, India. *Acta Trop* 2008 May 29.

(Malaria news contd. from p.2)

bal warming malaria has already returned to the areas such as eru that had already eradicated the disease forty years ago.

Mosquito bed net experiment to eradicate malaria

Source: NDTV

Along with monsoon also comes the scare of various diseases and one of them is malaria. A survey done in 2003–2004 by the National Institute of Malaria Research in Khandera found 11 cases of the dreaded falciparum malaria and 22 cases of *P. vivax* in a popu-

lation of 2000, unusually high in western Uttar Pradesh. The malaria-prone village then became the setting to test mosquito bed nets. In August 2004, 1500 nets laced with insecticide were distributed to each family in one of the longest running clinical studies of bed nets in the country. The impact has been startling. In just four and half years, malaria has nearly disappeared.

In 2008, just two *P. vivax* cases and not a single *P. falciparum* case was reported in this endemic area. The study has effectively shown that mosquitoes, carrying the malaria parasite die within four minutes after coming into contact

with the net. Without human blood, the mosquito and the parasite cannot survive, so transmission of malaria is stopped.

These nets can be washed up to 20 times in five years but even after four and half years of use, mosquitoes die within 11 minutes. It also allows sufficient airflow to prevent suffocation, a major cause of rejection in traditional bed nets and till date only one person has complained of a mild skin allergy.

With its efficiency proven, it is now a matter of months that medicated bed nets will be introduced in the National Malaria Programme.

Scientific and Research Advisory Committee meetings

The Research Advisory Committee meeting of the Integrated Disease Vector Control Project was organized at NIMR Field Unit Goa on 15 March 2008 under the chairmanship of Dr S Pattanayak, former Advisor, WHO- SEARO. The Research Advisory Committee meeting of Epidemiology, Parasite Biology and Vector Biology and Control were held on 21 March 2008 under the chairmanship of Dr S Pattanayak, Dr YD Sharma, Prof. & Head, Deptt. of Biotechnology, AIIMS, and Prof. MKK Pillai, Former Prof & Head, Deptt. of Zoology, University of Delhi, respectively.

The meeting of the Scientific Advisory Committee was held at the institute's own campus on 23 March 2008 and was chaired by Prof. RC Mahajan, SN Bose INSA Research Professor & Emeritus Professor, PGIMER, Chandigarh.



SAC meeting in progress



IDVC RAC in progress

NIMR's Annual Day

The institute organized its annual day on 12 June 2008. Prof. Seyed E. Hasnain, Vice Chancellor, University of Hyderabad, Hyderabad delivered the Annual Day Oration on 'Molecular Epidemiology of *Mycobacterium tuberculosis*'. Dr SK Bhattacharya, Additional Director General, ICMR presided over the function, and Sh. Sanjeev Dutta, Financial Advisor, ICMR was the guest of honour.

Also present for the function were the dignitaries like Dr J P Narain, Director CD, WHO-SEARO, Prof. RC Mahajan, Dr S Pattanayak, Dr GPS Dhillon.



Prof. Seyed E. Hasnain giving the annual day oration



Prof. Mahajan introducing the speaker. Also present on the dias Sh. Sanjeev Dutta, FA, ICMR, Prof. AP Dash, Prof. Hasnain, Dr SK Bhattacharya and Dr VK Dua