

NIMR Newsletter

Newsletter of the National Institute of Malaria Research (formerly Malaria Research Centre), Delhi

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In this issue...

- Malaria in News 2
- Guest Column 3
- Institute's Activities 5
 - New Studies Launched 5
 - New Website Launched 6
 - IDVC Field Units Reorganised 6
 - Conferences/Workshops/
Courses Attended 7
 - Training Courses/Workshops/
Seminars Organised 9
 - Ph.D. Degree Awarded 9
 - Research Papers Published 10
- Forthcoming Scientific Events 11
- NIMR will have New Campus
Soon! 12
- NIMR Offers Research
Opportunities 12

From the Director's Desk

Dear readers,

Despite various efforts of tackling, malaria continues to be a serious global health hazard. In addition to the emergence and rapid spread of drug resistant parasite, there are recent reports on the emergence of new strains of *Plasmodium falciparum*. Also, this parasite species continues to overdominate its contemporary *P. vivax* and posing a greater threat on human life in India. We at NIMR are putting our efforts to understand the disease from various angles both in field and laboratory and our scientists continue to attract funding from national and international agencies for this purpose. A new website was launched to provide updated information on the genetic and biological diversity of Indian *Plasmodium* species. Keeping in view on the need, we had a recent major reorganisation of our field units; five previously existing field units were closed and two new field units were opened in the malaria prone areas of Jharkhand and Chhattisgarh.



Having our own campus is no more a dream. The foundation stone of the new campus at Dwarka had been laid on 2 February 2006 and the work is going at full momentum. I would like to take this opportunity to thank the Director General, Indian Council of Medical Research, Prof NK Ganguly for his continuous support in general and for the realisation of this long-cherished dream of the NIMR family, in particular. NIMR would be better organised once we shift to our new campus, some time in late 2007.

NIMR is now recognised by two universities, Indraprastha University, Delhi and Jiwaji University, Gwalior, for awarding Ph.D. degrees to students working at NIMR. This would definitely help attracting bright students to carryout research under the guidance of NIMR scientists in emerging fields of malaria research leading to Ph.D. degree.

I would like to invite all scientists working in the field of malaria research to contribute to NIMR Newsletter for better dissemination of knowledge which would help understanding and control of malaria in a more efficacious way.

—AP Dash



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Wristwatch for Detecting Malaria

MedIndia.com; 14 and 21 January 2006

A new wristwatch has been invented in South Africa capable of detecting the malaria parasites in the body of the wearer. This is done by automatically collecting the blood samples of the person who is wearing the watch, and if the malaria parasite is found, it warns the person. Gervan Lubbe has developed the watch which obtains blood samples with a microscopic needle that automatically penetrates the skin twice during the day and twice at night. An alarm sounds if the parasite count is above 50, before the first symptoms appear. However, medical experts have warned that the new wristwatch invented by South Africa's Gervan Lubbe can turn out to be a health hazard. They have warned that the device may contribute towards spreading infectious diseases like HIV/AIDS. There are some who have also expressed doubts if the watch can really perform functions like detecting diseases.

Malaria may Gain Resistance to Single Drug Prescriptions

MedIndia.com; 21 January 2006

The World Health Organization (WHO) has called upon the pharmaceutical companies to stop marketing a single treatment malarial drug, as the parasite which causes malaria may develop a resistance to it. Arata Kochi, Director of the WHO's malaria department, expressed that the practice of using artemisinin, one of the most effective anti-malarials, on its own would result in the parasite becoming resistant to the drug, and will have disastrous consequences for malaria treatment. It is to be noted that artemisinin combination therapies are currently the single most effective treatment to cure malaria, with a 95% cure rate.

The WHO is very much concerned that using artemisinin as a single drug would lead to it going the same way as other anti-malarial drugs such as chloroquine, sulphadoxine-pyrimethamine and atovaquone which lost their effectiveness because the malarial parasite was able to develop resistance to these drugs.

Malaria Parasites Develop in Lymph Nodes of the Immune System

BBC News; 23 January 2006

In a new study conducted by a team of scientists led by Dr Robert Ménard working at the Pasteur Institute in Paris found that malaria parasites develop in the lymph nodes of the immune system. Although the finding was unexpected, but it underlines just how complex malaria infection can be. The immature parasites are known to travel to an infected person's liver, which, until now, scientists thought was the only place they could develop. The new study revealed that only fully developed parasites can infect red blood cells and cause malaria – so the lymph-node parasites probably do not contribute to the appearance of malaria symptoms. However, even partially developed or destroyed parasites could significantly affect how the immune system responds to infection. Parasites developing in the lymph nodes might alert the body that an invader is present and activate a protective immune response. Alternatively, their presence might desensitise the body to the parasites, blunting the immune system's response to infection. These new findings generate hope in aiding to the development of better vaccines, which might potentially target the parasites before they develop in the liver. The new findings also revealed the fact that some of the parasites remained in the animals' skin for up to seven hours, raising the possibility that they might be responsible for a second wave of infection.

Low-cost Malaria Cure will not be a Distant Dream

MedIndia.com; 13 April 2006

It will now be possible to manipulate bacteria to produce a form of the malaria drug and thus enhance the capacity to lower the costs of each dose by 25 cents. A team of UC Berkeley scientists are coming out with this kind of facilities that would enable mass production of the medicines' most important ingredient, though it may take another five

years for the availability of an affordable drug in the market, yet this will not be a distant dream.

Malaria Resistant Mosquitoes and Genes Could Help in Combating Malaria

MedIndia.com; 29 April 2006

A new breed of mosquitoes found in Mali in West Africa, which is said to be naturally resistant to malaria could be helpful in combating the disease. Also, very recently a team of scientists from the University of Bamako in West Africa and three US-based institutes have identified a gene that could be the key to determining how resistant the mosquitoes are to infection by the parasite. The team found that many *Anopheles gambiae* mosquitoes which are Africa's most important malaria vectors are already resistant to the malaria parasite *Plasmodium falciparum*.

Anemia from Malaria Linked to a Protein MIF

MedIndia.com; 12 May 2006

Plasmodium is carried through blood by mosquito bites, and once in the bloodstream, it invades liver and red blood cells and makes more copies of itself. Eventually, as red cells break and free plasmodium to infect other cells, and as the body's immune system works to kill infected cells, the total number of red blood cells drops, causing anemia. Not everyone infected with malaria develops severe lethal anemia and also there are cases where patients who have been cured of infection still develop severe anemia. However, majority of deaths due to malaria is caused by anemia. Recently, scientists at Johns Hopkins, Yale and other institutions have conducted a joint cell and animal study that has revealed one important contributor to the severe anemia. The culprit is a protein, which the cells make in response to inflammation called MIF. This protein appears to suppress red blood cell production in people whose red blood cells already are infected by malaria parasites.

This report provides the rationale for a simple, genetic test to sort out which children may be most susceptible to this lethal complication of malarial infection and to identify treatments targeted especially to them.

Glucose Enables Speedy Recovery from Malaria

MedIndia.com; 18 May 2006

Once the RBCs get infected with the malarial parasite, not only does it draw energy from the infected cell but robs glucose from the adjacent cells that are otherwise healthy. This fact can explain the weakness experienced by patients with malaria. A team at the Tata Institute of Fundamental Research (TIFR) headed by Shobhna Sharma have now established that repeated doses of glucose given along with anti-malarial drugs can help patients especially children recover faster and in a better way.

Mosquito Immune System Examined

Johns Hopkins University, Bloomberg School of Public Health; June 8 2006

A recent study by researchers at the Johns Hopkins Bloomberg School of Public Health revealed that mosquitoes employ the same immune factors to fight off bacterial pathogens as they do to kill malaria-causing Plasmodium parasites. The study identified several genes that encode proteins of the mosquito's immune system. All of the immune genes that were involved in limiting infection by the malaria parasites were also important for the resistance to bacterial infection. However, several immune genes that were essential for resistance to bacterial infection did not affect Plasmodium infection. The findings add to the understanding of mosquito immunity, and could contribute towards the development of malaria-control strategies based on blocking the parasite in the mosquito. In this study, the investigators also analyzed the immune responses of *Anopheles gambiae* mosquitoes to infection with different Plasmodium parasite species, one that causes malaria in humans and another that only infects rodents. The study revealed that mosquitoes mostly employ the same immune factors in defending against the two different Plasmodium species. Only a few immune genes were more important in the defense against either one of the two species.

Malaria: Burden of Disease/Unsolved Problem

Gyan Chandra Mishra

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Plasmodiasis (Malaria) is a major public health problem in sub-Saharan Africa and southern Asia. The deadly infectious disease annually causes clinical illness in 400–600 million people and kills 2–3 million. The disease is caused by protozoan of genus, *Plasmodium*. Four species are parasitic to humans: *P. falciparum*, *P. malariae*, *P. ovale*, *P. vivax*. The most fatal form of the disease is caused by *P. falciparum* parasites.

Malaria Infection is initiated when an infected female anopheline mosquito transfers sporozoites to the human host during a blood meal. Sporozoites enter the blood stream and infect the hepatocytes where they develop into exo-erythrocytic forms and finally divide into thousands of merozoites. The merozoites leave liver cells to invade red blood cells (RBC) and thus initiate erythrocytic life cycle. Only the erythrocytic stages of parasites are responsible for clinical manifestation of the disease. The successful invasion of the parasites depends on the interaction of merozoite ligands (*MSPs*, *EBA-175*, *MSA-1*, etc.) and its receptors (*Glycophorin dependent*, *GP-A*, *GP-B*, *GP-C*; and *independent*) on the red cell surface (1). The merozoites subsequently transform into ring, trophozoite and schizont stages. The parasite replicates at periodic intervals and release merozoite progeny which re enter fresh erythrocytes. Some merozoites differentiate into male or female gametocytes which are ingested by the mosquito and finally lead to the formation of sporozoites.

Malaria infection has a very variable pathogenesis ranging from a mild febrile to life-threatening severe anaemia or cerebral malaria. Only 1–2 percent of *P. falciparum* malaria cases results in the severity and complicated disease. Deaths occur primarily in young children and other immunocompromised individuals. Various factors have been implicated in the susceptibility to pathogenesis of malaria: host genetic factors such as HLA class I and class II alleles have been either associated with development of severity of the disease or reduced susceptibility to malaria in different populations. Parasite sequestration, infiltration of cytotoxic effector CD8 T lymphocytes in the brain, endothelial cell damage and disruption of blood-brain barrier also play a role in the severity of the disease. Moreover, why some infected persons die while other remain asymptomatic or develop mild illness is still not clearly understood.

The sequestration of the infected RBCs to the endothelial cells of post-capillary venules of various organs (2) like kidney, lungs, brain and in the placenta of pregnant women also

contributes to the severity of the disease. The sequestration is mediated by a parasite molecule — Pf EMP-1 (*P. falciparum* erythrocyte membrane protein-1) which is expressed on the surface of infected erythrocytes. This protein interact with receptors such as CD36, intracellular adhesion molecule-1 (ICAM-1), chondroitin sulfate (CAS), Vascular cell-adhesion molecule-1-(VACAM-1), E-selectin, and Platelets-endothelial cell-adhesion molecule (PECAM-1). The sequestration is evolved as an immuno-evasion strategy which helps the parasite to escape from spleen-mediated destruction.

Vascular aggregation of activated platelets, production of lymphotoxins, inappropriate immune responses and the secretion of proinflammatory cytokines are also implicated in the pathogenesis of malaria. We have recently investigated

Dr GC Mishra was born on August 15, 1947 and did his Ph.D. from ML Sukhadia University, Udaipur, Rajasthan in 1975 on “Neuro-salivary complex of Indian cattle leech”. The work entailed both histochemical and biochemical enzymatic analysis and their role in cellular physiology of the complex. He has published over 50 papers.



His findings are highly original: be it altered membrane asymmetry in malaria infected red blood cells, role of proteases and calcium in the invasion of plasmodium merozoites, (incidentally proteases are currently perceived as hot targets for antimalarial therapy), discovery of Th-1 and Th-2 specific costimulatory molecules and their role in pathogenesis of tuberculosis and leishmaniasis. He was the first to show the special functions of house keeping proteins in T cell costimulation. The most important contribution remains their role in stress-induced immunosuppression. These studies have opened new vistas in understanding and developing therapeutics for the Kala Azar and Tuberculosis. His group is currently involved in understanding the molecular basis of antigen presenting cell mediated CD8⁺ T cells activation and immunobiology of arthritis.

He is fellow of all the Academies of Science in India, recipient of Ranbaxy Research Foundation Award (2002) and conferred “Padmashree” on 3 April 2003. Presently Dr GC Mishra is the Director of National Centre for Cell Science, Pune.

cytokine profiles in an endemic place of Gondia Distt. of Maharashtra state, India. The study revealed two clusters of cytokines relevant to clinical sub-groups of malaria. The first cluster is composed of IFN- γ , IL-2, IL-5, IL-6, and IL-12 that were significantly increased during infection but are predominant in mild malaria patients and allow to distinguish them from severe and cerebral malaria groups. The second cluster of cytokines comprises TGF- β , TNF- α , IL-10, and IL-1b that were highly correlated with each other in the different clinical groups of patients and significantly increased with degree of disease severity, particularly in cerebral malaria (3). This study also indicated that the pathophysiology of disease severity in malaria patients is independent of parasitaemia level, sex and age.

Host immune response to *Plasmodium* infection is complex and results into both humoral and cell-mediated in nature. Infection of *P. falciparum* triggers higher levels of IgM and IgG antibodies. Specific IgM antibodies contribute in limiting the growth of erythrocytic state of parasite. In particular merozoites and ring stages are eliminated by antibody dependent cellular cytotoxic mechanism, which is primarily mediated by IgG1 and IgG3. Increase of IgE levels in malaria patients living in endemic areas have been reported and implicated in both protective and pathogenesis of the disease. T-cell responses - either Th1-type (production of IFN- γ and associated with cell mediated immunity) or Th2-type (production of IL-4 and IL-5, and associated with humoral immunity) play an important role in the resistance or susceptibility to malaria infections. It not clear what factors contribute to the development of Th1 or Th2 response, but it seems the infective dose of parasitemia and level of antigen presented to the immune system might influence the response. Individuals living in endemic areas develop acquired immunity due to repeated exposure to parasite infection, which protects them from developing severe or cerebral malaria or death. However, the naturally acquired immunity never develops into sterilising immunity.

Different kinds of malaria vaccine constructs are under trials at different levels. For example-synthetic peptide vaccine-spf66 containing antigens from the blood stage of malaria linked with antigens from sporozoite stage, pre-erythrocytic malaria antigen thrombospondin-related adhesion protein vaccine (PfTRAP), merozoite invasive molecule based antigens - 42kDa fragment of c-terminal of MSP-1, C-terminal of conserved region of MSP-3, EBA175, RTS-S, and malaria transmission blocking based vaccines (Pf25, Pv25 & Pv28). But most of them seem to be effective in inducing partial immunity or reducing development of severe pathology of the disease.

Other parasite infections, which are prevalent in malaria endemic areas, have been shown to regulate immune responses and hamper efficacy of malaria vaccines (4, 5). Further, recent studies have shown impairment of function of antigen presenting

cells which are phagocytosed with malaria pigment (haemozoin) and contributes to immunosuppression (6,7).

However, fresh efforts are being made to curtail the disease. Comparatiive analysis of genomic data, studies on proteome and transcriptome of *P. falciparum* are being exploited in search of new parasite antigen candidates that may contribute to a successful development of vaccine against malaria.

A new area is emerging for the development of genetically modified whole organism as potential vaccine candidate. For example, immunization of rodents with genetically modified sporozoites deficient in UIS3, a gene (knout gene) which is essential for early liver-stage development, conferred complete protection against infectious sporozoite challenge in a rodent model (8).

A number of effector mechanisms have been developed for interfering with malaria parasite development in mosquitoes. The use of these mechanisms will provide researchers with the ability to engineer a refractory mosquito vector (transgenic mosquitoes) (9). However, it will be a challenge how efficiently and safely they can be introduced into existing mosquito population in the field.

Fresh effectors should be made to identify protective antigens from sporozoites (to stop hepatocyte infection), erythrocytic stages (inhibition of erythrocytic stages and prevention of severity of disease) and gametocyte stage (transmission blocking) of the parasites. Selection of appropriate plasmodium antigens in combination with suitable effective adjuvants, targeting innate immune response involving (dendritic cells) DCs, may provide optimal protection against malaria.

Thus, in the current scenario, it is preferable to consider prophylactic vaccines against malaria which reduce morbidity and mortality in the absence of disease preventive vaccines.

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New Studies Launched

New Projects on 'Malaria Burden Estimation' Launched in Jharkhand

A project funded by USAID/WHO to estimate malaria burden in Jharkhand known as 'Jharmal Project' has been launched in 6 districts — Ranchi, Bokaro, East Singhbhum, Hazaribagh, Gumla and Simdega. These districts represent low, moderate and high endemic zones of malaria in the state. To begin with district advocacy workshops have been conducted for senior state officials of health. A local project committee has been set up to monitor the progress of the project quarterly.

A centralised quality control laboratory is being set up in Ranchi office of the 'Jharmal' project. Based on experiences in the pilot phase, trial would be extended in all the six study districts in the final phase in January 2007 for one year. Finally disability adjusted life years lost and economic loss due to malaria in Jharkhand shall be calculated.

Monitoring of Programme Implementation in Goa

The monitoring of malaria control programme implementation was carried out in Corcalim PHC and Margaon UHC of South Goa district of Goa by a team from IDVC Field Unit, Goa. The selected PHC and UHC were visited by the team which assessed the basic laboratory facilities, functioning and record keeping, scrutiny of various malaria registers, microscopic examination for cross checking of positive and negative blood smears. Existing epidemiological data were procured from PHC/UHC and analysed to study the trends of malaria in these areas.

Vector control activities undertaken by the PHC/UHC were assessed by making field visits to know the status of vector breeding in the construction sites, houses and slum areas. Mass blood surveys were carried out to check the prevalence of malaria.

Control measures undertaken by the PHC/UHC were assessed by checking the presence of larvivorous fish in the wells and other permanent water bodies. Information on IEC activities undertaken, manpower availability, capacity building, etc. was gathered. A detailed status report with recommendation is under preparation.

Characterisation of *P. falciparum* Strains in Assam

A collaborative ICMR funded project entitled

"characterisation of *P. falciparum* strains prevalent in N.E. state, Assam" has been initiated in two districts, Dhubri and Nalbari in collaboration with Regional Medical Research Centre, Dibrugarh Assam. A one day meeting was organised in Guwahati with state health authorities Dr D Hojai, Director Health; Mr JC Goswami, Joint Secretary, Health; Dr J Bora, Joint Director Malaria; Dr P Gogai, Regional Director Health and Family Welfare and District Medical Officer of District Dhubri and with collaborating institute's officials Dr J Mohanta Director Regional Medical Research Centre, Dibrugarh and Dr Mahapatra, Dy Dir, RMRC Dibrugarh. The Director of NIMR and scientists of NIMR also participated in this meeting. Study PHCs have been selected after thorough visits and feasibility of conducting the study has been done.

Trial of RBx 11160 in the Treatment of Uncomplicated *Plasmodium falciparum* Malaria

A phase II, double-blind, parallel-group, randomised, dose-ranging study assessing the antimalarial activity and safety of RBx 11160 administered for 7 days in patients with acute uncomplicated *Plasmodium falciparum* malaria has been initiated at Rourkela in collaboration with Ispat General Hospital, Rorkela, Orissa. RBx11160, a new peroxide, is a synthetic trioxolane that is easy to synthesise, inexpensive, achiral and orally rapidly acting with high antimalarial activity. It is a potential new antimalarial agent with demonstrable activity in pre-clinical models and a substantial safety margin between an effective dose for malaria and the toxic dose.

Safety pharmacology studies carried out indicate that RBx11160 is safe and does not produce any clinically significant effect on behavioural parameters and cardiovascular systems. It is critical to gather data on clinical safety and efficacy of RBx11160 when used as monotherapy in adult patients suffering from acute uncomplicated *P. falciparum* malaria. The present study has been designed to assess the clinical safety and efficacy of three dose levels of RBx11160 (50, 100 and 200 mg), administered as a single dose for 7 consecutive days, in patients with uncomplicated *P. falciparum* malaria.

Patent Filed

A new composition for insect and pest control by Dua VK, Alam MF and Dash AP. [application number 3234 /DEL/ 2005] was filed in December 2005.

New Website Launched

New Website on the Genetic and Biological Diversity of Indian *Plasmodium* (www.plasmodiversity.org.in)

A website containing information on the genetic and biological diversity of malaria parasites in India has been developed at NIMR. This website contains comprehensive information on the biological and genetic diversity, research in these aspects, information of Indian Plasmodia and on the workers in this field. The beta version of the website has already been released and could be accessed at www.plasmodiversity.org.in.

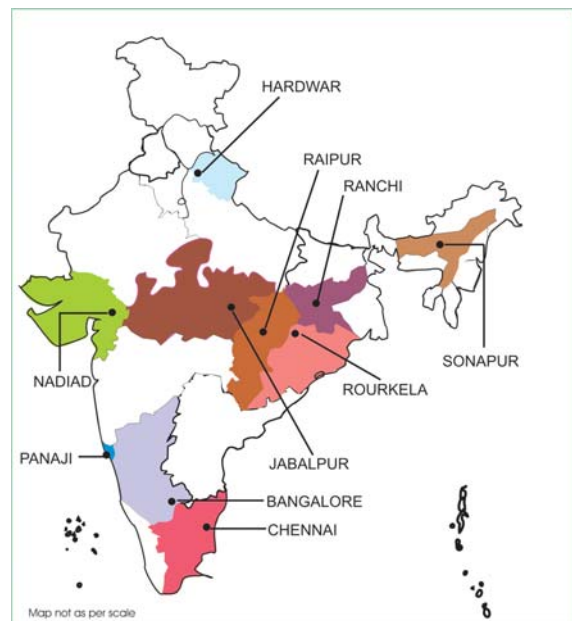


IDVC Field Units Reorganised

NIMR has a good network of field units under Integrated Disease Vector Control (IDVC) of Malaria project in different parts of India. Recently a major reorganization of field units was undertaken. Field units at Delhi, Shankargarh (Allahabad), Shahjahanpur, Car Nicobar and Haldwani were closed and two new field units were opened—one in Itki, Ranchi district of Jharkhand state and another in Raipur of Chhattisgarh state.

Field Unit at Raipur

The field unit at Raipur (Chhattisgarh) was inaugurated by Dr Krishnamurthy Bandhi, Hon'ble Health Minister of Chhattisgarh on 2 April 2006. Prof NK Ganguly, Director General of ICMR presided over the inaugural function. The major issue to be tackled by the new field station will be demonstration of situation-specific malaria control model best suitable for Chhattis-garh which is facing increase of malaria cases since 1990. In addition to malaria, studies would also be undertaken on haemoglobinopathies, nutritional problems, screening of



Location of IDVC field units after reorganisation



Inauguration of IDVC field unit at Raipur



Dr. Krishnamurthy Bandhi, Hon'ble Health Minister, Govt. of Chhattisgarh inaugurating the IDVC field unit at Raipur

Institute's Activities

genetic disorders, detection and prevention of gynaecological problems and counseling. A comprehensive action plan would be developed for mother and children so as to reduce infant mortality rate. Maternal mortality will be reduced by improving the post partum anaemia. In the field of malaria, mapping of the malaria vectors, mapping of drug resistance, need of combination therapy, early warning system, monitoring of insecticide quality etc would be undertaken on priority. Prof Ganguly mentioned on setting up of one independent centre of ICMR, if need arises.

Dr RM Bhatt, Assistant Director has taken over the charge of this field unit.

Field Unit at Ranchi

Another field unit was opened in Itki, District Ranchi of Jharkhand state in March 2006. Ranchi is one of the districts dominated by tribes. Studies have been launched for finding out the local malaria vectors and biological control agents available in the paradigm. The field unit will focus on estimating burden of malaria and will identify the transmission risk factors of malaria in Santhal parganas and other tribal areas of Jharkhand.

Dr MK Das, Senior Research Scientist is presently the Officer-Incharge of this field unit.

Conferences/Workshops/Courses Attended

Prof AP Dash attended 'III Southeast Asia and Western Pacific Bi-regional TEPHINET' conference at Chennai on 8 January 2006.

Prof AP Dash attended National symposium on 'Recent Trends in Malaria Studies' at Pune on 20 January 2006 and delivered the key note address.

Prof AP Dash attended 'Urban Malaria Workshop' at Ajmer on 23 January 2006.

Prof AP Dash attended 'International Conference on Urban Health Initiatives' at Surat from 8–9 February 2006.

Prof AP Dash attended workshop on 'Drinking Water & Community Health Standard' at Indian National Science Academy, New Delhi on 10 February 2006.

Prof AP Dash attended 'VI Joint Annual Conference of Indian Society of Malaria and Other Communicable Diseases (ISMOCD) and Indian Association of Epidemiologists (IAE)' and delivered invited lecture on 'Malaria: Lessons learnt' at National JALMA Institute of Leprosy and other Mycobacterial Diseases, Agra, Uttar Pradesh from 11–13 February, 2006.

Prof AP Dash delivered 'Dr CP Alexander Memorial Lecture' at Deptt. of Zoology, University of Delhi, Delhi on 10 March 2006 on the topic 'Malaria: are we loosing the battle?'

Prof AP Dash participated in the investigators meeting of the 'Multi-country Clinical Trial of a New Synthetic Antimalarial Drug RBx11160' organised jointly by Swiss Tropical Institute and Medicines for Malaria Venture (MMV) at Basel, Switzerland from 26–28 April 2006.

Prof AP Dash attended Tefenoquine for *P. vivax* Advisory Board Meeting, Bangkok, Thailand from 13–14 February 2006.

Dr VK Dua attended Medical Science Congress held at ASSOCEM Delhi from 23–24 January 2006 organised by ICMR and presented a paper entitled 'Role of herbal drugs in malaria'.

Dr Alex Eapen attended 'International Conference on Urban Health Initiatives' at Surat from 9 to 11 February 2006.

Dr Hema Joshi attended Tefenoquine *P. vivax* Advisory Board Meeting, Bangkok, Thailand from 13–14 February 2006.

Dr PK Mittal attended the 'International Forum for Sustainable Management of Disease Vectors' held at Beijing, Peoples Republic of China from April 21–23, 2006.

Dr SS Mohanty, Research Associate (CSIR) attended 'VI Joint Annual Conference of Indian Society for Malaria and other Communicable Diseases (ISMOCD) & Indian Association of Epidemiologists (IAE)' at Agra from 11–13 February 2006.

Dr SS Mohanty, Research Associate (CSIR) attended 'III International Malaria Research Conference' jointly organised by Johns Hopkins Malaria Research Institute, Johns Hopkins Bloomberg School of Public Health at Baltimore, Maryland, USA from 20–21 March 2006.

Dr BN Nagpal attended workshops on 'Urban Malaria under USAID Project' held at Ajmer on 24 January 2006; at NIMR, Delhi on 6 February 2006; at IPP-VIII Office, C.L. Zone on 21 February 2006; at West Zone meeting hall, Delhi on 24 February 2006; at Asaf Ali Road, Delhi on 25 February 2006 and at South Zone meeting hall, Delhi on 6 March 2006.

Institute's Activities

- Dr BN Nagpal attended a workshop on 'National Consultation Meeting on Malaria Burden in India' at National Agriculture Science Complex, New Delhi from 29–30 March 2006.
- Dr K Raghavendra attended 'National Consultative Workshop on National Vector Borne Disease Control Programme' organised by NVBDCP, New Delhi on 16 March 2006.
- Dr K Raghavendra attended 'VI Joint Annual Conference of Indian Society of Malaria and Other Communicable Diseases (ISMOCD) and Indian Association of Epidemiologists (IAE)' at National JALMA Institute of Leprosy and other Mycobacterial Diseases, Agra, Uttar Pradesh from 11–13 February 2006.
- Dr SK Sharma participated in the investigators meeting of the 'Multi-country Clinical Trial of a New Synthetic Antimalarial Drug RBx11160' organised jointly by Swiss Tropical Institute and Medicines for Malaria Venture (MMV) at Basel, Switzerland from 26–28 April 2006.
- Dr MM Shukla and Dr Bhoomika Pradhan attended Indo-US workshop on 'Clinical Trial and Clinical Research' at Mumbai from 4–6 April 2006.
- Dr Neeru Singh attended a workshop on 'Initiatives in Vector Control Through Community Mobilization' at Delhi from 19–20 April 2006.
- Dr SP Singh attended 'VI Joint Annual Conference of Indian Society for Malaria and Other Communicable Diseases (ISMOCD) & Indian Association of Epidemiologists (IAE)' at Agra from 11–13 February 2006.
- Dr Aruna Srivastava attended 'International Conference on Urban Health Initiatives' organised at Surat from 9–11 February 2006 and presented a paper on "GIS-based malaria information management system for urban malaria".
- Dr Aruna Srivastava attended workshops on 'Urban Malaria under USAID Project' held at Ajmer on 24 January 2006; at NIMR, Delhi on 6 February 2006; at IPP-VIII Office, C.L. Zone on 21 February 2006; at West Zone meeting hall, Delhi on 24 February 2006; at Asaf Ali Road, Delhi on 25 February 2006 and South Zone meeting hall, Delhi on 6 March 2006.
- Dr Aruna Srivastava attended workshop on 'National Consultation Meeting on Malaria Burden in India' at National Agriculture Science Complex, New Delhi from 29–30 March 2006.
- Dr Neena Valecha attended a workshop on 'Urban Malaria under USAID Project' held at Ajmer on 24 January 2006; at NIMR, Delhi on 6 February 2006; at IPP-VIII Office, C.L. Zone on 21 February 2006; at West Zone meeting hall, Delhi on 24 February 2006; at Asaf Ali Road, Delhi on 25 February 2006 and South Zone meeting hall, Delhi on 6 March 2006.
- Dr Neena Valecha attended 'International Conference on Urban Health Initiatives' from 9–11 February 2006 at Surat and delivered a lecture on "Drug resistance".
- Dr Neena Valecha participated in the investigators meeting of the 'Multi-country Clinical Trial of a New Synthetic Antimalarial Drug RBx11160' organised jointly by Swiss Tropical Institute and Medicines for Malaria Venture (MMV) at Basel, Switzerland from 26–28 April 2006.
- Drs RS Yadav and S Haq participated as resource persons in a workshop on 'Use of Biological Control Methods' at Godhra on 22 February 2006 organised by the Deptt. of Health, Govt. of Gujarat.
- Dr RS Yadav attended a workshop on 'National consultation on Vector Borne Diseases' at New Delhi on 21 March 2006
- Dr RS Yadav attended workshop on 'National Consultation Meeting on Malaria Burden in India' at National Agricultural Science Complex, New Delhi from 29–30 March 2006.
- Dr RS Yadav and Dr S Haq participated in a workshop on 'Women and Health Care Initiatives and Vector Control Through Community Mobilization' at IIT, Delhi from 20-21 April 2006 and gave lectures on insecticide treated nets and environmental management of malaria, respectively.
- Dr RS Yadav participated as a WHO Temporary Advisor in a WHO Working Group to develop an operational manual on insecticide treated bed nets for preventing malaria in Geneva from 4–10 May 2006.
- Mr PK Bharti visited Centre for Diseases Control and Prevention (CDC), Atlanta, USA for training on Molecular biology techniques (Pyro sequencing) from 7 December 2005 to 31 January 2006.
- Mr V Jain visited More House School of Medicine Atlanta, USA for training on Micro array techniques and cerebral malaria sample analysis from 29 March to 18 June 2006.
- Mr SK Prajapati attended International training workshop on '*Plasmodium vivax* in vitro Culture Techniques' jointly organised by Penn State University, Mahidol University and AFRIMS Thailand, held at Bangkok, Thailand from 15–29 June 2006.

Training Courses/Workshops/Seminars Organised

1. Five workshops for Medical Officers of 12 districts of Madhya Pradesh were organised by IDVC Field Unit, Jabalpur under EVBDCP of National Vector Borne Disease Control Programme (NVBDCP) from 19 to 21; 23 to 25 January; 6 to 8; 13 to 15 and 20 to 22 February 2006.
2. The IDVC field unit at Nadiad organised a seminar on 'Malaria vector control' for the urban malaria staff of Nadiad on 23 February 2006.
3. A travelling seminar on 'Vector borne diseases' was organised from 24–29 April 2006 in different parts of Gujarat and the Union Territory of Diu by the Nadiad field unit.
4. An exhibition on 'Mosquitoes and their control: A bioenvironmental approach' was displayed at Mela Control Office, Hardwar on 22 March 2006. Several officers of District Hardwar visited the exhibition.



Malariaology training workshop at IDVC field unit, Jabalpur under EVBDCP (NVBDCP)

degree on the topic 'Studies on isolation and antimalarial activity of different compounds from *Andrographis paniculata* (Kalmegh) family- Acanthaceae against malaria parasites' in January 2006 (Supervisors: Dr VK Dua and Dr MC Bhatnagar) from Ch Charan Singh University, Meerut.



Advocacy workshop in Ranchi. The workshop was inaugurated by Shri Shivendu, Secretary Health, Govt. of Jharkhand

5. NIMR, Delhi organised a meeting on 'Assessment of malaria treatment practices in public and private health sectors' on 22 March 2006 at Delhi.
6. NIMR, Delhi organised a meeting on 'Assessment of therapeutic efficacy of antimalarial drugs against uncomplicated *P. falciparum* malaria' from 23–25 March 2006 at Ranchi, Jharkhand.
7. NIMR, Delhi organised two training courses for Technicians of Municipal Corporation Delhi from 8–12 and 15–19 April 2006 at Delhi.

Ph. D. Degree Awarded

Mr VP Ojha, Asstt. Research Scientist has been awarded Ph.D.

OBITUARY

Dr. Musharraf Ali Ansari
(1948–2006)

The NIMR family deeply expresses heartfelt condolences on the sudden and sad demise of Dr MA Ansari. Dr Ansari was an eminent scientist who served for more than thirty years in Indian Council of Medical Research and passed away on 4 May 2006. He joined as Senior Research Officer at NIMR in 1977 and served in various positions till February 2006 and later joined as Director of the Regional Medical Research Centre for Tribals, Jabalpur, Madhya Pradesh, India.

His contribution in the field of vector biology and control especially in the development of new tools for vector control is commendable. He had published more than 125 scientific research articles in various national and international journals. He served as Editor for *Journal of Vector Borne Diseases* for three years and was also associated in the publication of newsletters, bulletins, documents, journals, etc. With the passing away of Dr Ansari, India has lost an eminent scientist in malaria research.



Research Papers Published

A. Published (January–June 2006)

- Adak T, Singh OP, Nanda N, Sharma VP, Subbarao SK. Isolation of a *Plasmodium vivax* refractory *Anopheles culicifacies* strain from India. **Trop Med Int Health** 11: 197-203, 2006.
- Ahmed A, Das MK, Dev V, Saifi MA, Wajihullah, Sharma YD. Quadruple mutations in dihydrofolate reductase of *Plasmodium falciparum* isolates from Car Nicobar Island, India. **Antimicrob Agents Chemother** 50: 1546-1549, 2006.
- Alam MT, Das MK, Ansari MA, Sharma YD. Molecular identification of *Anopheles (Cellia) sundaicus* from the Andaman and Nicobar Islands of India. **Acta Trop** 97: 10-18, 2006.
- Ansari MA, Sreehari U, Razdan RK, Mittal PK. Bioefficacy of Olyset nets against mosquitoes in India. **J Am Mosq Control Assoc** 22: 102-106, 2006.
- Bhatia V, Bhattacharya PR. Wild isolates of *Plasmodium falciparum* from India show restricted polymorphism in T-helper cell epitopes of the circumsporozoite protein. **Acta Trop** 97: 259-264, 2006.
- Bhattacharya PR, Bhatia V, Pillai CR. Genetic diversity of T-helper cell epitopic regions of circumsporozoite protein of *Plasmodium falciparum* isolates from India. **Trans R Soc Trop Med Hyg** 100: 395-400, 2006.
- Dev V, Phookan S, Sharma VP, Dash AP, Anand SP. Malaria parasite burden and treatment seeking behavior in ethnic communities of Assam, Northeastern India. **J Infect** 52: 131-139, 2006.
- Dev V, Dash AP, Khound K. High-risk areas of malaria and prioritizing interventions in Assam. **Curr Sci** 90: 32-36, 2006.
- Dua VK, Pandey AC, Alam ME, Dash AP. Larvicidal activity of *Hibiscus abelmoschus* Linn. (Malvaceae) against mosquitoes. **J Am Mosq Control Assoc** 22: 155-157, 2006.
- Kaur S, Prajapati SK, Kalyanaraman K, Mohmmmed A, Joshi H, Chauhan VS. *Plasmodium vivax* dihydrofolate reductase point mutations from the Indian subcontinent. **Acta Trop** 97: 174-180, 2006.
- Mamillapalli A, Pattnaik P, Sharma M, Sharma SK, Tyagi PK, Joshi H, Chitnis CE. Sequence polymorphisms in the receptor-binding domain of *Plasmodium falciparum* EBA-175: implications for malaria vaccine development. **Mol Biochem Parasitol** 146: 120-123, 2006.
- Mishra S, Raj DK, Hazra RK, Dash AP, Supakar PC. An efficient PCR-SSCP-based method for detection of a chloroquine resistance marker in the PfcRT gene of *Plasmodium falciparum*. **Trans R Soc Trop Med Hyg** 100: 243-247, 2006.
- Mitra P, Vinayak S, Chandawat H, Das MK, Singh N, Biswas S, Dev V, Kumar A, Ansari MA, Sharma YD. Progressive increase in point mutations associated with chloroquine resistance in *Plasmodium falciparum* isolates from India. **J Infect Dis** 193: 1304-1312, 2006.
- Raj DK, Mishra S, Dash BR, Dash AP. *Plasmodium falciparum* Pfs25 gene promoter has no polymorphism in natural isolates of eastern India. **Acta Protozool** 44: 289-292, 2006.
- Sharma SK, Upadhyay AK, Haque MA, Padhan K, Tyagi PK, Batra CP, Adak T, Dash AP, Subbarao SK. Effectiveness of mosquito nets treated with a tablet formulation of deltamethrin for malaria control in a hyperendemic tribal area of Sundargarh district, Orissa, India. **J Am Mosq Control Assoc** 22: 111-118, 2006.
- Sunish IP, Rajendran R, Mani TR, Dash AP, Tyagi BK. Evidence for the use of albendazole for the elimination of lymphatic filariasis. **Lancet Infect Dis** 6: 125-126, 2006.

B. In Press/Accepted for Publication

- Batra CP, Mittal PK, Adak T, Subbarao SK. Efficacy of Agnique MMF monomolecular surface film against *Anopheles stephensi* breeding in urban habitat in India **J Am Mosq Control Assoc**.
- Biswas S Assessment of immunometric parameters in malaria: role of enzyme immunoassay. **J Immunoass Immunochem**.
- Goswami G, Singh OP, Nanda N, Raghavendra K, Gakhar SK, Subbarao SK. Identification of all members of the *Anopheles culicifacies* complex using allele-specific polymerase chain reaction assays. **Am J Trop Med Hyg**.
- Sharma SK, Tyagi PK, Padhan K, Upadhyay AK, Haque MA, Nanda N, Joshi H, Biswas S, Adak T, Das BS, Chauhan VS, Chitnis CE, Subbarao SK. Epidemiology of malaria transmission in forest and plain ecotype villages in Sundargarh district, Orissa, India. **Trans R Soc Trop Med Hyg**.
- Sharma, SK, Upadhyay AK, Haque MA, Padhan K, Tyagi PK, Ansari MA, Dash AP. Wash-resistance and bio-efficacy of Olyset nets—a long lasting insecticide treated mosquito net against malaria vectors and non-target house-hold pests **J Med Entomol**.
- Singh N, Mishra AK, Chand SK, Singh MP, Bharti PK, Dash AP. Epidemiology of malaria in an area of low malaria transmission in central India. **Am J Trop Med Hyg**.
- Singh N, Shukla MM, Mishra AK, Singh MP, Paliwal JC, Dash AP. Malaria control in central India (Madhya Pradesh) using existing tools, Betul, a case study. **Trop Med Int Health**.
- Takala SL, Escalante AA, Branch OH, Kariuki S, Biswas S, Chaiyaroj SC, Lal AA. Genetic diversity in the Block 2 region of the Merozoite Surface Protein 1 (MSP-1) of *Plasmodium falciparum*: Additional complexity and selection and convergence in fragment size polymorphism. **Infect Genet Evol**.
- Tomar D, Biswas S, Tripathy V, Rao DN. Development of diagnostic reagents: Raising antibodies against synthetic peptides of PfHRP-2 and LDH using microsphere delivery. **Immunobiol**.
- Valecha N, Joshi H, Eapen A, Ravindran J, Kumar A, Prajapati SK, Ringwald P. Therapeutic efficacy of chloroquine in *Plasmodium vivax* from areas with different epidemiological patterns in India and their *Pvdhfr* gene mutation pattern. **Trans R Soc Trop Med Hyg**.

Forthcoming Scientific Events

Conferences

XI International Congress of Parasitology (ICOPA XI)

August 6–11, 2006, Glasgow, Scotland

Host: British Society of Parasitology

Contact: Dr D Rollinson, Natural History Museum
Phone: (44-20)-7492-5181; Fax: (44-20)-7942-5518
E-mail: d.rollinson@nhm.ac.uk; copa@meetingmakers.co.uk;
Website: <http://www.icopa-xi.org>

III International Symposium on Integrated Water Resources Management

September 26–28, 2006, Bochum, Germany

Organizers: International Association of Hydrological Sciences (IAHS); International Commission on Water Resources Systems (ICWRS); Institute for Hydrology, Water Management and Environmental Engineering of the Ruhr-University Bochum, Germany; UNESCO-IHE; Institute for Environment and Human Security of the United Nations University Bonn, Germany

Contact: Jana Radoj, E-mail: water@conventus.de
Website: <http://www.conventus.de/water>

International Conference on Bioinformatics

December 18–20, 2006, New Delhi, India

Organizers: Jawaharlal Nehru University in collaboration with Indian Institute of Technology, Delhi and Dept. of Biotechnology
Deadline for abstract submission: 31st Aug 2006
For further details visit www.incob2006.in

Contact: Prof Alok Bhattacharya, School of Life Sciences, Jawaharlal Nehru University, New Delhi-110067, India. Email: alok0200@mail.jnu.ac.in or Prof B Jayaram, Professor of Chemistry & Coordinator, Supercomputing Facility for Bioinformatics & Computational Biology, IIT Delhi, Hauz Khas, New Delhi-110016, India. Email: bjayaram@chemistry.iitd.ac.in;

I Malaysian-Scandinavian Conference on Tropical and Infectious Diseases 2006

November 17–20, 2006, Universiti Malaysia, Sabah
For Details visit <http://www.ums.edu.my/perubatan/msidt/>

Severe/Cerebral Malaria Workshop

December 13–14, 2006, Jerusalem, Israel
Contact: Jacob Golenser, E-mail: golenser@md.huji.ac.il

Meetings

Royal Society of Tropical Medicine and Hygiene Centenary Meeting

September 13–15, 2007, Westminster, England
Contact: Nina Woods, RSTMH Conference Secretariat
Phone: +44 (0) 1865 843297, Fax: +44 (0) 1865 843958
E-mail: n.woods@elsevier.com

Infectious Diseases Society of America (IDSA) 44th Annual Meeting

October 12–15, 2006, Toronto, Ontario, Canada

Contact: IDSA Headquarters, Phone: 703-299-0200
Fax: 703-299-0204, E-mail: info@idsa.org
Website: <http://www.idsociety.org>

CXXXIV American Public Health Association (APHA) Annual Meeting

November 12–16, 2006; Boston, Massachusetts, USA
Contact: Coordinator, APHA Annual Meeting
Phone: 202-777-2477; Fax: 202-777-2530
E-mail: donna.wright@apha.org; Website: <http://www.apha.org>

55th American Society of Tropical Medicine and Hygiene (ASTMH) Annual Meeting

November 12–16, 2006; Atlanta, Georgia USA
Contact: ASTMH Secretariat; 60 Revere Drive, Suite 500
Northbrook, IL 60062 USA
Phone: 847-480-9592; Fax: 847-480-9282
E-mail: info@astmh.org; Website: <http://www.astmh.org>

Courses

ASTMH Intensive Update Course in Clinical Tropical Medicine and Travelers' Health

Tentatively October 10–11, 2006

Contact: ASTMH Headquarters; Phone: 847-480-9592
Fax: 847-480-9282; E-mail: info@astmh.org

Molecular Approaches in Malaria Research and Vaccine Development

20 November–1 December 2006, New Delhi, India

Organisers: Prof VS Chauhan, Dr Chetan E Chitnis and Dr Pawan Malhotra (ICGEB, New Delhi, India)

Contact: Ms HS Narayanan, Chief of Administration, ICGEB - New Delhi Component, Aruna Asaf Ali Marg, New Delhi-110067, India. Tel.: +91-11-26167356; Fax: +91-11-26162316; E-mail: shubha@icgeb.res.in

Experimental Approaches to Studying Host-pathogen Interactions

30 October – 10 November 2006, New Delhi, India

Organiser: Kanury VS Rao (ICGEB, New Delhi, India)

Contact: Ms HS Narayanan, Chief of Administration, ICGEB - New Delhi Component, Aruna Asaf Ali Marg, New Delhi-110 067, India. Tel.: +91-11-26167356; Fax: +91-11-26162316; E-mail: shubha@icgeb.res.in

ICGEB-UNU/BOLAC Theoretical Course "Evolutionary Genomics in Modern Integrative Biology

8–14 October 2006, Pátzcuaro, Mexico

Organisers: Alicia González (Instituto de Fisiología Celular, UNAM, México D.F.) & Alexander De Luna (Center for Genomics Research, Harvard University, Cambridge, MA, USA)

Contact: Dr Alicia González, Departamento de Genética Molecular, Instituto de Fisiología Celular, UNAM - Universidad Nacional Autónoma de México, Circuito exterior s/n, Ciudad Universitaria, México, D.F. 04510, México. Tel.: +52-55-56225631; Fax: +52-55-56225630; E-mail: amanjarr@ifc.unam.mx

NIMR will have new campus soon!

The NIMR is presently functioning from four different places in Delhi and Noida making it difficult to work in effective and coordinated manner. A new campus is under construction in a seven acre plot at Dwarka, Delhi. This would include Research Block, Animal House, Auditorium, Hostel, Guest House and Staff Quarters. Construction of the Research Block of NIMR has already been started.

The foundation stone of the Research Block was laid by Prof NK Ganguly, Director General, ICMR on the auspicious day of 'Basant Panchami' (2 February

2006). Prof RC Mahajan, Dr S Pattanayak, scientists and members of building committee, technical experts from ICMR and other institutes and staff of NIMR were present on this occasion.

The construction work has started in February 2006 by M/s Rajasthan State Road Development and Construction Corporation Limited, Setu Bhawan, Jaipur—A Rajasthan Govt. Undertaking under the supervision of M/s Gherzi Eastern Ltd. The construction of Research Block is scheduled to be completed within 17 months.



NIMR Offers Research Opportunities

The National Institute of Malaria Research provides opportunities for high-quality research leading to Ph. D. degree on modern areas of malaria research. Interested students can join different research groups at the NIMR headquarters in Delhi and at different field units located in different parts of India to carry out both field and laboratory based research on malaria. NIMR has been recognised by two universities for the award of Ph. D. degree—Guru Govind Singh Indraprastha University at Delhi and Jiwaji University at Gwalior (MP).

The principal areas of research are: species complexes in malaria vectors; biochemical and molecular basis of insecticide resistance; vector bionomics and control; biology of malaria parasites; drug resistance in parasite; epidemiology with special emphasis on GIS and remote sensing, biochemistry,

immunology; host-parasite interactions; molecular biology and evolutionary genomics; bioinformatics, etc. Students can opt for any of these topics or propose any other related topic closely developed with NIMR scientists.

NET qualified (both CSIR-UGC and ICMR) students may contact the Director or contact individual scientist of their subject of interest. The details of the scientists (subject specialisation, contact info, etc.) are provided in the NIMR website www.mrcindia.org/scientist.htm. NIMR is also funded by different outside national and international funding agencies and different scientific positions fall vacant as and when required. Students with good academic career and interest on malaria research are advised to regularly watch NIMR website (www.mrcindia.org) for details.