

## Research Group: Malaria Biology Group



### Scientist

#### Dr. Inderjeet Kaur

The major theme of Dr Kaur research is to study the role of post-translational modifications of parasite proteins in different stages of development. Recently she has deciphered the first ever stage specific "methylome" of the malaria parasite with other colleagues. Currently, using genetic manipulation approaches, she is investigating the functional significance of these methylated proteins in parasite development. She is also studying the stage specific interactomes of Calcium dependent protein kinases (CDPKs) and their substrates to understand the unique signaling mechanisms operating within parasites. Using proteomic approaches coupled with high-resolution mass spectrometry, she is investigating crucial events of the pathogenesis of *Plasmodium falciparum* in asexual blood stages.

### Post Doctoral Members

#### 1. Dr. Mohit Vashishta

He is investigating the pathogenic proteins; *P. falciparum* (PF3D7\_0510700) and *M. tuberculosis* (Rv2467) that are involved in modulating the host immunity upon *P. falciparum* and *M. tuberculosis* infections to macrophages and dendritic cells. In particular, he is investigating the role of these identified proteins in modulating the host immunity through PD-L1:PD-1 axis. Programmed death ligand-1 (PD-L1). In addition, he

is working with other laboratory colleagues in studying the role(s) of secretory proteins for their ability to suppress immune responses upon malaria and tuberculosis infections

**2. Dr. Md. Kalamuddin**

He is mainly involved in testing the effect of newly synthesized inhibitors on proteases as well as on *in vitro* *P. falciparum* cultures. He has recently identified a new family referred as ankyrin repeat containing protein family in *P. falciparum* genome. He is presently trying to understand the role of these proteins with an emphasis on their structure and functional diversity.

**3. Dr. Gourab Paul (ICMR post doctoral fellow in collaboration with NIMR)**

He is currently working on the Characterization of *Plasmodium falciparum* extracellular secretory antigens as a novel diagnostic biomarkers of Malaria and also for their role(s) in immune modulation.

**4. Dr. Priya Gupta (ICMR post doctoral fellow In collaboration with NIMR)**

She has been interested in understanding the hemoglobin degradation and heme detoxification pathways of *P. falciparum* with an aim to develop computational, structural and experimental approaches for rational drug design to combat drug resistant malaria.

## PhD Scholars

**1. Mr. Asif Akhtar**

Our laboratory has identified putative RNA binding proteins referred as RAP like proteins on the *Plasmodium falciparum* merozoite surface along with MSPs. These are proteins with uncharacterised RNA binding domains known as RAP domains. His primary aim is to investigate the role of these proteins in the establishment of parasite blood stage infection, focussing on the pathways these proteins are involved.

**2. Mr. Mansoor Siddiqui**

He is mainly involved in understanding the role(s) of dynamic post translational modifications (PTMS) like palmitoylation and phosphorylation in regulating the signal transduction pathways involved in invasion and egress of *P. falciparum*. He has recently illustrated that S-palmitoylation regulates signaling through calcium dependent plant like kinase molecules (CDPKs) and control key processes like motility, invasion and microneme secretion in the merozoites. The long term goal is to identify the significance of S-palmitoylation in parasite biology and identify novel molecular targets for chemotherapeutic intervention

**3. Miss. Niharika Singh**

She is mainly focusing on illustration of interactome for host- pathogen interacting proteins (eg. AARP, RhopH3C, MTIP etc.) with an aim to identify high-activity binding peptides, which are able to inhibit pathogenic entry to target cells.

**4. Miss. Ekta Saini**

Her aim is to understand the complexities involved in vaccine design and to work for a strategy to develop a potent vaccine/therapeutic agent. To address this, she has been able to devise a strategy to obtain merozoite surface coat proteins in their native forms. Presently her focus is to know the role(s) of post-translation modifications on surface proteins in mediating parasite invasion into the RBCs. She has also characterized an IMC structural protein PhL1 and identified a novel motility associated complex which

might play a role in invasion or motility of the merozoites in collaboration with Prof Rita Tiwari, University of Nottingham, UK..

**5. Miss. Sadaf Parveen**

She focuses on screening of phage display human antibody library against intact *P. falciparum* merozoite surface and against important Merozoite Surface Proteins (MSP)-1 and -3. Goal is to identify a potent antibody that can block merozoite invasion of human RBCs. This work is being carried out in collaboration with Prof Dinakar S Salunke.

**6. Mr. Osama Mukhtar**

His work is focused on identification and characterization of malarial protozoan parasite *Plasmodium falciparum* immunomodulatory protein especially those which interfere with Toll-like receptor (TLR) functions. He has recently identified TIR-domain containing proteins in *P. falciparum* genome by *In silico* approaches and is presently cloning them.

**7. Mr. Vaibhav Sharma**

He is studying the role of *Plasmodium falciparum* secretory proteins during malaria infection and their development as potential biomarker for malaria infection detection. The current focus is to study the role of certain secretory antigens, which might be better than the current rapid detection kits based on HRP2 protein in detecting malaria during low level of parasitaemia.

**PhD Members (Under Co-Supervision)**

**1. Mr. Arunaditya Deshmukh (MDU University, Rohtak)**

He has identified a *Plasmodium falciparum* merozoite surface protein 3 (MSP3) associated complex on the surface of merozoites consisting of MSP1, MSP6 and MSP7, proteins. He has further shown that MSP3 especially its N-terminal region containing known B/T cell epitopes are targets of naturally acquired immunity against malaria and is an important candidate for a multi-subunit malaria vaccine.

**2. Mr. Ashutosh Panda (AIIMS, New Delhi)**

His work focuses on the global proteomic analysis on the surface of infected erythrocytes in patient samples suffering from cerebral malaria. It will provide insights into the expression of specific proteins that are expressed during severe malaria. This may also reveal host-protein modifications by the parasite. This will further enable us to identify effectors of parasite virulence that are actually present in clinical isolates, making them more relevant for the development of new antimalarials.