CeMMP

Australian Government
Australian Research Council

MONASH University

bio21 institute

MOLECULAR HORIZONS

WEHI brighter together

SEMINAR SERIES 2026

25 August, 10:00 AM AEST

Dr. Melanie Dietrich

Tham Laboratory, Infection and Global Health Division at the Walter and Eliza Hall Institute of Medical Research, Australia

Dr Melanie Dietrich is a mid-career researcher who was awarded her PhD at the University of Tuebingen. She is a structural biologist interested in host-pathogen interactions and how antibodies inhibit infection in both viruses and malaria parasites. In the last five years, Melanie has elucidated the structural biology of the 6-cysteine proteins which are a family of surface-expressed proteins involved in infection and immune evasion in malaria parasites. Melanie's current research uses integrative structural biology approaches, including X-ray crystallography and cryo-EM, and biophysical techniques to study endogenous protein complexes involved in malaria parasite fertilisation. Her work aims to understand structural mechanisms of inhibitory antibodies and nanobodies to develop novel therapeutical tools to block malaria parasite transmission.

A novel transmission blocking vaccine candidate against malaria parasites

Plasmodium falciparum is a major parasitic pathogen resulting in over 600,000 deaths annually. Within the mosquito host, the malaria parasite undergoes fertilisation and sexual reproduction critical for onwards transmission of the parasite to humans. Blocking parasite fertilisation in the mosquito midgut can prevent malaria transmission. Pfs230 and Pfs48/45 are the current leading transmission-blocking vaccine candidates, which form a complex on the surface of sexual stage parasites, called gametes, and are essential for male gamete fertility.

I will present a cryo-EM structure of the endogenous Pfs230-Pfs48/45 complex from P. falciparum sexual stage parasites. This structure identified Pfs230 domains 13 and 14 as interaction site with Pfs48/45. We used transgenic parasites with a deletion of these domains to show that they are crucial for localisation of Pfs230 on the gamete surface and their absence greatly reduces parasite transmission within the female Anopheles mosquito. Nanobodies, which are small antigen-binding domains of camelid antibodies, targeting domains 13 and 14 are able to disrupt the endogenous Pfs230-Pfs48/45 complex, reduce transmission and structural analyses reveal their epitopes. Furthermore, domains 13 and 14 are targets of naturally acquired immunity and mRNA-LNP vaccination of mice with these domains elicits transmission-reducing antibodies. This work shows that Pfs230 domains 13 and 14 are new vaccine candidates for blocking malaria transmission.