Development of serological biomarkers as indicators of recent and asymptomatic infections for innovative tools to accelerate malaria elimination

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Targeting *P. vivax* malaria for elimination

- More than 2 billion people at risk to transmit *P. vivax* in Asia-Pacific, American, and African countries

- Estimated clinical *P. vivax* malaria cases may exceed 80 million per year

- Accounts for some 41% of all clinical malaria episodes outside Africa

- Elimination of *P. vivax* essential for a malaria-free Asia-Pacific region by 2030
Vast majority of infections are asymptomatic and thus not detected

Transmits efficiently early in the infection and at relatively low density

80-90% of all infections are relapses caused by hypnozoites in the liver

Hypnozoites carriers cannot be identified with present diagnostic tests

The only drugs to treat hypnozoites are potentially toxic and/or ineffective in 10-20% of patients

*P. vivax* malaria: difficult to control and eliminate
Development of serological biomarkers for *P. vivax* malaria

- Human immune system “very effective” in detecting parasites
- Antibodies against parasite proteins remain for certain time after infection
- Hence such antibodies against parasite proteins can be used to identify recent and asymptomatic infections

Goal: *Sero*logical test to identify possible hypnozoite carriers for treatment (POCT)

Goal: *Sero*logical test for surveillance of ongoing transmission (Laboratory Settings)
Development partnership

- Epidemiological data on *P. vivax*
- Naturally acquired antibody response
- Patient cohorts for post infection monitoring
- HTP screening *P. vivax* proteins

- Selection of 55 target proteins
- Production of 40 target proteins
- Screening patient cohorts (~2,500 samples from Thailand, Brazil, Solomon Islands)
- Selection of biomarker sets

- Target Product Profiles with help of external expert panel (TPPs)
- Technology landscape analysis of near-patient multiplex immunoassay platforms (POCT)

**WEHI**
- Ehime University

**FIND**
- CellFree Sciences
- Sample providers

**Other groups**
Project identified serological markers of recent exposure

- Serological biomarkers can identify concurrent and recent past infections
- These individuals are the most likely hypnozoite carriers
- Enables targeted mass-drug administration to individuals with confirmed *P. vivax* exposure
- Allows surveillance and stratification of areas according to transmission risk

![ROC curve for classifying recent *P. vivax* infections](image)

Panels of 5 antigens
Lessons learned

- We had been successful in our research because the group had worked together very well!
- Regular project meetings in person and doing telephone conferences
- Very good network for doing malaria research and getting access to clinical samples/volunteers
- FIND’s expertise in diagnostics (landscape analysis for POCT platform, expert panel for TPPs)
- The group keeps on working together using our marker set to develop POCT test for P. vivax!
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