Genomic epidemiology of *P. vivax*: Dissecting parasite transmission patterns to strengthen surveillance
Burden of *P. vivax*

- 5-10 million cases in the Asia-Pacific in 2016
- Highly resilient to interventions
- Prone to resurgence
- Diverse and continually changing
- Chloroquine resistance
Traditional surveillance tools quantify infection

Provide new molecular tools for *P. vivax* surveillance
Objective 1

- Establish **finger-printing** to monitor *P. vivax* transmission patterns in the Asia-Pacific
  - Identify and monitor individual strains
  - Identify polyclonal infections
Objective 1

- Genotyping 4,000 samples at 42 SNPs

**Research Article**

Development of a Single Nucleotide Polymorphism Barcode to Genotype Plasmodium vivax Infections


**Diagram:**

- Amplicon Sequencing
  - Genomic or Template DNA
  - Gene-specific Primer
  - PCR Amplification
  - Alignment
  - Sequencing

**Text:**

1: CAGTACACACACACACACACG

2: CAGTACACACACACACACAC

- Microsatellite: Two bases which are repeated several times
- SNP (single nucleotide polymorphism): Just one base at a specific point
Objective 2

- Establish an online, open-access platform to support data analysis and sharing
Objective 3

- Identify geographic markers for mapping *P. vivax* in the Asia-Pacific region

- Genetic differentiation

  - Low differentiation
  - High differentiation
Objective 3

Genome-wide data (800,000 SNPs)

CRMP1 gene (17 SNPs)
Objective 4

- Identify molecular markers of CQ resistance in *P. vivax*
- Genome-wide association

- **Ex vivo phenotypes**
  - Indonesia (*n*=250)
  - Thailand (*n*=60)

- **Clinical phenotypes**
  - Malaysia (*n*=40)
  - Ethiopia (*n*=200)
  - Afghanistan (*n*=100)
  - Vietnam (*n*=80)
Outcomes and significance

- Objectives 2-4 will produce new surveillance tools for *P. vivax*
- Objective 1 will produce pilot data to showcase these tools
- Inform on strategic decisions on resource allocation
  - Hot-spots
  - Imported cases
  - Outbreaks
  - Drug resistance
Acknowledgements

Angela Rumaseb
Benedikt Ley
Kamala Thriemer
Jutta Marfurt
Ric Price
Matt Grigg
Bridget Barber
Nick Anstey

Richard Pearson
Roberto Amato
Olivo Miotto
Dominic Kwiatkowski

vivaxGEN Network