

IMPERIAL

Mechanisms of Immunity against *Plasmodium Falciparum*

Professor Faith Osier
Chair in Malaria Immunology and Vaccinology
Co-Director School of Convergence Science for Health & Technology

Colloque Paludisme 2026

4th June 2026

f.osier@imperial.ac.uk



Federation of African Immunological Societies



Federation of African Immunological Societies



Federation of African Immunological Societies



Federation of African Immunological Societies

BUILDING ON SUCCESS

FAIS2026

Heart of Immunology

Beating



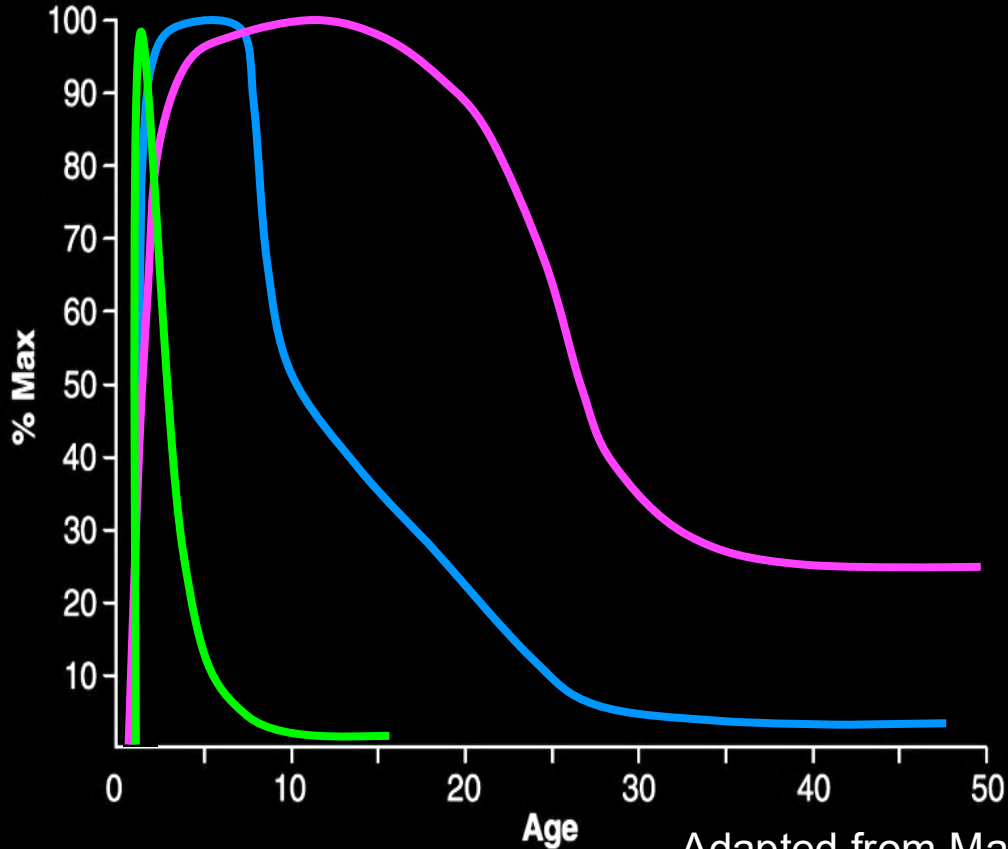
Cape Town, South Africa

30th Nov to 3rd December 2026

<https://savetcon.co.za/2026-fais-congress-2026/>

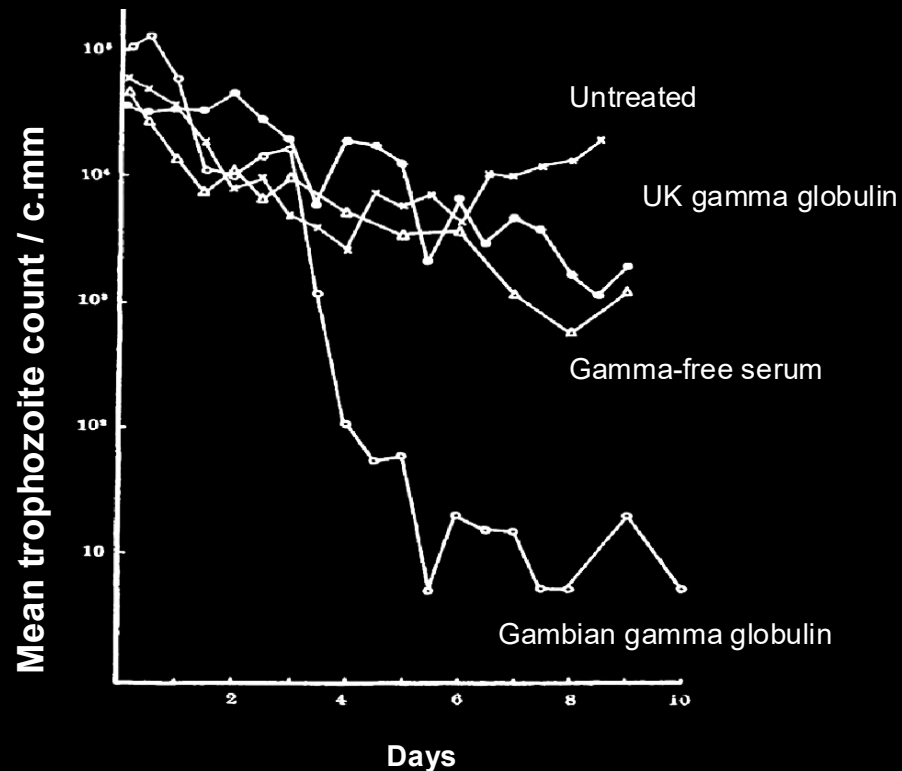
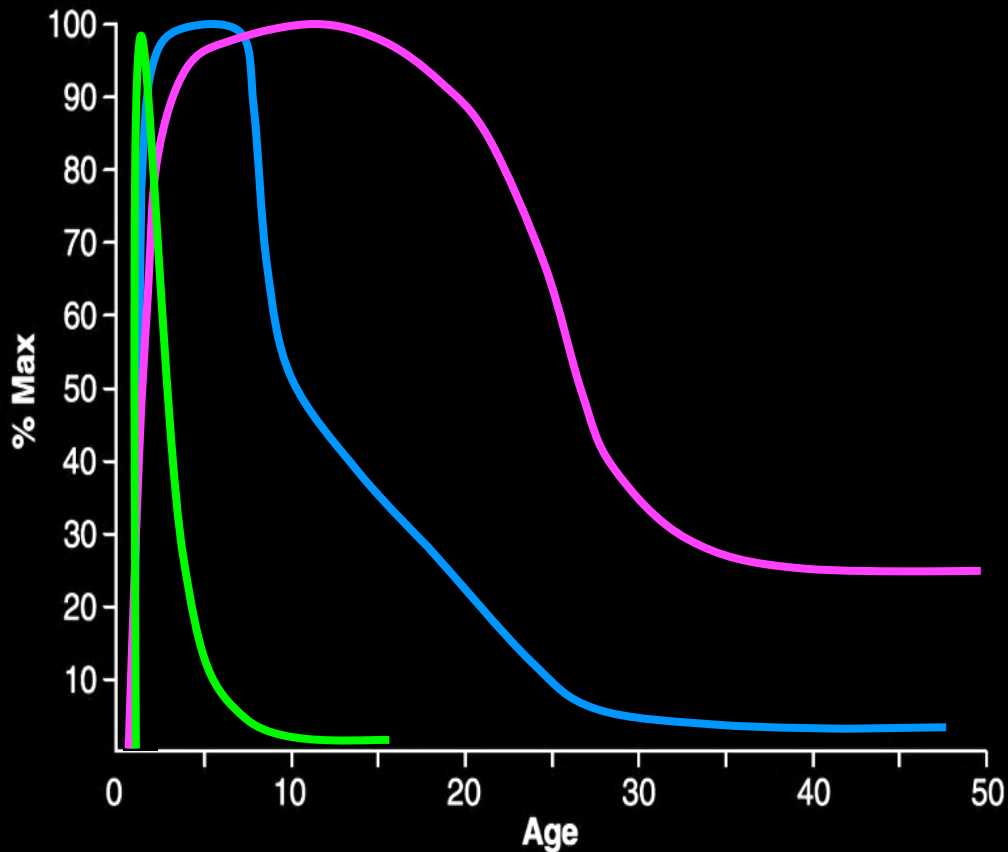
Registrations Open!

Humans *can acquire* immunity

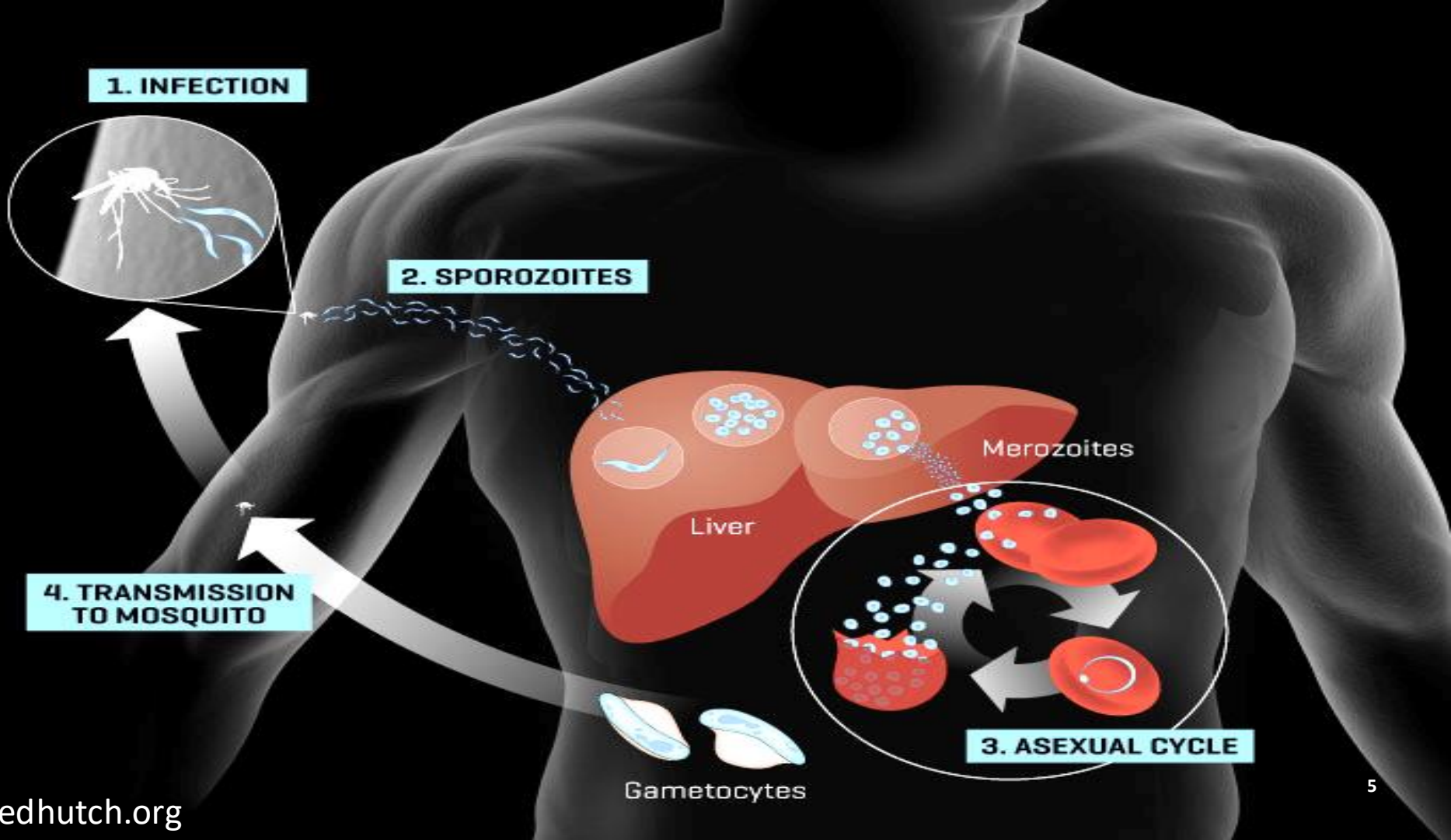


Adapted from Marsh 2006, Parasite Immunol.

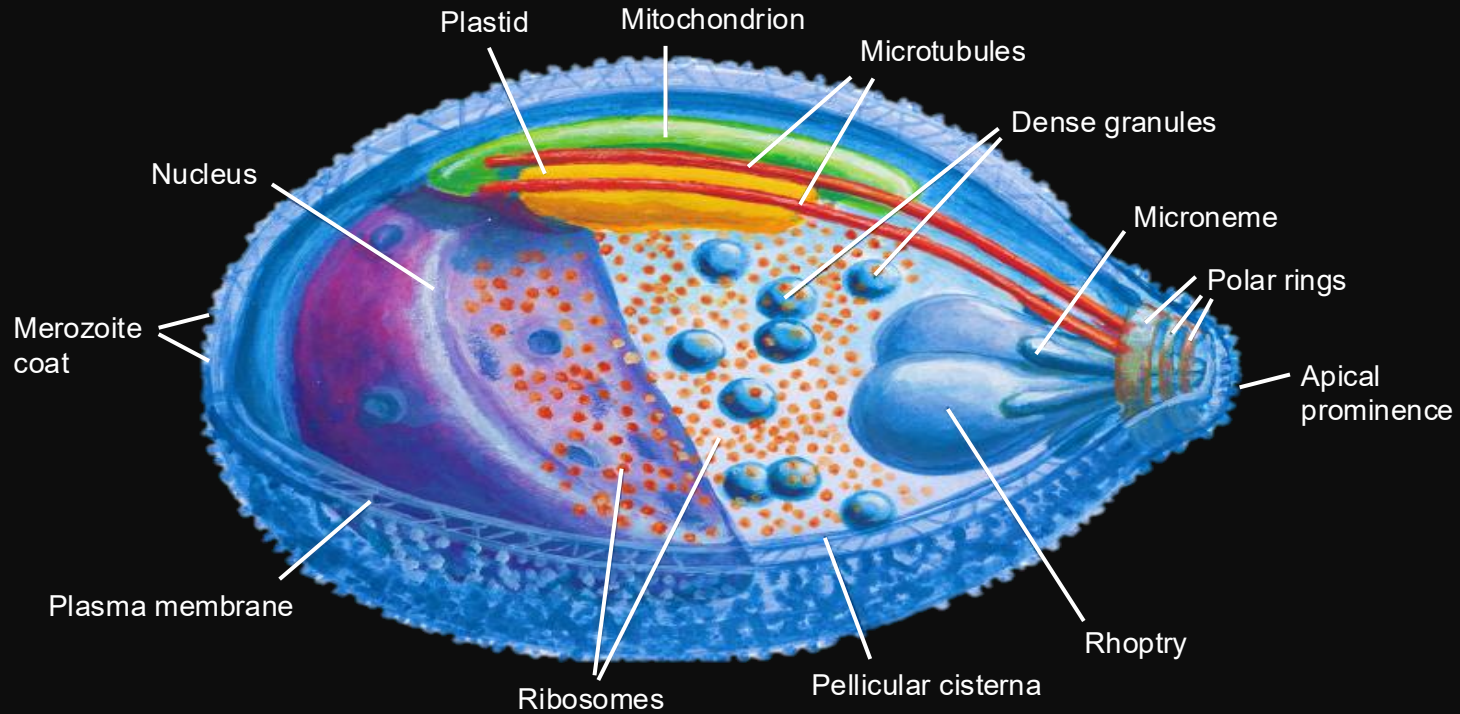
Humans *can transfer* immunity



Adapted from Cohen *et al.*, 1961 *Nature*



Plasmodium falciparum merozoite



Make malaria history through vaccination

- Vaccine candidate discovery
- Correlates of protection
- Mechanisms of protection

CHMI: Transformative for Science in Africa

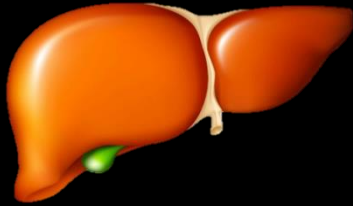
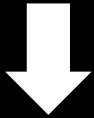


Day 0: inject sporozoites



Days 7 onwards: monitor parasites

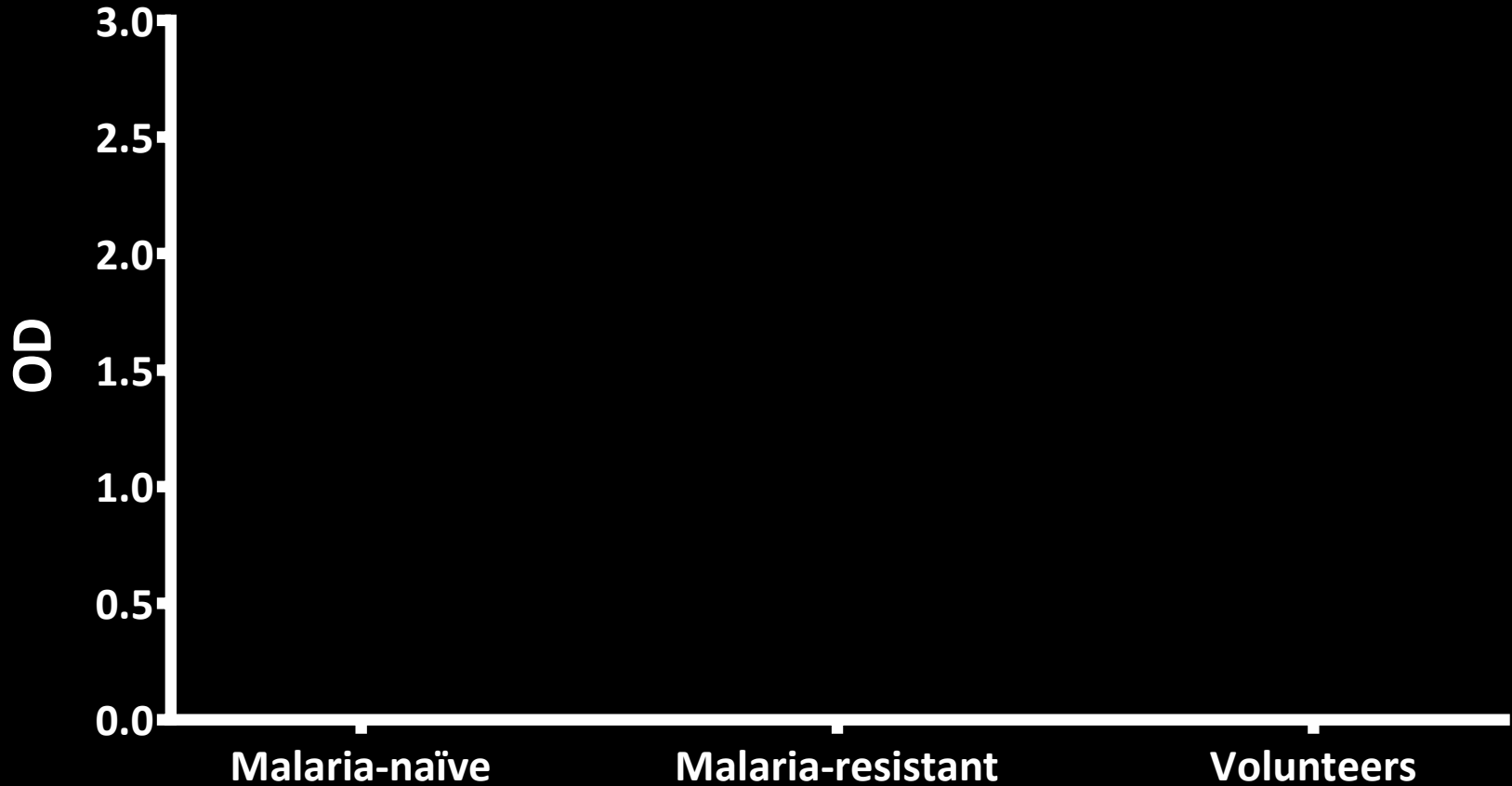
Use Daily qPCR to quantify parasites



Day 0-6: liver incubation



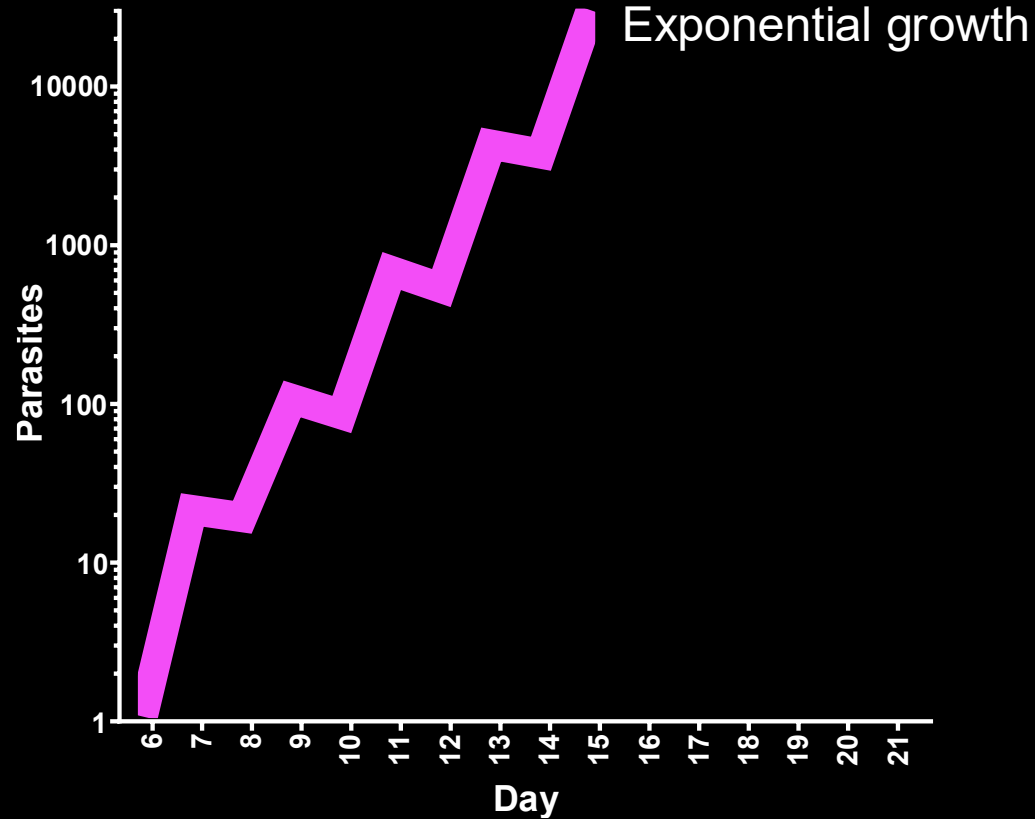
Epi-Intel: volunteer selection



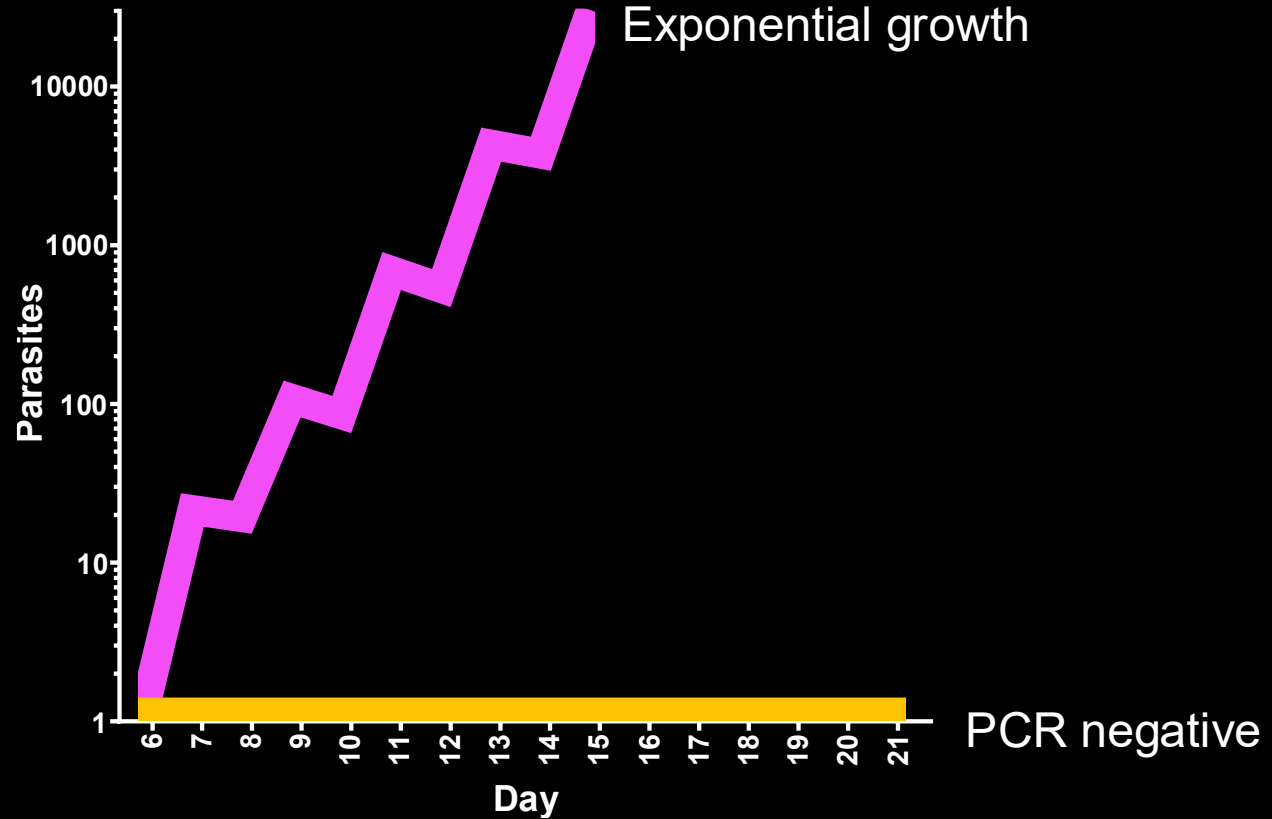
Volunteer characteristics

- Healthy young adults : aged 18 – 45 years
- N = 142 (70% Male)
- Range of previous exposure to malaria
- Excluded sickle cell trait

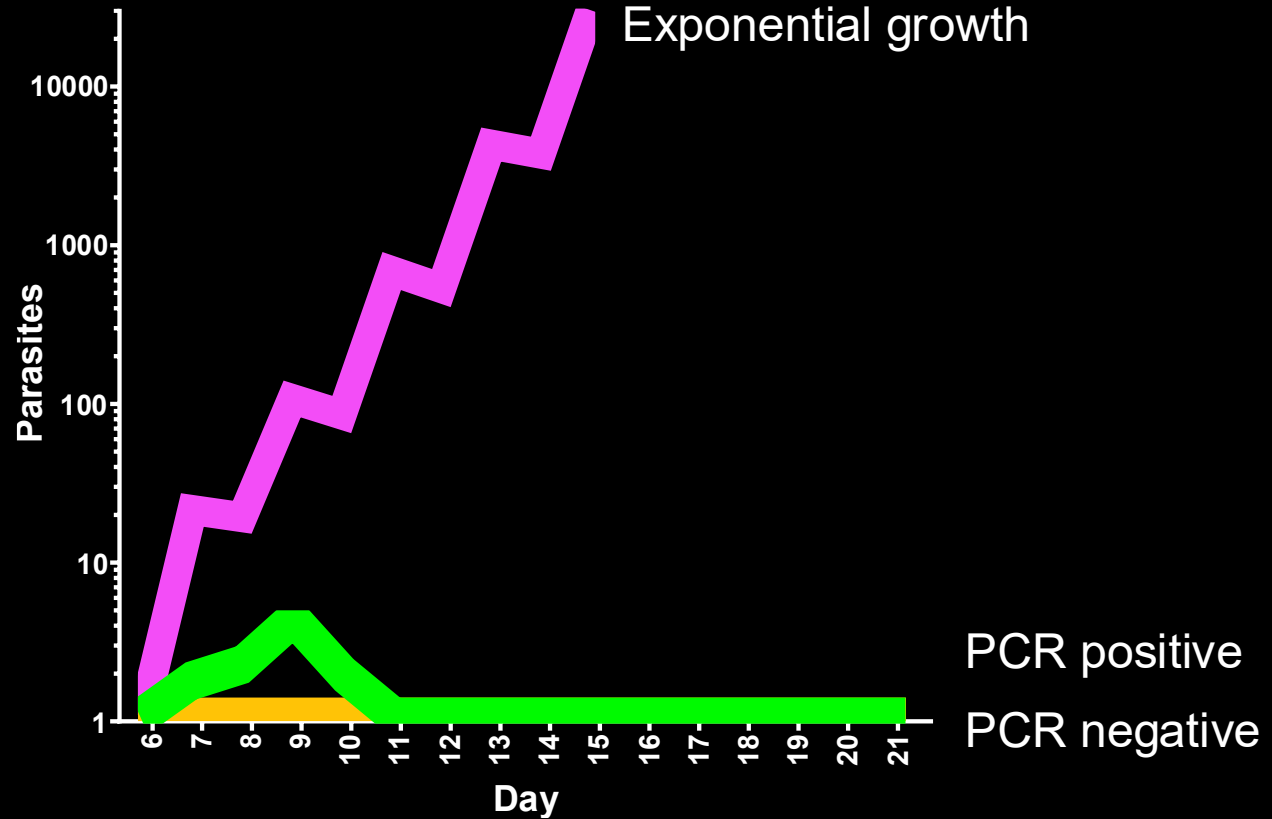
Outcomes



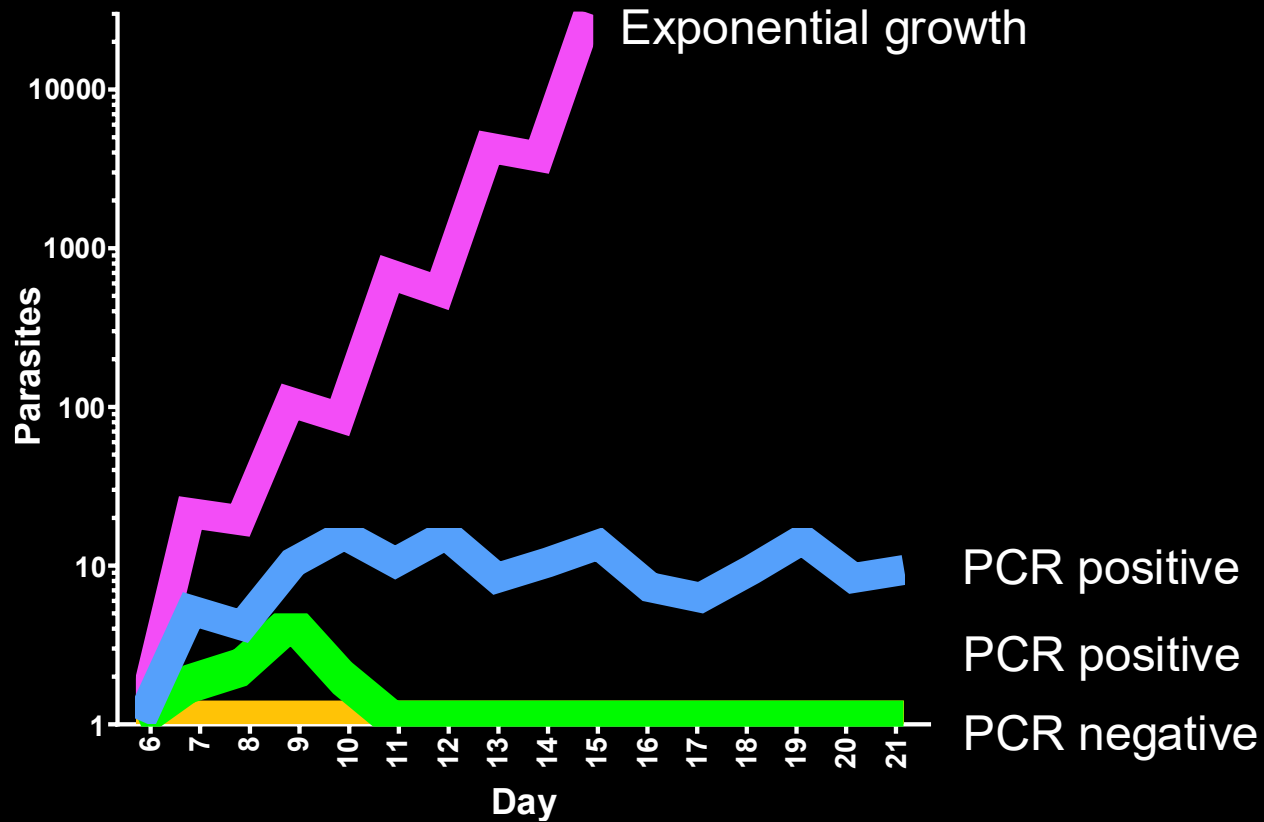
Outcomes

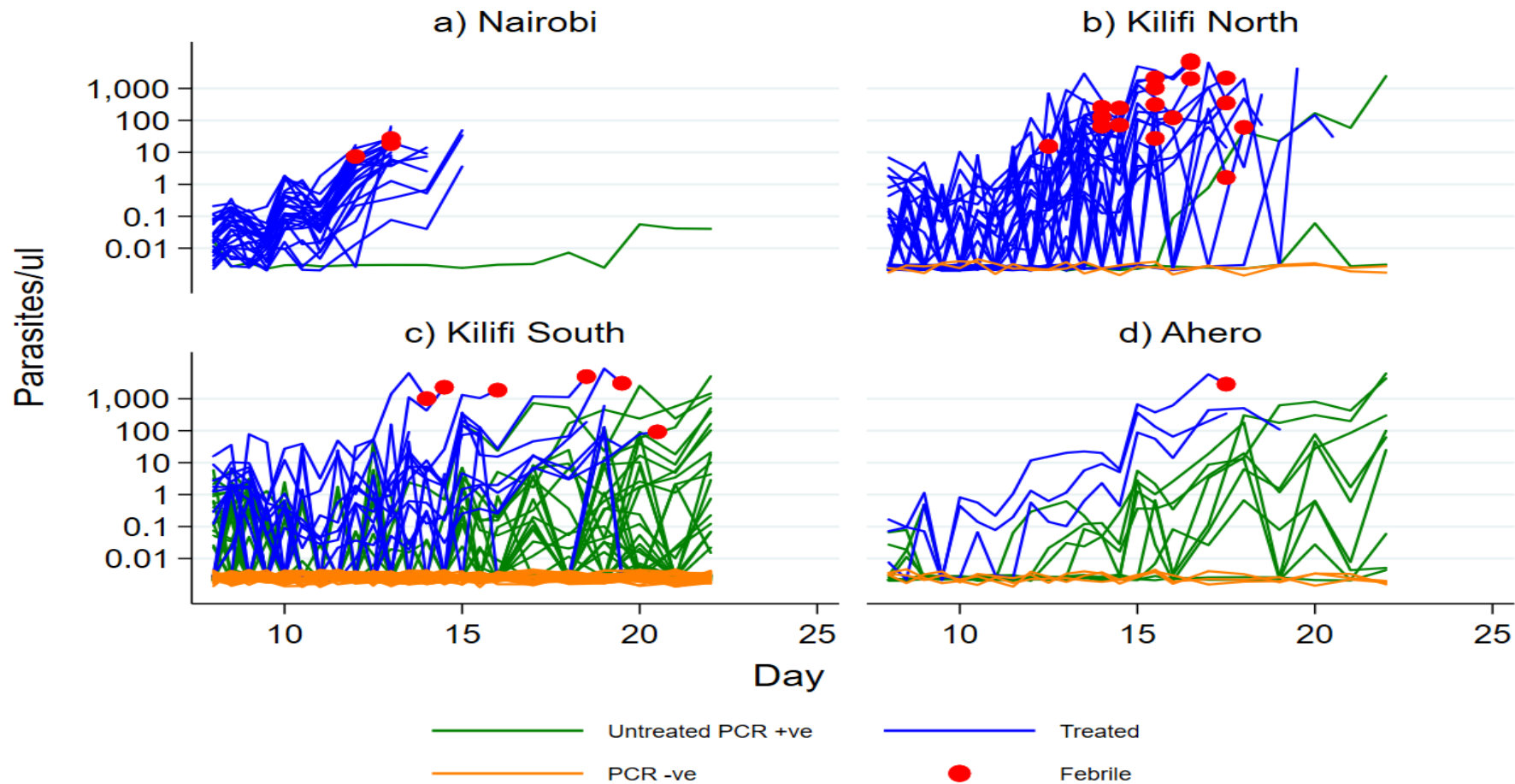


Outcomes

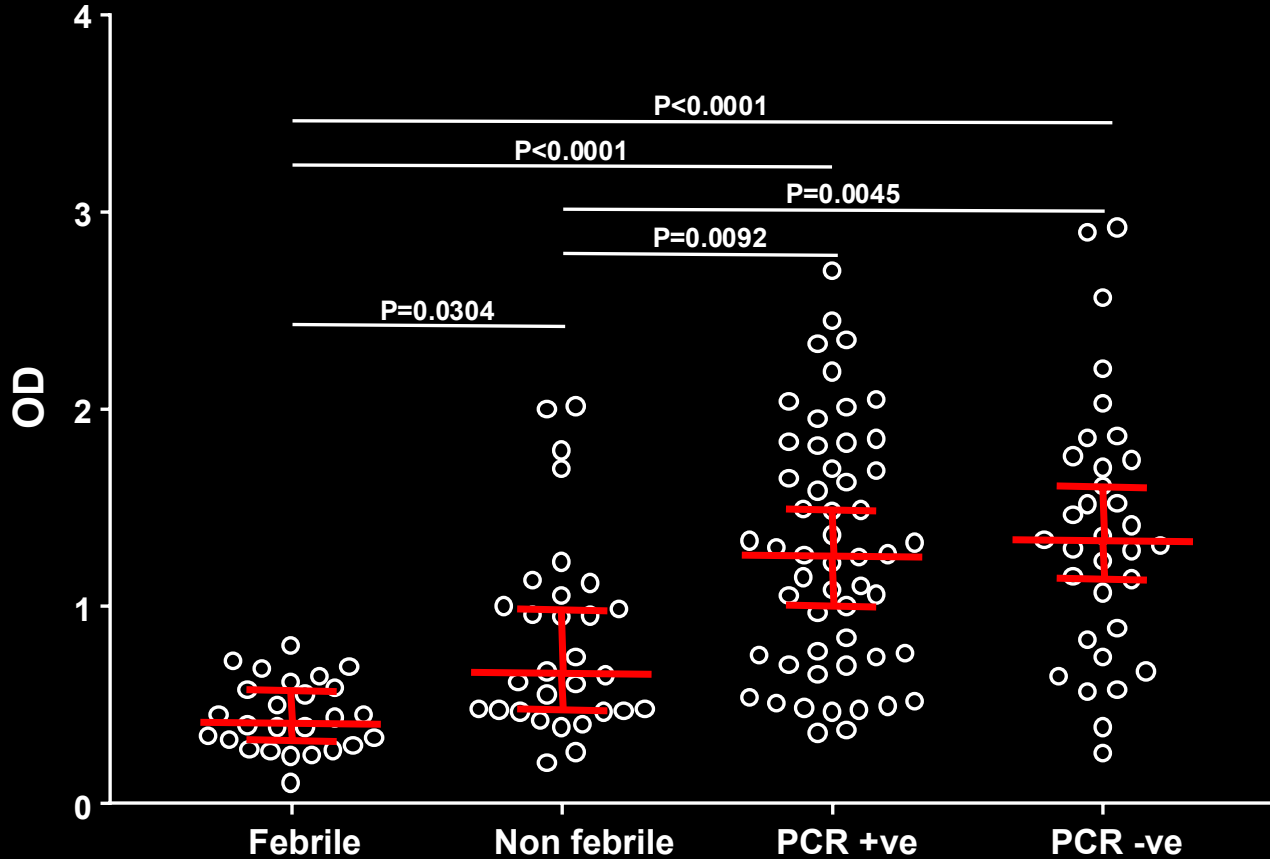


Outcomes

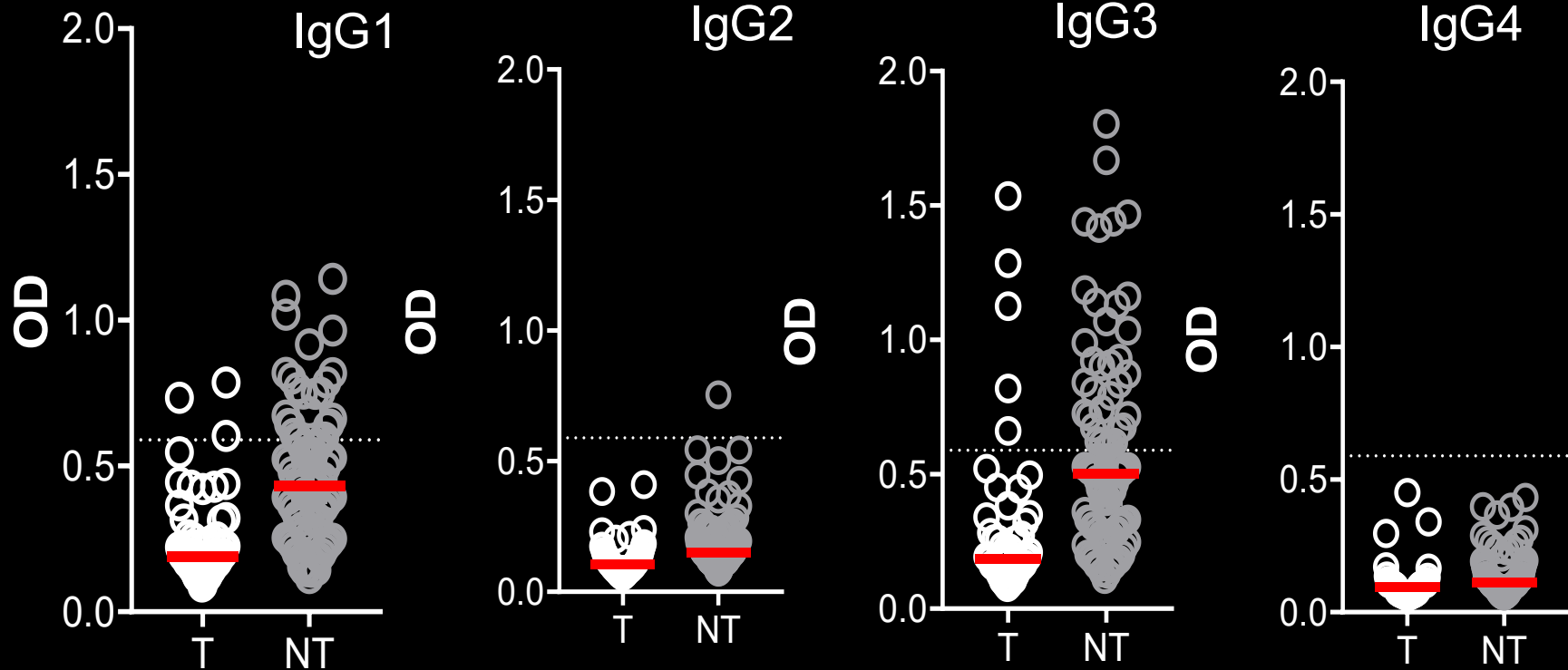




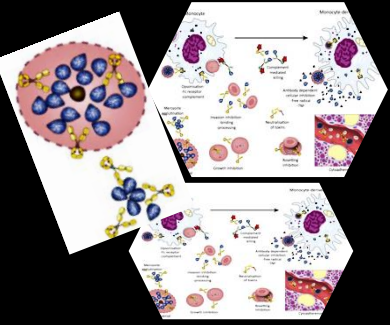
Anti-merozoite total IgG mirrors outcome



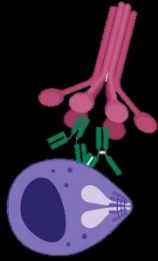
Anti-merozoite IgG predominantly cytophilic



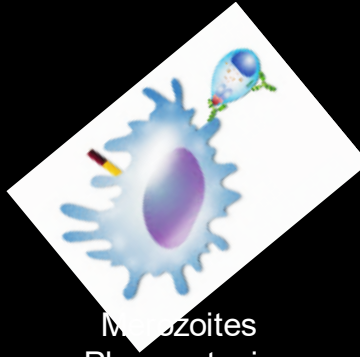
Antibodies and Effector Function



Growth Inhibition
(GIA)



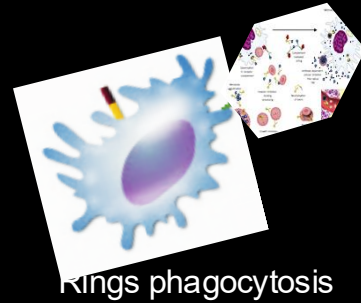
Complement activity
(AbC')



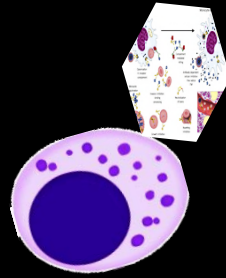
Macrophages
Phagocytosis



ADRB activity

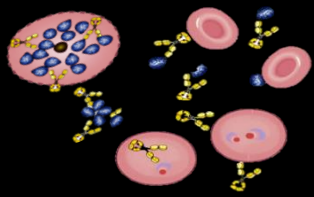


NK cells
phagocytosis



ADCC activity

IgG Fc function strongly predicts protection



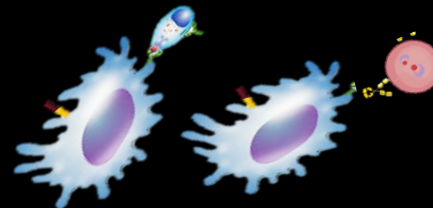
Growth Inhibition (GIA)



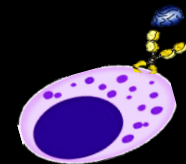
Neutrophil burst



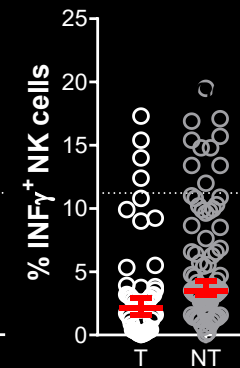
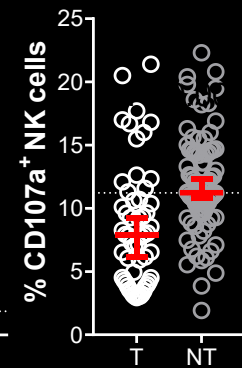
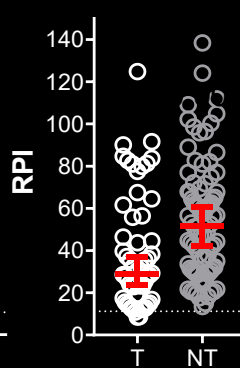
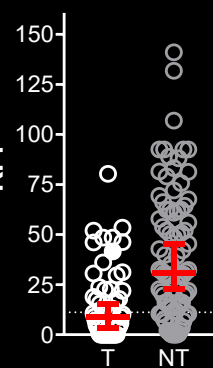
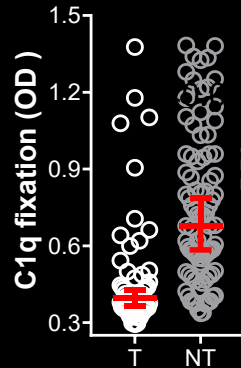
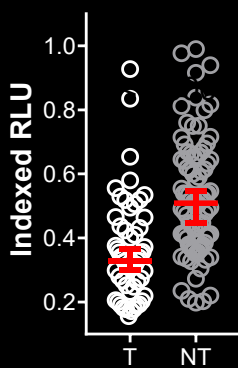
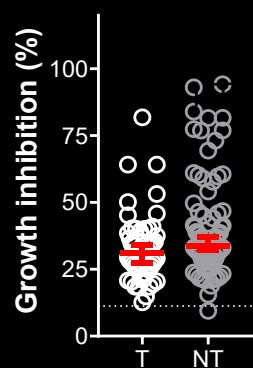
Complement fixation



Monocyte phagocytosis

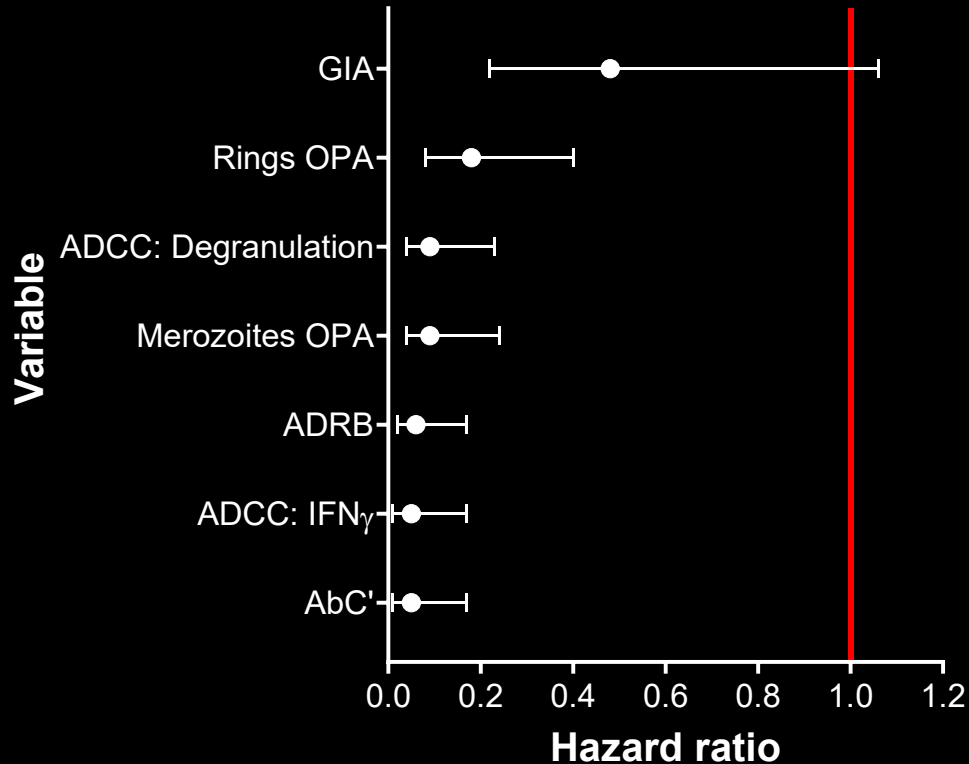


Natural Killer cytotoxicity

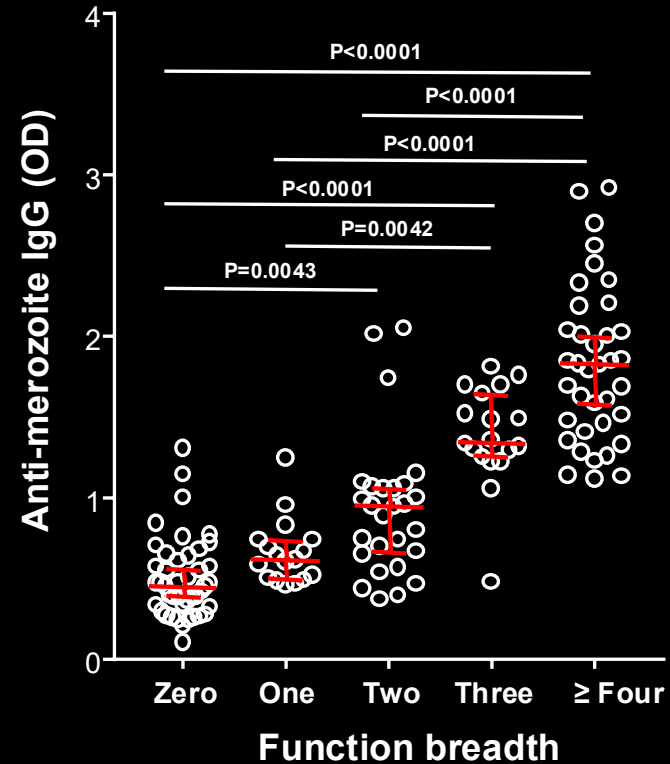
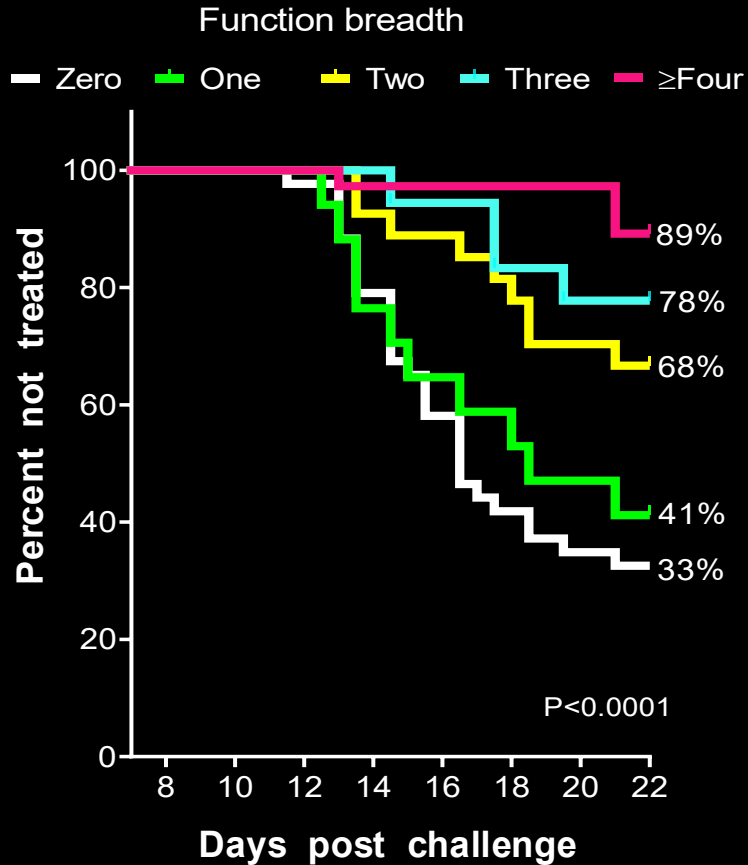


p < 0.0001

IgG Fc function: individual mechanisms



Breadth of IgG Fc fx



Kruskal-Wallis test

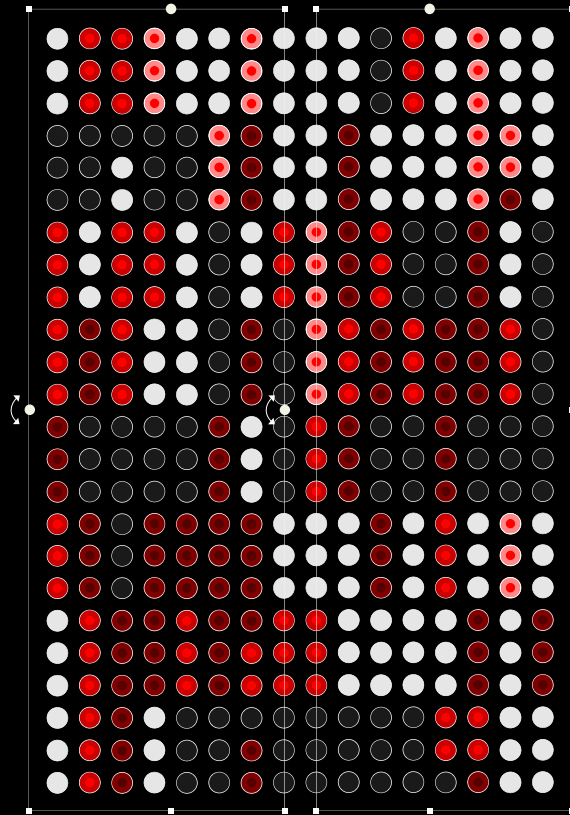
IgG Fc fx-guided vaccine design

- Human challenge platform: powerful demonstration of immunity
- Merozoite IgG (ELISA) is the strongest predictor of protection
- Cytophilic IgG1 & IgG3 important
- IgG Fc mechanisms strongly predict protection; GIA does not
- Breadth of Fc activity mirrors merozoite IgG; delineates clinical immunity

Specific merozoite antigens for vaccine design?

KILChip © : Custom Protein Microarray

Basic Science: Must Grow in Africa



Lidya Nyamako
Research Officer



Kamuyu *et al* 2018,
Frontiers in Immunology

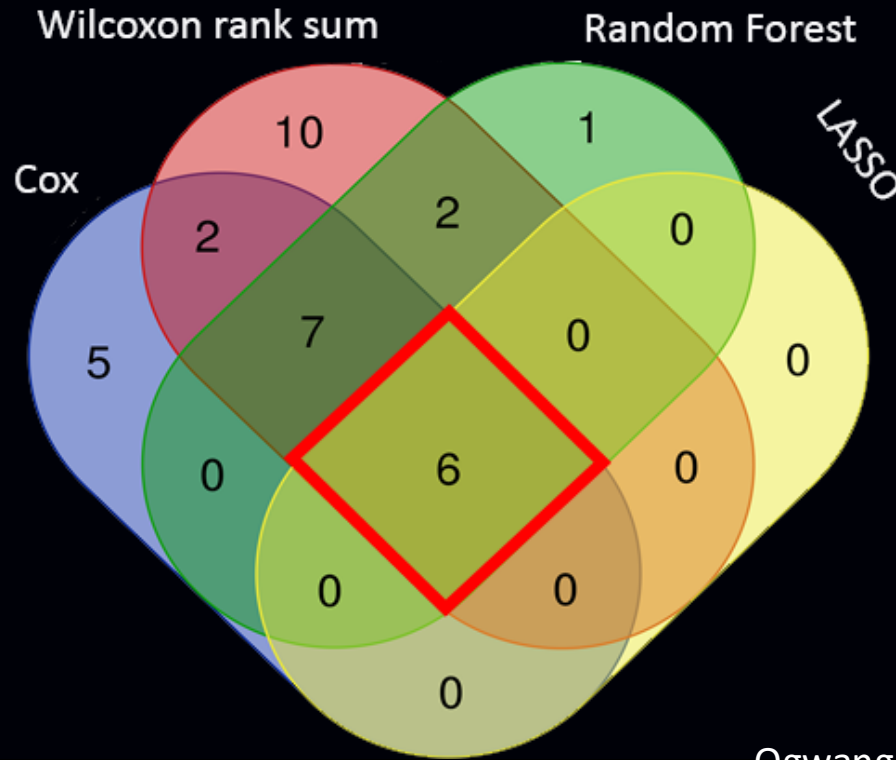
Comment faites-vous vos lasagnes ?



Analytical Approaches to Identify Immune Correlates of Protection

Data Scientists: Must Grow in Africa

Prioritized six merozoite antigens

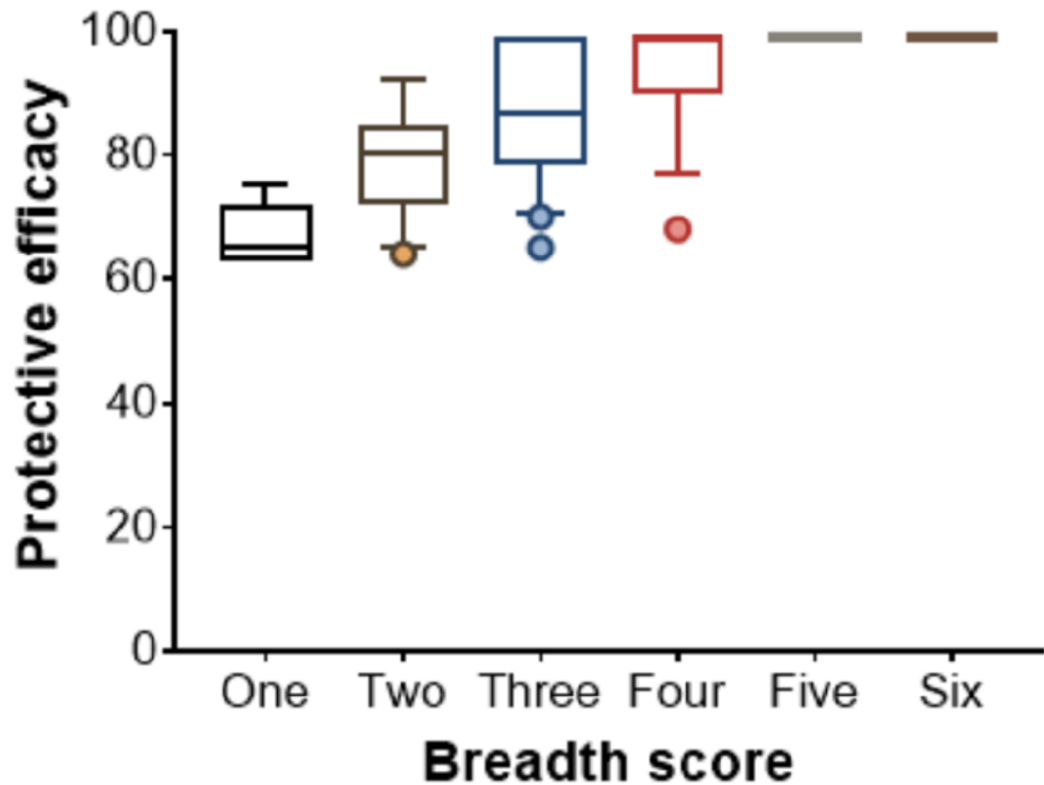


33 antigens
altogether

Combinations of Antibodies

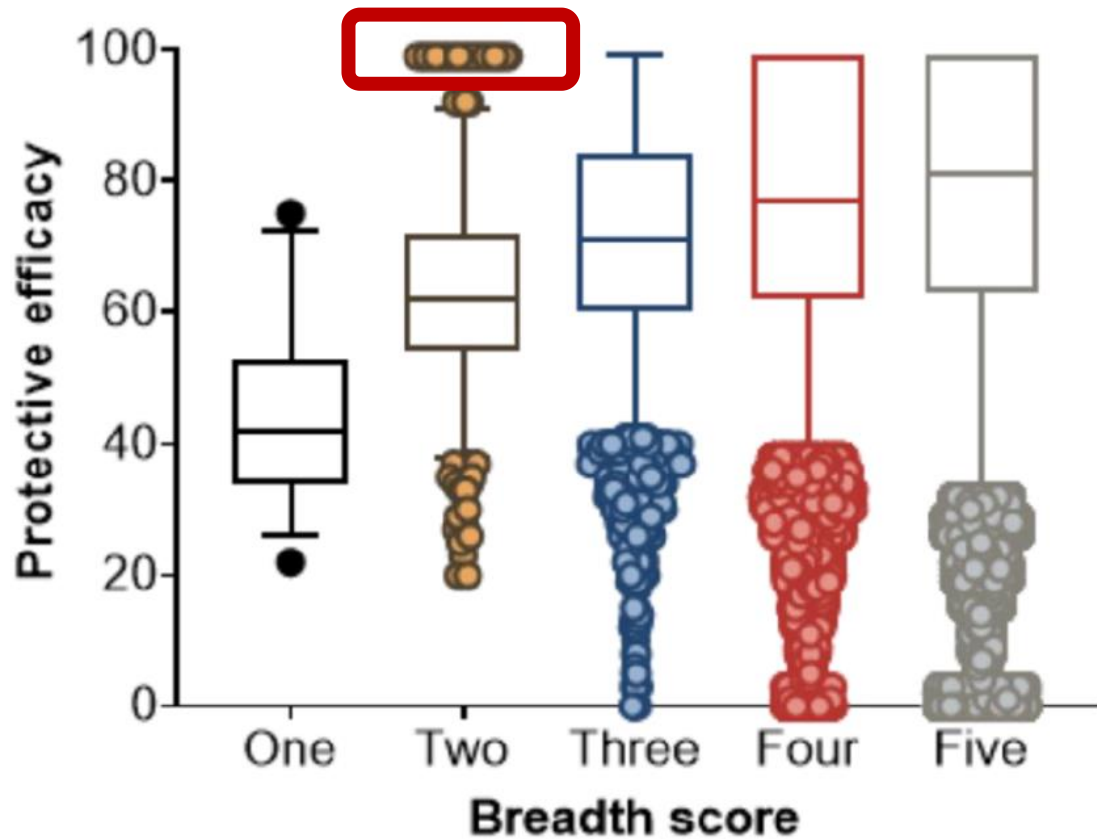
Are these better markers of protection than individual responses?

A



Antibodies to
five antigens
predict
complete
protection

Analysis involves only top 6 antigens

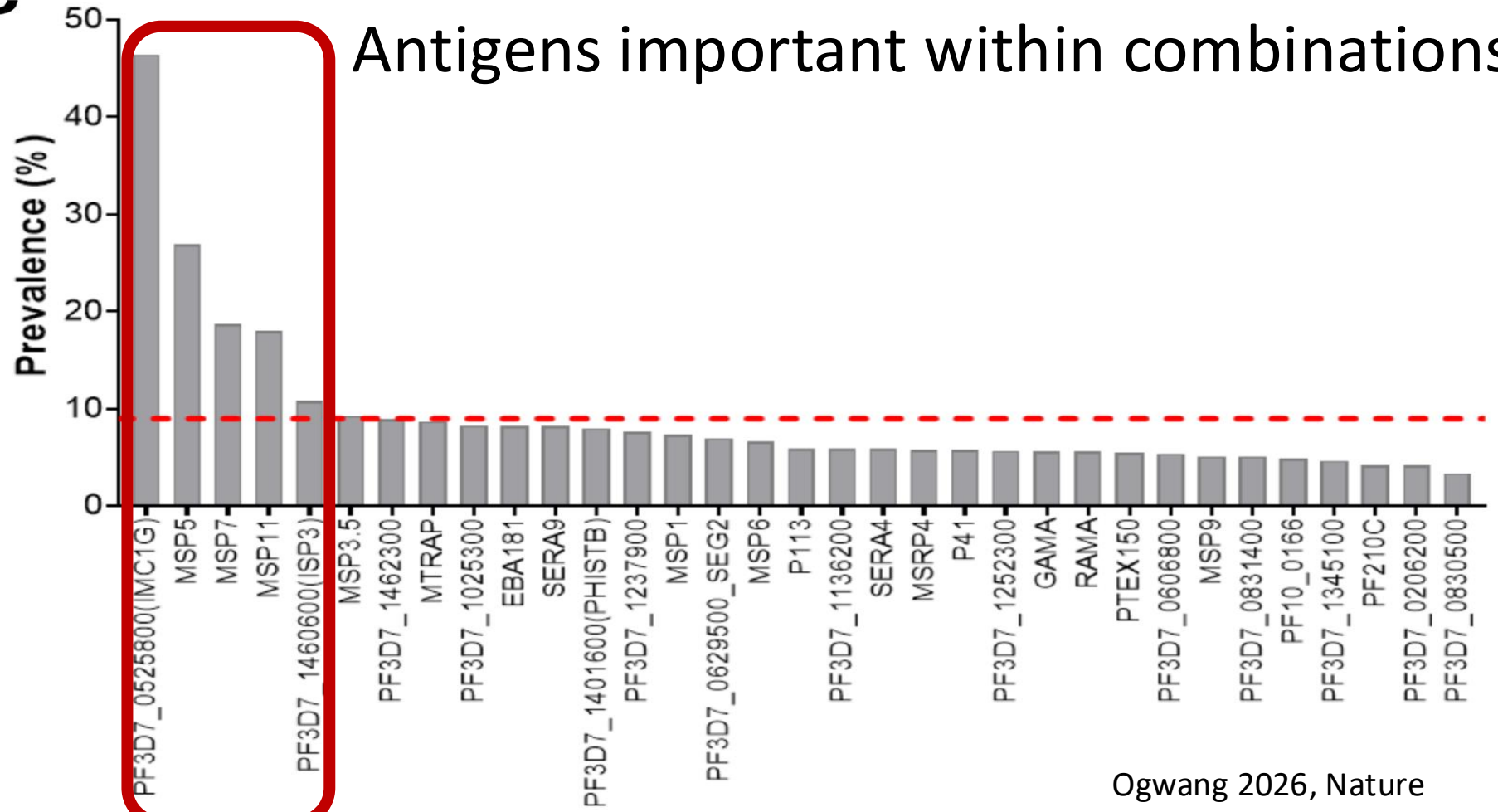


Selected pairs of antibodies also predict complete protection

Analysis involves only top 33 antigens

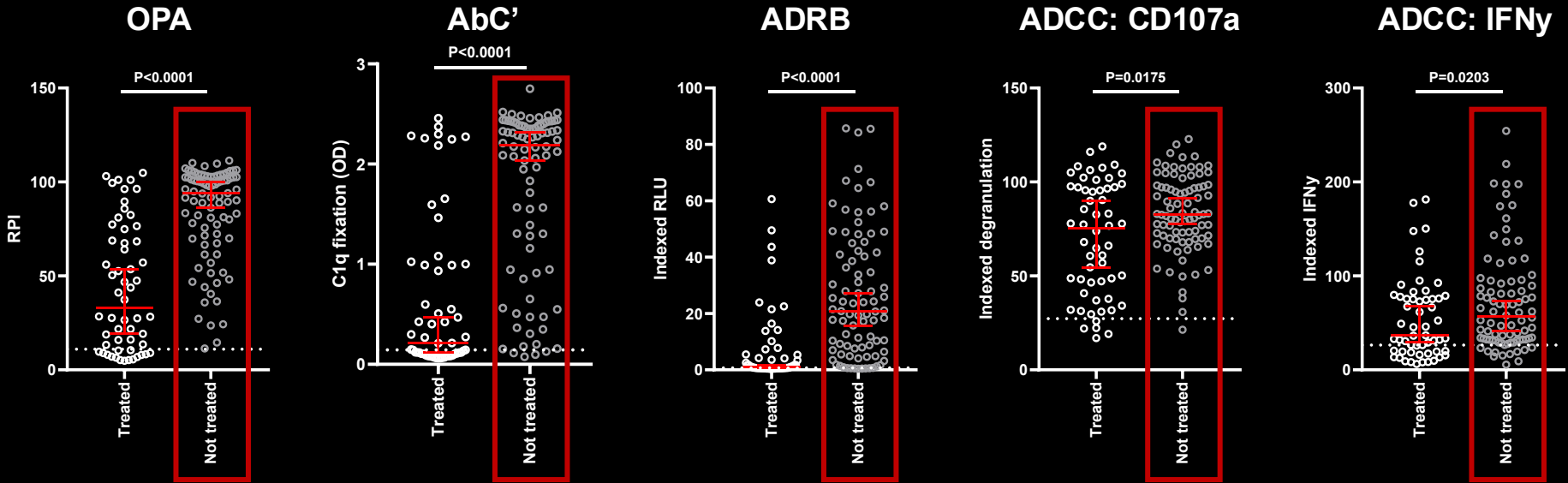
C

Antigens important within combinations



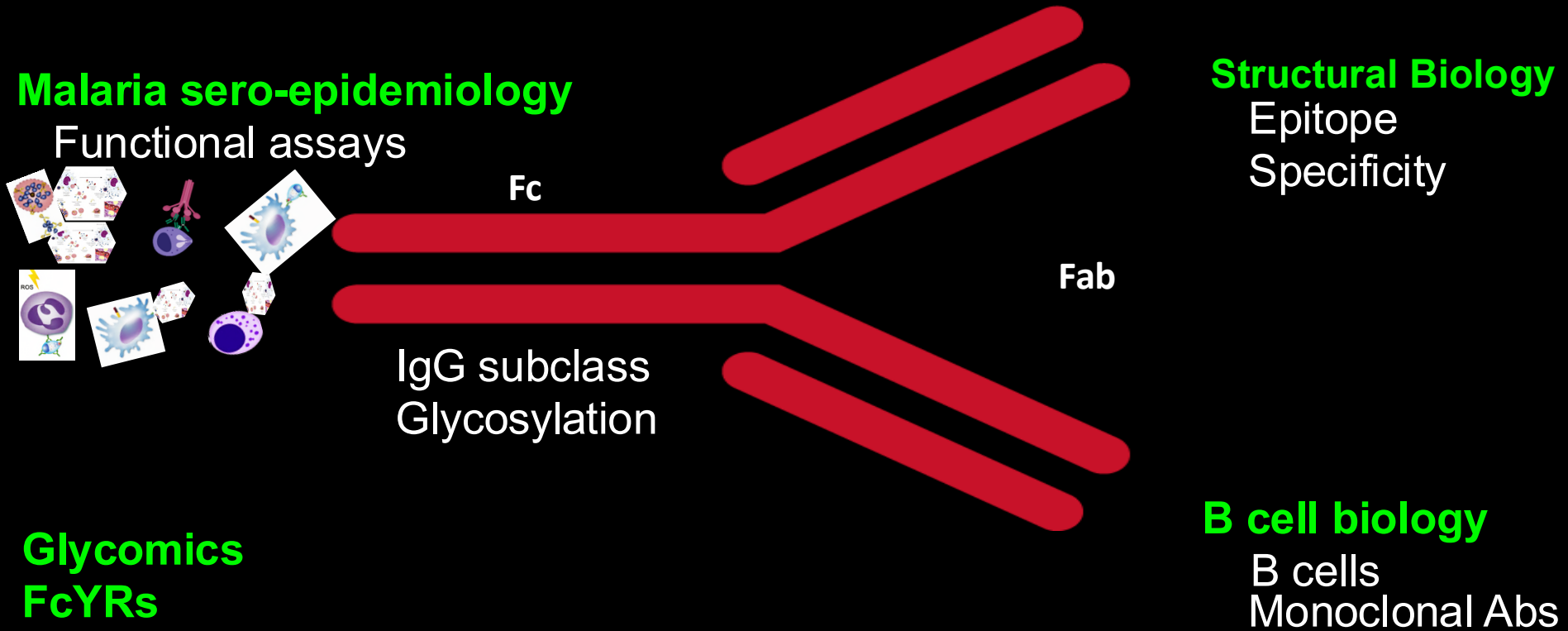
Antigen-specific function???

IgG Fc fx induced by MSP1



Mann Whitney test

Which antibody properties important?



IMPERIAL



Catalyze the African
vaccine manufacturing ecosystem

UK Vaccine Networks
UKVN





Our Vision

**African-led
African-owned**



Ambition Agency
Autonomy Sustainability

Make malaria history!

Training and Capacity Building: **Beyond Clinical Trial Sites**

Define

Understand

Products

Intervene

Implement



f.osier@imperial.ac.uk

IMPERIAL

KEMRI | Wellcome Trust



UNIVERSITY OF
OXFORD

