Gaps in Malaria Vaccines

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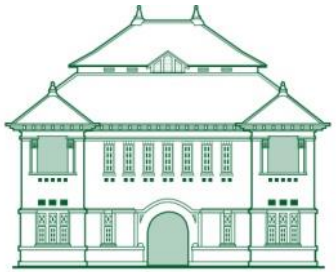
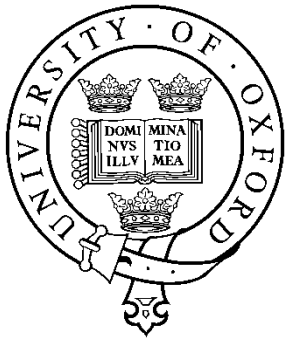
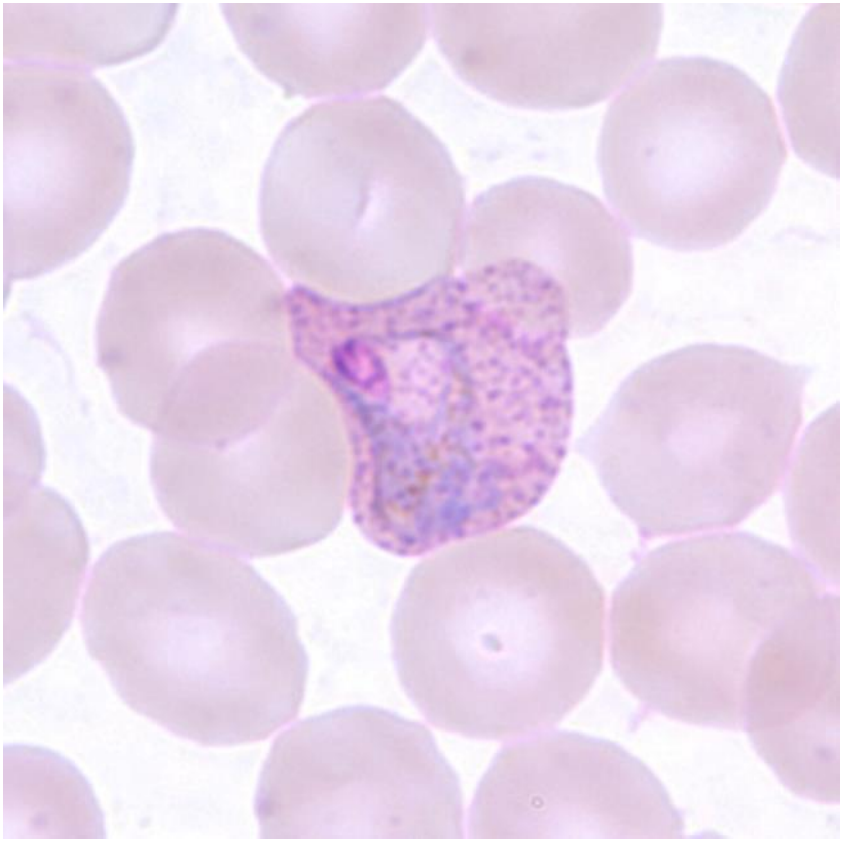


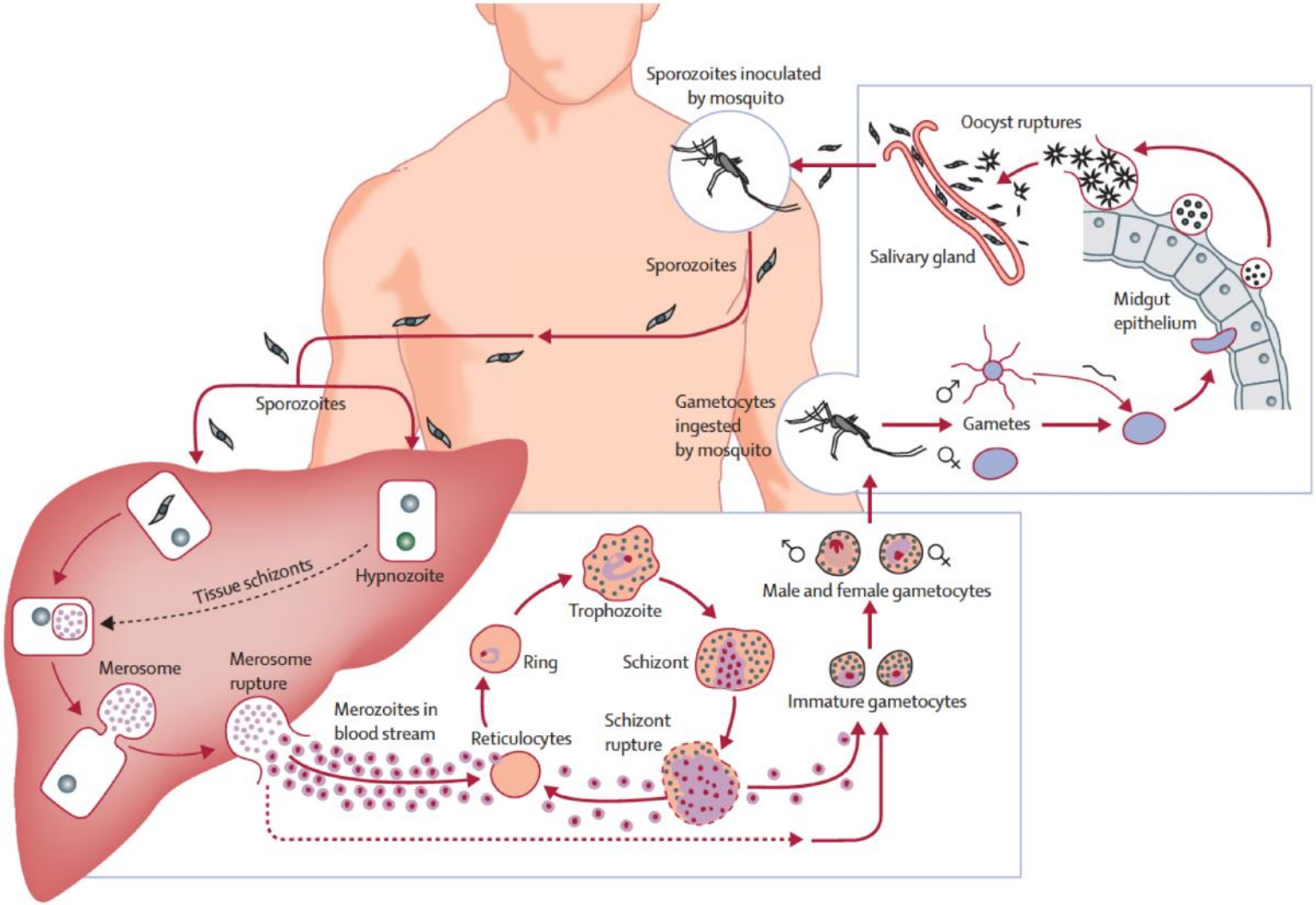


The human malarias

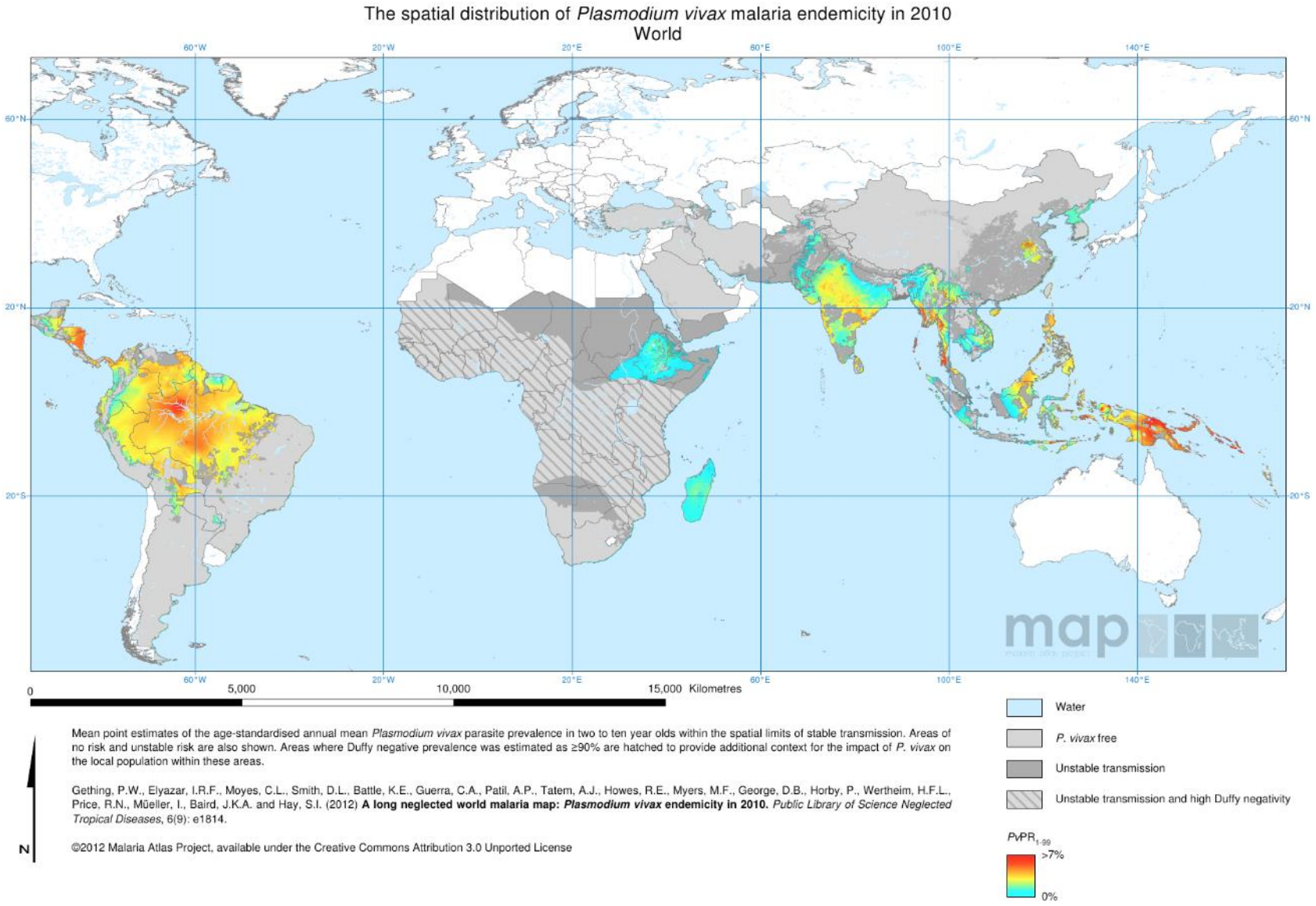
- At least 5 species of plasmodia carried by dozens of species of anopheline mosquito
- *P. falciparum* and *P. vivax* dominant
- *P. knowlesi* a zoonosis of SEAsia
- Hundreds of millions of cases
- Hundreds of thousands of deaths



A complicated animal



Occurring globally



Mean point estimates of the age-standardised annual mean *Plasmodium vivax* parasite prevalence in two to ten year olds within the spatial limits of stable transmission. Areas of no risk and unstable risk are also shown. Areas where Duffy negative prevalence was estimated as ≥90% are hatched to provide additional context for the impact of *P. vivax* on the local population within these areas.

Gething, P.W., Elyazar, I.R.F., Moyes, C.L., Smith, D.L., Battle, K.E., Guerra, C.A., Patil, A.P., Tatem, A.J., Howes, R.E., Myers, M.F., George, D.B., Horby, P., Wertheim, H.F.L., Price, R.N., Müeller, I., Baird, J.K.A. and Hay, S.I. (2012) **A long neglected world malaria map: *Plasmodium vivax* endemicity in 2010.** *Public Library of Science Neglected Tropical Diseases*, 6(9): e1814.

Creating a problem that is...

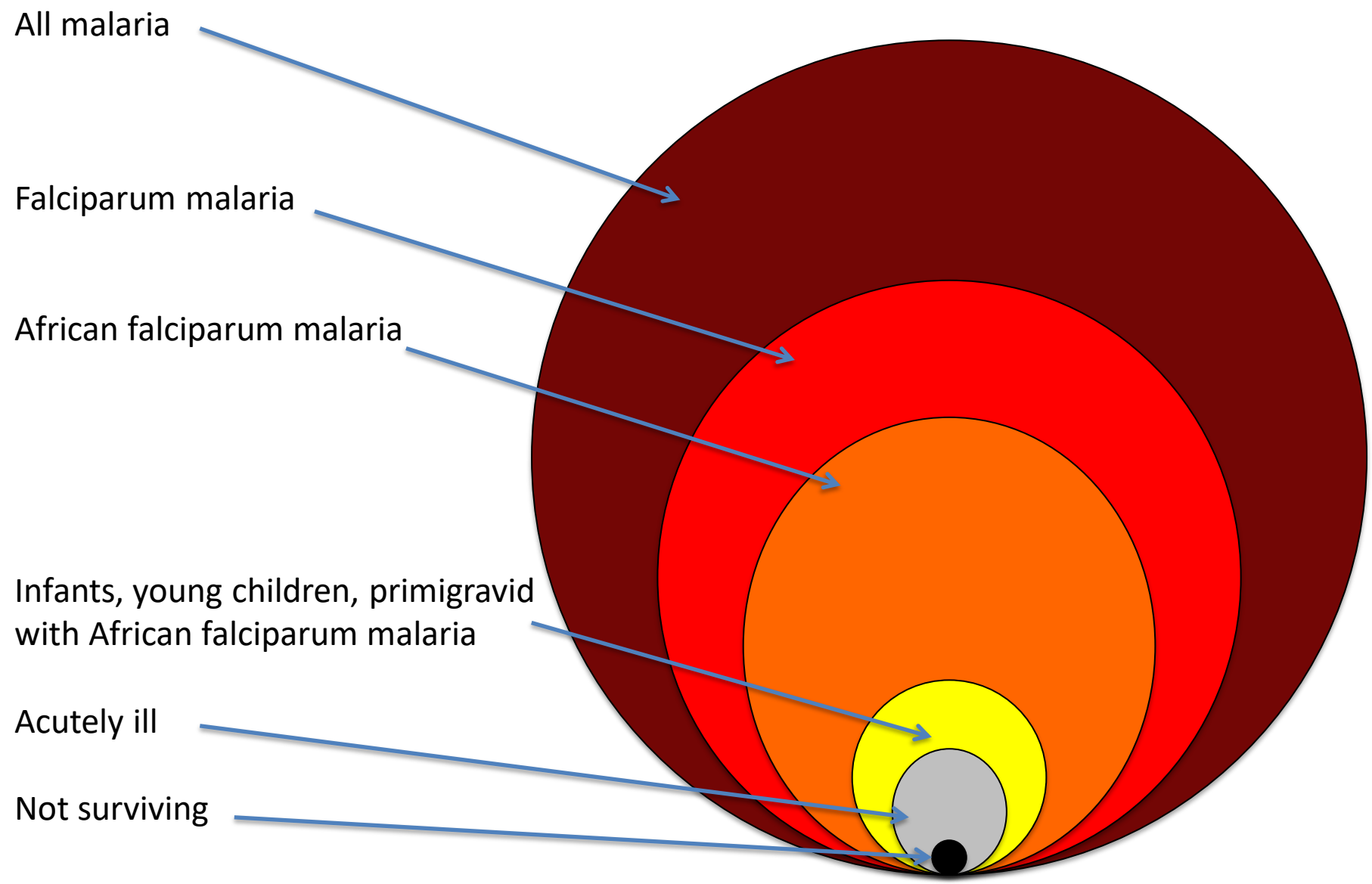
- Treatable and preventable with effective diagnosis, chemotherapeutics, and mosquito contol – and yet...
- Causing enormous burdens of morbidity, mortality and stunted intellectual and economic development
- Highly biologically diverse and complex occurring across extremely broad demographic and geographic distributions
- Driven by drug and insecticide resistance, rural isolation and poverty, derelict vector control programs

Vaccines a strategic necessity

P. falciparum has dominated vaccine research

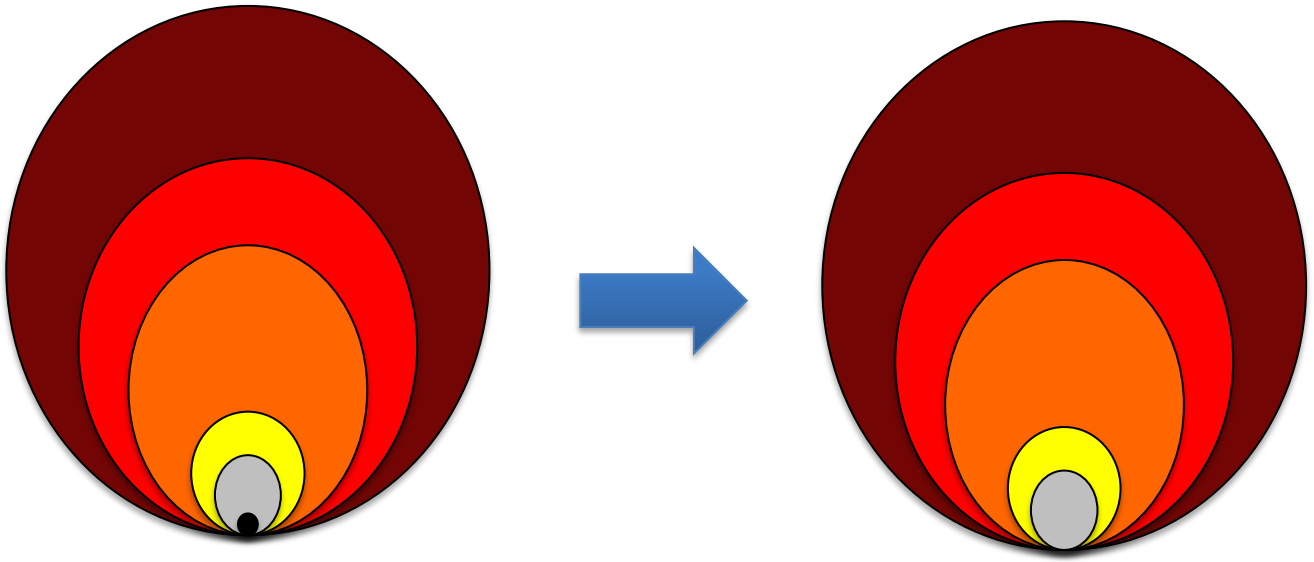
- Misperceived as the only dangerous species
- The only species adapted to continuous in vitro cultivation
- Vaccines work historically focused on mitigating mortality in African infants & young children using molecular sub-unit technology

Precision targeting of *P. falciparum*

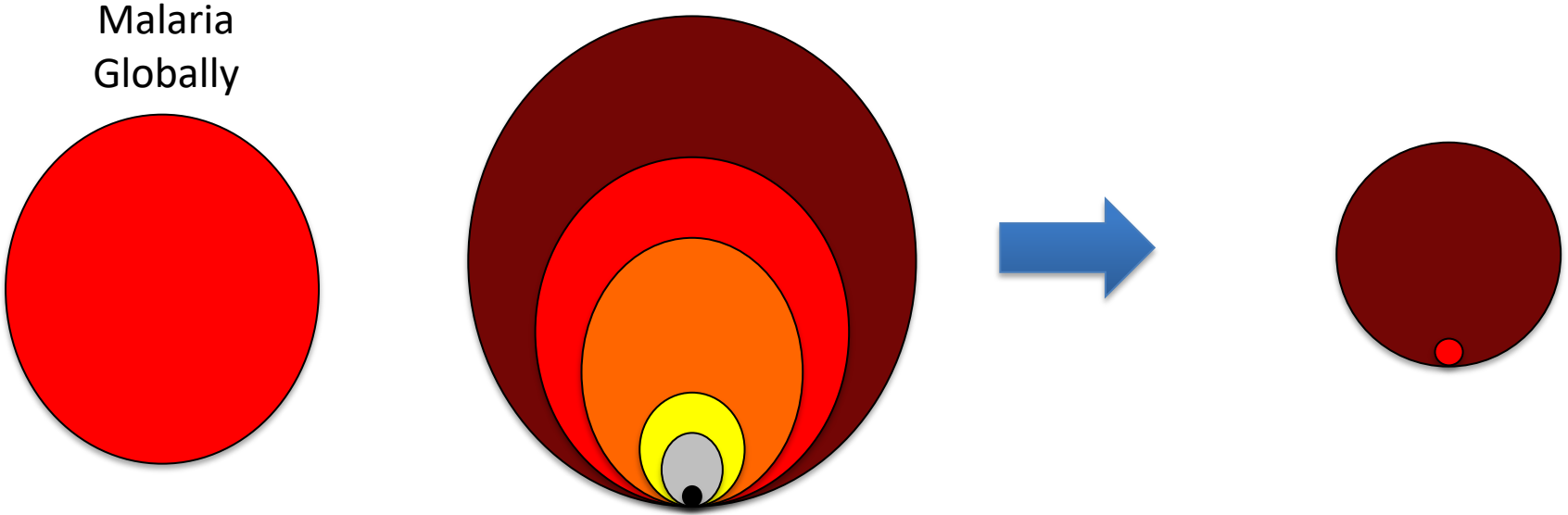


What success looks like – strategic goals matters

TARGET
Mortality
In African
Infants



TARGET
Falciparum
Malaria
Globally



Gaps in *P. falciparum* vaccine research

- A vaccine inclusive of older children and adults in Americas, Africa and Asia
- Transmission blocking vaccines
- Whole parasite vaccines, i.e., attenuated sporozoites
- A vaccine for eliminating rather than mitigating malaria

Gaps in malaria vaccine research

- Research for a *P. vivax* vaccine lags far behind
  - All stages, blood, hepatic, dormant, sexual
- Exploration of approaches to achieve a single vaccine effective against all plasmodia
  - Irradiated sporozoite vaccines protect across species

A more diverse research agenda than the past 50 years delivered