Does *P. falciparum* develop faster in mosquitoes with higher ageing rate?

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According to life history theory, parasites that can adjust their investment into growth or transmission stages in response to environmental conditions should have greater fitness all else being equal. Temperature affects both mosquito lifespan and *Plasmodium*'s extrinsic incubation period (EIP). Understanding how the temperature effects on the ageing rate of malaria mosquitoes impacts the EIP of *Plasmodium* is crucial to produce good estimates of malaria risk, particularly in the context of climate change.

Our experiments involve rearing mosquitoes in environmental chambers with fluctuating temperatures that mimic real-world conditions. We will measure the impact of temperature on mosquito ageing rate (using survival analysis) and the time to salivary gland invasion by sporozoites (using molecular analysis of regularly sampled mosquitoes). We will use generalised linear models to describe the relationship between temperature, mosquito lifespan, and EIP. Additionally, we will monitor sporozoite expectoration in the filter papers used for sugar feeding to explore their potential as a non-destructive EIP analysis method.

Our experimental pipeline also includes using mid-infrared spectroscopy (MIRS) to analyse the cuticle of all mosquitoes. MIRS spectra are influenced by the chemical composition of the samples, and spectroscopic methods have been used in the past to distinguish mosquitoes of different species or age groups. These methods require no refrigeration chain, reagents, or sample preparation, and offer much higher throughput than molecular methods. We will generate a heterogeneous dataset with spectra from mosquitoes of different species, age, ageing rate, and infection status. We will train machine learning algorithms on these data to predict these characteristics of mosquitoes, including infection status, to ultimately develop a new surveillance tool to determine malaria transmission dynamics in mosquito populations.