Analysing the capacity of *Aedes aegypti* pupae to avoid thermal stress

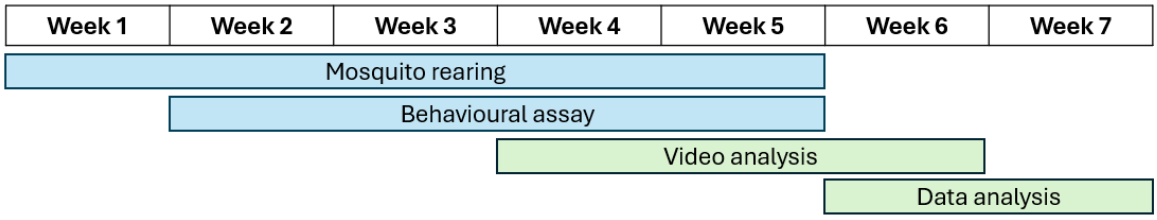
Introduction

Aedes aegypti mosquitoes are major vectors of arboviruses that represent a significant threat to humans (ECDC, 2023). With climate change, the frequency and intensity of hot periods is expected to increase (WHO, 2024), but the impact of this on the ecology of important mosquito vectors remains unclear. Mosquitoes have an aquatic pupal developmental stage, that are believed to be particularly sensitive to these thermal changes as they have limited behavioural capacity. Thermal stress during this developmental stage has been shown to reduce reproductive fitness (Griep et al., unpublished). However, it is still uncertain whether these pupae would be able to avoid damaging temperatures in the field. Thus, the **objective** of this project is to analyse the capacity of *Aedes aegypti* pupae to avoid certain temperatures.

Proposed experimental work

Aedes aegypti pupae will be maintained at 27˚C. The pupae will then be placed in a thermal gradient that rangers from 27˚C - 44˚C. The pupae will be left to acclimatise for 5 minutes. After the acclimatization period they will be recorded for an additional 5 minutes. This recording will be analysed using Behavioural Observation Research Interactive Software (BORIS) to determine how much time each pupa spends in a certain temperature zone. Both male and female pupae will be tested separately to assess sex specific differences. Finally, both individuals and groups of pupae will be tested to determine the effect of the presence of other individuals on temperature preference. Based on the interests of the student additional species or life stages could be included in the analysis as well.

Timeline



Research training for the student

- Mosquito rearing, maintenance, handling, pupae sexing
- Mosquito behavioural assays
- Experience with behavioural analysis software, specifically BORIS
- Extracting and organising data from behavioural analysis software
- Statistical analysis in R

References

European centre for disease prevention and control. (2023). Aedes aegypti - Factsheet for experts. Retrieved from https://www.ecdc.europa.eu/en/disease-vectors/facts/mosquito-factsheets/aedes-aegypti

Griep, J (Unpublished). Carry over effects of thermal stress during the pupal stage of *Aedes aegypti* on the adult mosquito.

WHO. (2024). Heat and Health. Retrieved from https://www.who.int/news-room/fact-sheets/detail/climate-change-heat-and-health