It's about time: Do rhythmic interactions between mosquitoes and their microbiota influence malaria transmission?

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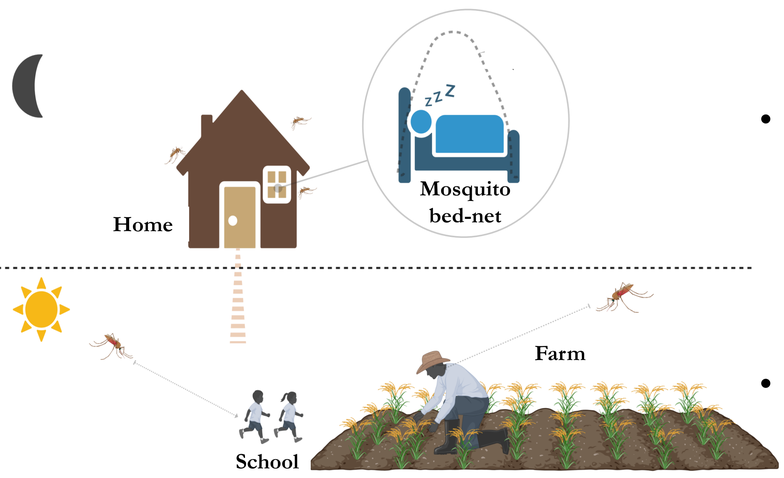
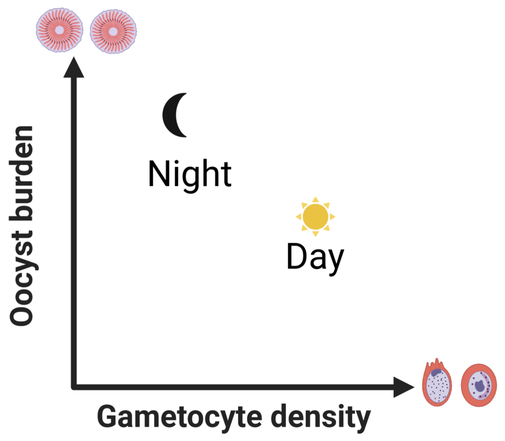
1 Daily rhythmicity of *Anopheles's* biting behaviour is changing

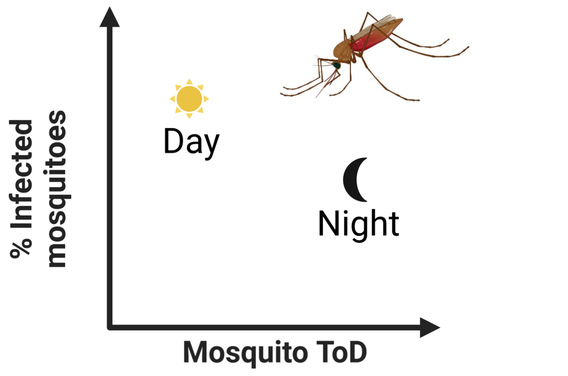


- Changes in **mosquito-biting behaviour** could potentially impact control interventions
- Consequently, placing more people are at risk of infection

2 Changes in biting/feeding times affect malaria transmission



- Gametocytes are more infective at night



- Night-fed mosquitoes are less likely to get infected

Transmission is determined by both parasite and mosquito time of day

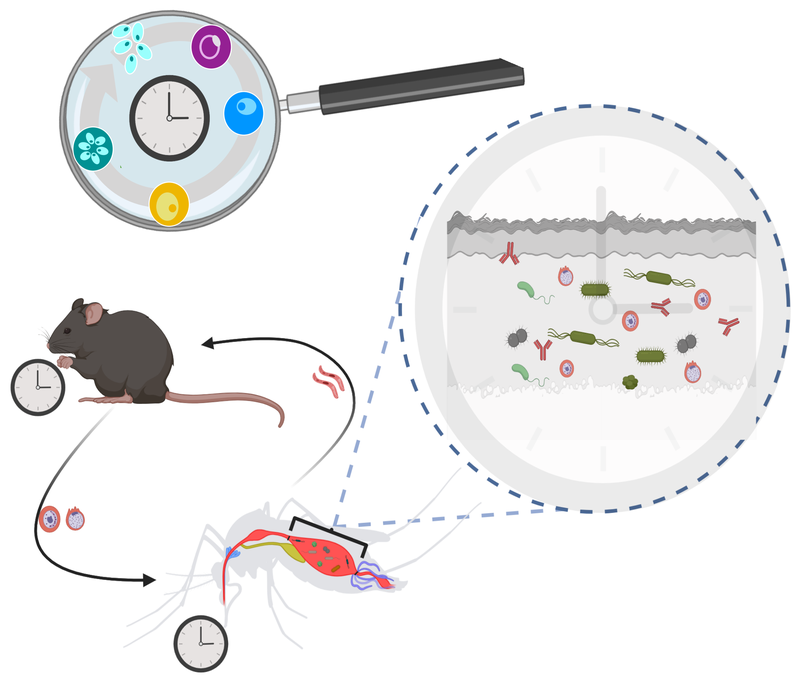
3 Role of microbes in disease transmission

The general roles

- Possible immune priming/activation of immune responses
- Potential of transmission-blocking and infection-enhancing capabilities
- Keeping a homeostatic balance within the vector

In malaria infection?

- Examples of microbes that can influence malaria transmission success include: *Wolbachia*, *Microsporidia*, *Serratia* and *Penicillium*



Microbial rhythms

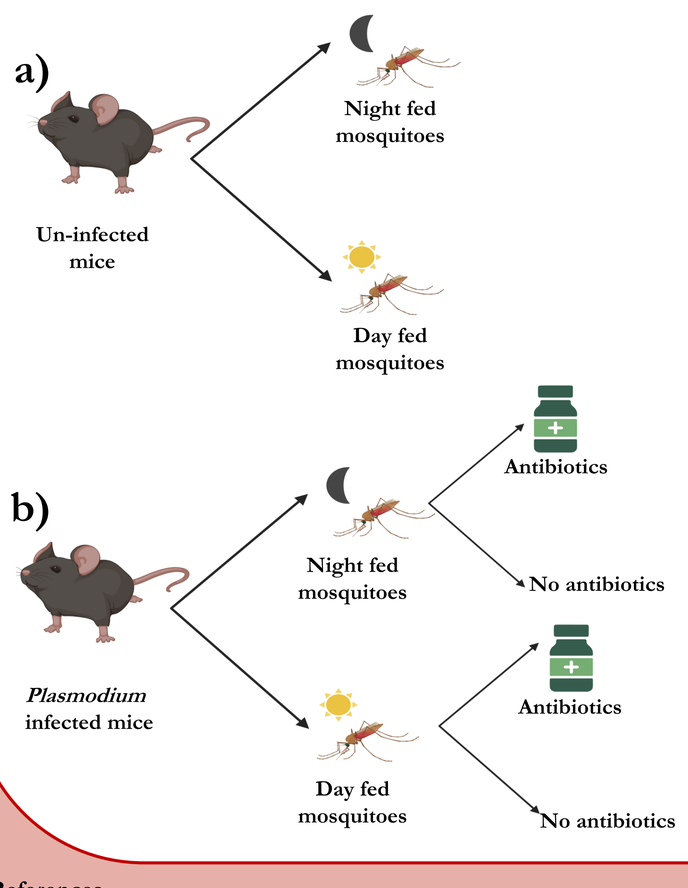
- Host/vector rhythms drive not only parasite rhythms but also microbial rhythms
- There is evidence of rhythmicity in the abundance/composition of microbiota in the mosquito midgut

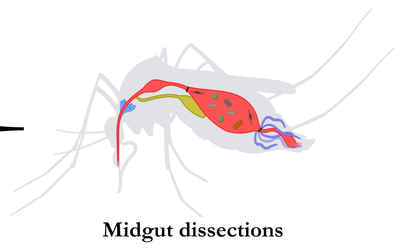
I, therefore, hypothesise that microbial rhythms could shape the vector immune and metabolic rhythms in a time-dependent manner, affecting vector susceptibility to malaria infection.

Key question

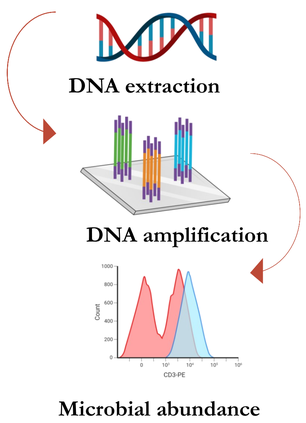
How does time of day (ToD) influence microbial rhythms and overall disease transmission?

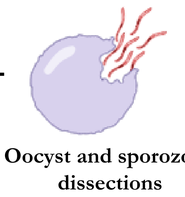
4 Does time of day influence microbial rhythms and overall disease transmission?





Midgut dissections





Oocyst and sporozoite dissections

Approach

a) Compare the microbial abundance and diversity difference between night-fed and day-fed mosquitoes at two-time points, the onset of light and dark phases.

b) Compare *Plasmodium* infection in the presence and absence of microbiota at different time points by quantifying the number of infective stages (oocysts and sporozoites).

How can we translate these findings into malaria control interventions?

References

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