

PROS セミナー

愛媛大学プロテオサイエンスセンター 寄生病原体学部門主催

日時：令和5年11月6日（月） 13:00～15:00

場所：プロテオサイエンスセンター棟 4階 会議室

このたび、プロテオサイエンスセンター寄生病原体学部門のセミナーを開催いたします。
皆様のご参加、心よりお待ちしております。

Sophisticated strategies:

Malaria parasites are rhythmic and respond to their environment.

Aidan O'Donnell & Petra Schneider

Reece Group – The University of Edinburgh

Aidan O'Donnell:

Research into daily rhythms in infections is gaining traction because explaining the regulatory mechanisms and fitness consequences of biological rhythms exhibited by parasites and hosts offers new avenues to treat infections. Rodent malaria parasites exhibit ~24h developmental rhythms during replication and during transmission and parasite success is determined by whether these developmental rhythms are synchronised to the host's circadian rhythms. But how periodicity is generated and maintained during infection is poorly understood. We address this using *Plasmodium chabaudi* infections and compare infection rhythms in WT mice and clock KO mice housed with various lighting and feeding schedules. We apply a 'phase-shift' to parasites and track the parasite schedule for over ten cycles to determine how they resynchronise with host rhythms. We show (i) parasite rhythms match the phase of the host's feeding-fasting rhythm and not the phase of rhythms in activity or body temperature; (ii) the timing of the parasite cycle is independent of the host clock; (iii) following perturbation, parasites reschedule to regain synchrony with the timing of the host's rhythm within 7 replication cycles and achieve this by speeding up the replication rhythm by 2 hours per cycle. We discuss how it is beneficial for parasites to be in synchronization with their host's feeding-fasting rhythms and plasticity in their development duration facilitates this synchrony by enabling parasites to make small daily changes to their schedule when necessary.

Petra Schneider:

During each asexual replication cycle, a small and variable proportion of malaria parasites commit to producing sexual stages that are essential for between-host transmission. Since individual parasite cells follow either the sexual or the asexual route of development, a trade-off occurs between investing in within-host survival and between-host transmission. How do malaria parasites resolve this trade-off?

We answer this question by applying evolutionary theory, developed to explain reproductive strategies in multicellular organisms, to the life history of malaria parasites. Our experiments – using *P. falciparum* and rodent models – reveal that parasites adjust their reproductive effort according to the dynamics of asexual densities in the host's blood. Specifically, parasites respond with either "terminal investment" or "reproductive restraint" depending on how severely asexual replication is affected. These seemingly contradicting parasite responses are part of one continuous non-linear reproductive strategy, which maximises parasite fitness during the changeable conditions experienced during infections.

Understanding variable reproductive effort in malaria matters because within-host replication is responsible for disease symptoms and between-host transmission determines disease spread. Furthermore, identifying the mechanisms used by parasites to sense and respond to their circumstances could reveal targets to minimise virulence and reduce transmission. We integrate recent progress on the epigenetics of conversion and argue that an evolutionary lens is crucial to interpreting regulatory pathways.

- ・感染予防のため、日頃から、咳エチケットに注意するとともに、手洗いやうがいなどを行ってください。
- ・入室時の手指の消毒にご協力ください。
- ・当日体調のすぐれない方は参加をお控えください。

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