

Is the cercarial emission rhythm of the parasite *Schistosoma mansoni* circadian ?



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1 *Schistosoma mansoni* life cycle

Schistosomiasis is a neglected tropical disease caused by parasitic flatworms (schistosomes) that ranks second behind malaria in terms of human suffering in the tropical and subtropical areas. **The life cycle of *Schistosoma mansoni* includes a vertebrate host (mostly humans and rodents) where sexual reproduction occurs and a snail vector where an asexual multiplication occurs. Transmission from the snail to the human host occurs in fresh waterbodies: hundreds of cercariae (with bifurcated tail) emerge daily from infected snails and these larvae actively seek and penetrate skin of the vertebrate host.**



2 Cercarial emission rhythm

Cercarial emergence from infected snails follows a **daily rhythm matching with the behavior of the targeted vertebrate host**. For instance, *Schistosoma mansoni*, which causes intestinal schistosomiasis, exhibits two different chronotypes: (i) one adapted to the human where cercariae mainly emerge from the infected snail, *Biomphalaria pfeifferi*, with a peak around midday (diurnal chronotype) and (ii) **one adapted to the nocturnal rodent, *Rattus rattus*, where cercariae mainly emerge during the night with a peak at 7 or 8 pm (nocturnal chronotype)** (Mouahid *et al.* 2012 *Trop. Med Int Health* 17, 727-732 (2012)).

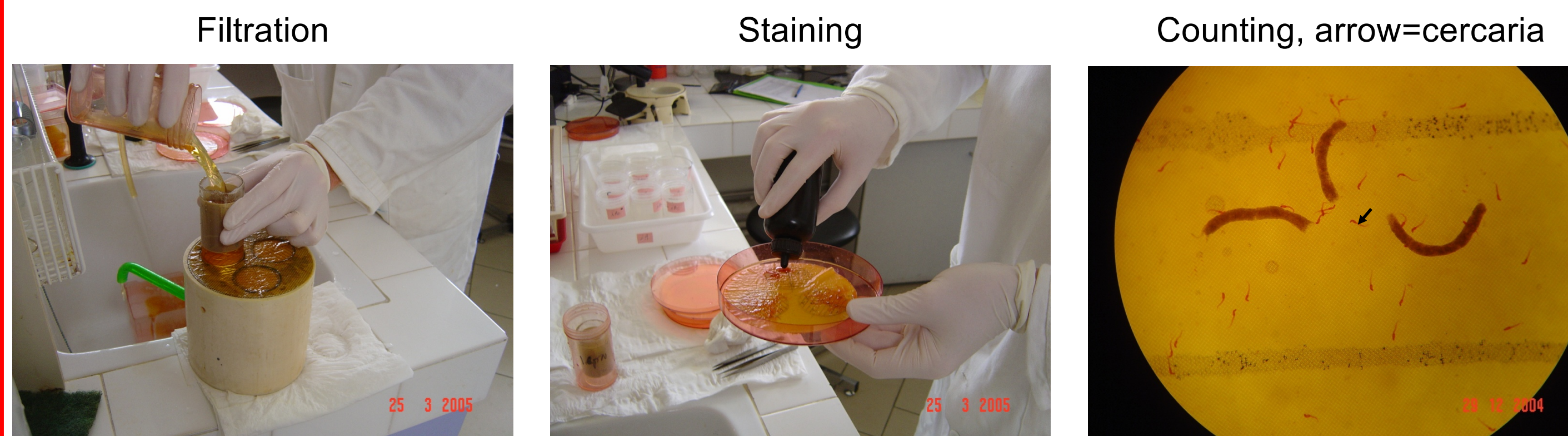
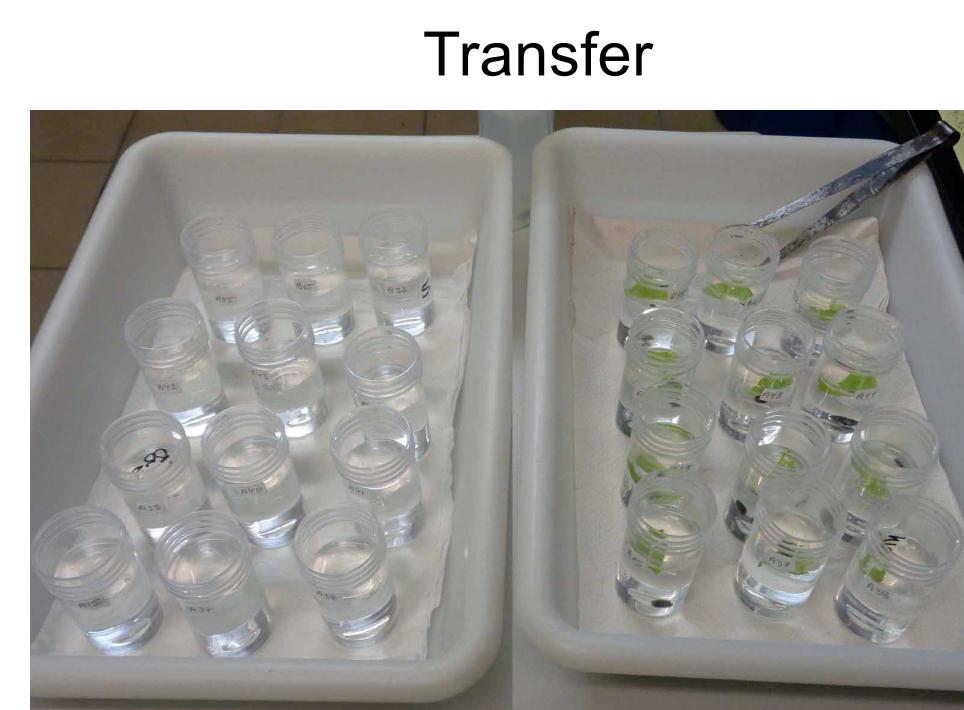


3 AIM

This project was designed to determine if the rhythm of the nocturnal chronotype is, or is not, circadian (i.e.= a rhythm that can persist under constant conditions (Kuhlman *et al.* 2018, *Cold Spring Harb Perspect Biol* 2018; 10:a033613).

4 Chronobiology design

- We infected *Biomphalaria pfeifferi* snails with one miracidium each, using the nocturnal chronotype of *S. mansoni*.
- From an equilibrated 12 hr light 12 hr dark photoperiod, the infected snails were divided into two groups. Two experiments were conducted: (1) constant darkness, (2) photoperiod switch.
- We kept constant temperature (25-26°C) all over the experiment.
- We analyzed the cercarial emergence pattern hourly, **24 hours a day**, during 19 consecutive days. To collect the cercariae, each infected snail was transferred to a new beaker filled with well water; the collected cercariae were filtered, stained and counted under a binocular microscope.



6 CONCLUSION

The cercarial emission rhythm of the nocturnal *S. mansoni* chronotype **DOES NOT** follow a circadian rhythm, suggesting the absence of a canonical internal clock and the presence of an alternative mechanism for timing of cercarial emission.

7 Future plans

- Analyze time keeping in the diurnal chronotype of *S. mansoni*.
- Analyze the intra-molluscan development of the parasites during constant darkness and constant light (histological approach).

5 Cercarial emission results

