

College PhD Studentship in Biology & Psychology

Studentship Number: MBSP/12/07

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Host Department: Department of Biology
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Project Title: Neurochemical and evolutionary bases of infection-induced host behaviour change

Project Description:

Parasites, including those of medical and veterinary importance, can have dramatic impacts on host behaviour. For example, both rats and humans infected with *Toxoplasma gondii* exhibit increased risk-taking behaviour, lower reaction times and bolder personalities, and these behavioural differences have consequences for risk of predation and involvement in traffic accidents respectively. Where parasites are transmitted indirectly between hosts, e.g. through predation or social contact, the possibility arises that they might actively 'manipulate' host behaviour to facilitate transmission. However, experimental tests of this hypothesis are rare, and whether altered host behaviours represent parasite adaptations, or just pathological 'side effects' of infection, is hotly disputed.

This cross-departmental project will investigate the adaptive significance of infection-induced behaviour change, examining both the proximate (neuromodulatory) basis and the ultimate (fitness) consequences of behaviour change in the stickleback-*Schistocephalus* host-parasite system, an experimentally-tractable model for studying the behavioural effects of parasitism, developed to a high level in our lab (see refs below). Through a combination of experimental infection studies and quantitative screening of behavioural change alongside detailed analyses of norepinephrine [NE] and 5-hydroxytryptamine [serotonin, 5-HT] levels in the stickleback brain, the project will investigate how patterns of behaviour, neurotransmitter expression and parasite development co-vary over the post-infection period. Specifically, the project will test the hypothesis that if parasite-induced host behaviour change is a parasite adaptation, *altered neurotransmitter profiles and altered host behaviour should coincide with a dramatic increase in the reproductive potential of the parasite.*

This project is fully funded by the University of Leicester and will provide the student with an excellent training in experimental parasitology and animal behaviour as well as in the quantification of neurotransmitters. Hard-working, independent-minded and enthusiastic students are strongly encouraged to apply.

Selected References

- Macnab V and Barber I (2011) [Some \(worms\) like it hot: fish parasites grow faster in warmer water, and alter host thermal preferences.](#) *Global Change Biology* in press.
- Barber I and Scharfack JP (2010) [The three-spined stickleback - *Schistocephalus solidus* system: an experimental model for investigating host-parasite interactions in fish.](#) *Parasitology* 137, 411-24
- Barber I, Wright HA, Arnott SA and Wootton RJ (2008) [Growth and energetics in the stickleback-*Schistocephalus* host-parasite system: a review of experimental infection studies.](#) *Behaviour* 145, 647-668.
- Barber I, Walker P and Svensson PA (2004). [Behavioural responses to simulated avian predation in female three-spined sticklebacks: the effect of experimental *Schistocephalus solidus* infections.](#) *Behaviour* 141, 1425-1440