JOB DESCRIPTION
Post-Doctoral Research Associate, Lancaster Environment Centre
Vacancy Ref:A3491

<table>
<thead>
<tr>
<th><strong>Job Title:</strong></th>
<th>Post-Doctoral Senior Research Associate/Research Associate (PDRA)</th>
<th><strong>Present Grade:</strong></th>
<th>6/7</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Department/College:</strong></td>
<td>Lancaster Environment Centre</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Directly responsible to:</strong></td>
<td>Prof Kenneth Wilson</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Supervisory responsibility for:</strong></td>
<td>Some supervision of postgraduate students</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Other contacts</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Internal:</strong></td>
<td>Academic staff, PDRAs, support staff and students in LEC</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>External:</strong></td>
<td>Dr Sheena Cotter (University of Lincoln, UK), Prof Tom Anderson (National Oceanography Centre, UK)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**The Role:**
Whilst it is generally accepted that malnutrition (both over- and under-eating specific nutrients) can influence health and wellbeing, the importance of diet in modulating susceptibility to parasites and pathogens is still not well understood. The aim of this project is to address this gap in our understanding using a well-studied insect host-pathogen interaction by dissecting the nutritional budgets of both the host and its pathogens.

The main purpose of this PDRA role is to undertake laboratory studies to help further our understanding of the role of host nutrition on the outcome of interactions between a model insect host (*Spodoptera littoralis*) and several pathogenic bacteria. The work will be based in Prof. Wilson’s laboratory at Lancaster University, UK. It will test novel predictions generated by the Geometric Stoichiometry (GS) framework about how host and pathogen nutritional requirements/constraints determine the outcomes of pathogenic infections, in collaboration with Prof. Anderson, who will lead the modelling component of this project.

The PDRA will work with a dedicated Research Technician (RT) to address three main aims:

1) To quantify host homeostatic relations (intake, growth, excretion, respiration, immune response, etc.) for immune challenged/non-challenged insects fed on one of a series of chemically-defined diets. These data will be used to parameterise GS models for insect metabolic budgets, in conditions of health and disease.

2) To quantify the *in vivo* and *in vitro* homeostatic relations of four bacterial species in the absence of the host using 12 synthetic ‘NutriBloods’. These data will be used to parameterise GS models for bacterial population growth.

3) Using data from 1) and 2), to model the dynamic interaction between the nutritional requirements, and consequences for growth and mortality, of the host and pathogen in combination, and to use experimental infections to test *a priori* 'null' predictions as to the outcome of the host-pathogen interactions across host diets. Discrepancies between the *in vivo* and *in vitro* results will be statistically quantified using generalised additive models.

This multidisciplinary project requires a range of skills (entomology, physiology, microbiology, etc.). We do not envisage candidates having all the required skills and so training will be provided for applicants where necessary.

For background to this project, see the following papers:
- Wilson, K. et al. (2020) Osmolality as a novel mechanism explaining diet effects on the outcome of infection with a blood parasite Current Biology 30: 2459-2467.


Major Duties:

- Conduct *in vitro* and *in vivo* bioassay experiments with bacteria in order to quantify growth rates, energetics and virulence on a range of synthetic diets.

- Handle, weigh and inject larvae with bacteria.

- Conduct life-history analyses, immune function assays and energetics studies of infected and non-infected insects on a range of synthetic diets.

- Perform statistical analyses of the data generated (using the R stats package and others, as appropriate), such as generalised additive models and provide input to the GS modelling of Prof. Anderson.

- Write up work for publication in peer-reviewed journals in a timely manner, and present findings at local, national and international conferences.

- Undertake insect culturing, make artificial diet and media, and other technical duties as and when required.

- Work in a safety conscious manner and maintain Risk Assessment and COSHH forms in collaboration with the PIs and RT.

- Work in a congenial and supportive manner with the dedicated technicians on this and related projects.

- Collaborate with the PIs to ensure the successful outcomes of the project in a timely manner.

- Support the work of PhD and Masters students, as well as visitors.

- Any other duties related to the post as deemed appropriate by the Principal Investigator.