Institute for
Agri-Food Research and Innovation

It is estimated that crop losses due to slug damage would amount to £45million - £100million per annum if pesticides were not used. Metaldehyde is the preferred active ingredient for slug control but its detection, and persistence in water, is a cause for concern by farmers, water companies and pesticide regulators. Metaldehyde is extremely difficult to remove via existing water treatment processes, so it is important to minimise its leaching from agricultural fields into water resources.

Given the national importance of both effective slug control and protection of water resources, this PhD will investigate some key aspects of the environmental fate of molluscicides, the use of this data in risk assessments, and the wider environmental impacts of molluscicide use.

This PhD benefits from being part of a metaldehyde research network overseen by a steering group that includes the Metaldehyde Stewardship Group and the UK water industry research (UKWIR). This close collaboration between university, private sector research institutions, agricultural and water industry stakeholders will maximise the value and real-world application of the research. The outcome of the research is expected to contribute to government policy.

Hypotheses**:**

1) The biodegradation of metaldehyde in UK scenarios is over-estimated by current risk assessment models
2) Volatilisation is a negligible route of exposure to the environment
3) The substitution of metaldehyde with ferric phosphate will not have potential long-term adverse impact on the environment

PhD Outline

The existing literature will be examined to establish the current knowledge base relating to molluscicide use, and environmental fate. It is likely that some relevant data will not be in the public domain, so the student will utilise the network of contacts in the overarching metaldehyde group to a) obtain further data, and b) identify possibilities for working in parallel with and/or building on existing research and so enhance its value for all concerned. This will provide an excellent opportunity to develop contacts amongst a wide range of stakeholders.

Laboratory experiments will be conducted to provide real, measured data for comparison to predicted/modelled data under a variety of scenarios (e.g. temperature, homogeneity) in order to investigate the robustness of models used in the pesticide approval process. The findings will be used

to subsequently investigate the impact of disparities between measured and predicted data on the risk assessment process.

To further support the above work, large-scale lysimeter experiments will be undertaken using the facilities at Newcastle University. This will provide information on the scalability of the degradation data under realistic conditions and highlight any significant differences. The role of soil microbes will also be considered. The use of large-scale lysimeters is important given that all risk assessments are based on the assumption that the laboratory data can be scaled up to the field using models.

If the data collation indicates that there are existing water monitoring networks, we will consider building on this to a) use the existing stream water samplers and b) to look at different flow paths within the environment (e.g. surface runoff vs cracked clay).

Other experimental work will consider the contribution of volatilisation to metaldehyde dynamics and the influence of the formulation of the pellet on leaching of the active ingredient if a novel formulation is developed in the wider metaldehyde project.

The PhD will also consider possible consequences of an increased use of ferric phosphate, using existing literature and identifying data gaps for further research.

All the experimental work will be aligned as closely as possible to the on-going research in other areas of slug-control to maximise the value of the projects.

Training

This PhD will offer a broad range of training providing the student with a robust set of skills that will be attractive to commercial companies, research institutions/universities and/or government agencies/regulators, to include:

- Degradation studies that are commonly used in commercial studies,
- Working in a GLP environment
- Use of lysimeters
- Analytical chemistry (LC-MS)
- Microbial total cell counts and community composition
- Regulatory risk assessment modelling

You must have, or expect to achieve, a first-class or upper-second-class Honours degree in a relevant subject or international equivalent.

The anticipated start is September 2018 with a duration of 3 years; it is preferred that the student is available to attend the Metaldehyde Conference in York on 13th September 2018.

Value of award: 100% tuition fees at UK/EU rate plus an annual stipend of £14,777.

This award is available to **UK/EU candidates only**. If English is not your first language, you must have IELTS 6.5 with at least 5.5 in each component.

The student will largely be based at Fera, York, but is likely to spend at least 6 months at Newcastle University for lysimeter and microbial work.

See: https://www.ncl.ac.uk/iafri/learning/opportunities/project1/ for further details and for application instructions.

Closing date: **Saturday 30th June 2018** (BST)