The impact of food transmitted endocrine disruptors on animal and human health

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Project Description: We are seeking a highly motivated individual to carry out PhD research on the biomedical impact of microplastic pollution in the environment and in the Agrifood sector to determine its effect on human health.

Microplastics are becoming a global problem in providing safe and healthy food for everyone. Microplastics do not biodegrade, and can absorb bioactive chemicals, which enter and persist throughout the food chain. The level of microplastics contamination in the environment has grown exponentially in recent decades, and now it is recognized as a harmful agent, representing a potential yet unexplained risk to human health. Microplastics can carry various contaminants, such as endocrine-disrupting chemicals (EDCs), which interfere with growth, development and reproduction of animals, can alter behaviour and can even interfere with higher level brain functions, such as cognition. While there is evidence for toxic effects of microplastics on animals of aquatic ecosystems, the consequences of microplastic contamination for food safety and human health is unknown. This project will investigate how food-delivered microplastics and their carried bioactive compounds alters biology and health of terrestrial animals in order to determine the underlying molecular mechanisms. The project focuses on determining the impact of microplastics and Endocrine-disrupting chemicals (EDCs) on cognitive and social behaviours as well as longevity by modifying signalling through conserved nuclear hormone receptors (NR), such as estrogen and testosterone receptors. The project will utilize two models: an established mammalian cell culture system to identify cellular targets of the endocrine disruptors and the simple Nematode, *Caenorhabditis elegans* model to obtain insight into whole-animal defects upon exposure, such as behaviour, cognition and aging. Results of this project will be used to gain insight on the impact of microplastics and their contaminants on human health and disease. This study will provide crucial evidence on the level and types of health risks that exposure to microplastic particles could pose and will provide insight into the molecular mechanisms involved.

This project represents a uniquely diverse training opportunity as the successful applicant will experience and learn various complimentary research techniques, will use multiple model systems and be exposed to different research environments by joining on this project led by four research groups (Drs Kevei, Connolly, Vasudevan and Arnott) at two locations (University of Reading and Queen's University Belfast).
Students will use genetic, molecular, cell biology and behavioural techniques in their study. The student will be part of a vibrant endocrine and food science group at the University of Reading and Queens University Belfast, with an opportunity to get training in teaching pedagogy. Apart from benefiting from a highly collaborative scheme, the student will also have an opportunity to network with potential overseas collaborators.

References:

Ogawa, S., Tsukahara, S., Choleris, E. and Vasudevan, N. (2018) Estrogenic regulation of social behavior and sexually dimorphic brain formation. Neuroscience and Biobehavioral Reviews. ISSN 0149-7634 doi: https://doi.org/10.1016/j.neubiorev.2018.10.012

Kevei É, Pokrzywa W, Hoppe T. (2017) Repair or destruction-an intimate liaison between ubiquitin ligases and molecular chaperones in proteostasis. FEBS Lett. 2017 Sep;591(17):2616-2635. doi: 10.1002/1873-3468.12750.

McComb, J., Mills, I., Berntsen, H. F., Ropstad, E., Verhaegen, S., & Connolly, L. (2019). Human-Based Exposure Levels of Perfluoroalkyl Acids May Induce Harmful Effects to Health by Disrupting Major Components of Androgen Receptor Signalling In Vitro. Exposure and Health. https://doi.org/10.1007/s12403-019-00318-8.

Camerlink, I., Turner, S., Farish, M. & Arnott, G., (2019), Advantages of social skills for contest resolution. In : Royal Society Open Science.