

The plastisphere: understanding the role of microplastics as vectors for aquaculturally important pathogens and their impacts on fish welfare

Supervisory team:

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Host institution: Cardiff University

Project description:

Aquaculture is the fastest growing food producing sector, projected to be worth almost £184bn by 2027. Fish provide 3.3 billion humans with over 20% of their average per capita animal protein intake. Two key threats facing aquaculture are pollutants and infectious diseases. One of the most prevalent pollutants faced by managed fish stocks are microplastics. These hyper-prevalent pollutants have been found within all monitored fish and they have the potential to be colonised by aquaculturally important pathogens, contributing to what has been termed the plastisphere. These colonising pathogens, capable of causing mass fish mortalities, can potentially be present at concentrations that are several orders of magnitude higher on microplastic surfaces, compared with naturally occurring cellulose-based material and this may have important implications for infectivity and future stock management.

This project will utilise bacterial and oomycete culturing techniques and cutting-edge microscopy and spectroscopy to understand and assess the relationship between various plastic surfaces (petrochemical and biobased polymers as well as degradation products), natural cellulose-based surfaces and aquaculturally important pathogens. The student will use established bioassays already available at Cardiff University to investigate the infectivity of these bacterial and oomycete pathogens when they successfully colonise various plastic surfaces. Importantly, we will test how bioplastics, which are poised as a sustainable alternative to traditional petrochemical plastics, compare in relation to their affinity to vector pathogens and how this translates to functional effects on fish welfare. Lastly, we will assess any transcriptional changes that occur in fish that are exposed to these pollutants with and without pathogens. Thus, this studentship will employ an interdisciplinary approach to understand the plastisphere and how it impacts pathogen infectivity and aquaculture fish welfare.

The student will have a biologically related degree, ideally a Masters, and molecular biology and or analytical chemistry experience. Based in the Schools of Biosciences and Chemistry at Cardiff University, the student will work with a range of industrial collaborators and be supported by a strong supervisory team.

Our aim as the SWBio DTP is to support students from a range of backgrounds and circumstances. Where needed, we will work with you to take into consideration reasonable project adaptations (for example to support caring responsibilities, disabilities, other significant personal circumstances) as well as flexible working and part-time study requests, to enable greater access to a PhD. All our supervisors support us with this aim, so please feel comfortable in discussing further with the listed PhD project supervisor to see what is feasible.