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METALGAE project: Physiology and molecular biology of microalgae for bio-refining valuable metabolites.

Microalgae biomass has been utilised as human dietary supplements, in animal feed and aquaculture for centuries. The biodiversity of these single celled photosynthetic organisms, together with their potential for mass cultivation in closed-system photobioreactors, have fostered the rapid development of their application for the production of high-value biotechnological products and services. These include, for example, the environmental remediation of waste streams for the sustainable production of triacylglycerides for the biodiesel industry or the bio-refinery of a wide variety of high-value products including; functional foods (polyunsaturated fatty acids, antioxidants, vitamins, proteins & food dyes) and biopharmaceuticals (antibiotics & novel anticancer drugs).

The aim of my research is to:

1. Undertake the bio-prospecting of water bodies of the West coast of Ireland to isolate and culture native Irish microalgae species.
2. Investigate their physiology and secondary metabolite production under a range of stress conditions in order to select a candidate strain with optimal biochemical profile.
3. Apply cutting-edge proteomics techniques on a candidate strain to determine pathways and regulatory controls involved in the synthesis of high-value metabolites.
4. Operate a pilot photobioreactor to assess the commercial potential of the candidate strain for the production of metabolites of interest (pigments, antimicrobials, polyunsaturated fatty acids and antioxidants).