SeaHealth

Seaweed as a source of novel bioactives for gut and metabolic health

Hypertension, type-2-diabetes, and obesity are global metabolic health burdens. These metabolic disorders are associated with dysbiosis of the gut microbiota – an imbalance or decreased diversity of beneficial versus harmful bacterial species. The gut microbiota is regarded as an endocrine organ that exerts an effect on immunity, metabolism, neuroendocrine responses, and synthesises short-chain fatty acids, which have multiple important biological functions. Seaweed is a sustainable source of novel bioactive compounds with potential to treat metabolic disorders and dysbiosis; however, there is limited published data on the impact of seaweed extracts on gut health and the effect of food processing on their bioactivity. This project will screen seaweed extracts for their impact on biomarkers of metabolic health *in vitro*; assess their potential as prebiotics for gut bacteria; and develop extracts with bioactivity into functional foods. Food-grade enzymes and solvents will be used to extract polysaccharides, peptides and polyphenols from a range of red, green and brown Irish and Australian seaweeds. *In vitro* assays will measure their ability to inhibit angiotensin-1-converting enzyme to lower blood pressure, α-amylase to improve glycaemic control, lipase to reduce dietary fat absorption, and antioxidant capacity to inhibit free radical damage. IC_{50} values will be compared to pharmaceutical inhibitors. Protein, fibre, lipids and minerals will be quantified. Physical characterisation of extracts will include viscosity, solubility, interactions with other ingredients, and stability during storage. The impact of seaweed extracts on gut health will be evaluated by simulated *in vitro* gastrointestinal enzymatic digestion and colonic fermentation with human faecal innocula. Gas chromatography will quantify short-chain fatty acid production by gut bacteria, while the abundance and diversity of bacterial populations will be assessed by 16s rRNA sequencing. Extracts that exhibit bioactivity will be characterised by LC-MS and NMR, and developed into functional foods with enhanced nutritional profiles while maintaining sensory acceptability.

Project Duration: 36 months (18M CSIRO + 6M CyberColloids + 12M Teagasc)

Collaborating Institutions: Teagasc Ashtown Food Research Centre, Ireland
CSIRO, Australia
CyberColloids, Ireland

Project Team:

RL2025 Fellow	Teagasc Supervisor	Outgoing Phase Supervisor	Secondment Supervisor
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