# FOOD AND FUEL MICROALGAE APPLICATIONS – INSIGHTS FROM PORTUGUESE EXPERIENCE

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Microalgae have a wide range of application fields, from food to fuels, to pharmaceuticals & fine chemicals, aquaculture and environmental bioremediation, among others. *Spirulina* and *Chlorella* have been used as food sources since ancient times, due to their high and balanced nutritional value. Our research group in Lisbon has developed a range of food products (emulsions, gelled desserts, biscuits and pastas) enriched with freshwater and marine microalgae (*Spirulina*, *Chlorella*, *Haematococcus*, *Isochrysis* and *Diacronema*). The developed products presented attractive and stable colours, high resistance to oxidation and enhanced rheological properties. Some of these products will be prepared at the Post-Congress Course *"Functional Foods Development"* at the University of Antofagasta. More recently, a great interest has arisen on using microalgae for biofuel production. The same group has also been exploring several marine and freshwater species for biofuel production (e.g., biodiesel, bioethanol, biohydrogen and biomethane) within a biorefinery approach, in order to obtain high and low-value co-products using integral biomass maximizing the energy revenue. Namely, supercritical fluid extraction of *Nannochloropsis* sp. allowed the recovery of valuable carotenoids and lipids, prior to bio$H_2$ production through dark fermentation of the residual biomass. Also, *Scenedesmus obliquus* residues after sugars (for bioethanol) and lipids (for biodiesel) extraction has been anaerobically digested attaining high biomethane yields. Regarding sustainability issues, the current trend of our group is now focused on using liquid effluents and high $CO_2$ levels for low cost microalgae growth, contributing to a lower water demand, primary energy consumption and global warming potential by reducing the need for potable water and fertilizers (P, N) and increasing $CO_2$ mitigation. Microalgae biomass has been successfully used for urban wastewater treatment with subsequent bio$H_2$ production, in a biorefinery approach. Presently, ammonium-rich raw effluents from piggeries and poultry industry are being effectively used for microalgae growth avoiding any pre-treatment step.

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