



Issue 34: July, 2020: This e-bulletin is aimed at personnel in fisheries and aquaculture, at fish packers, processors, distributors, retailers and finally, consumers.

Algae:-an old food with new horizons

The use of seaweed as food in Ireland is well documented on the Seaweed Site (http://www.seaweed.ie/uses_ireland/irishseaweedfood.php). Algae have been consumed in Ireland for centuries by coastal communities but nowadays algae are often referred to by the more up-market name 'sea vegetables' and innovative start-up Irish companies are actively engaging in the area (<https://thisisseaweed.com/>). A recent newspaper article referred to seaweed as Ireland's great untapped resource yet to be embraced (Irish Times, March 11, 2018). While algae as a food or an ingredient in cooking is being increasingly promoted by celebrity chefs the newest horizons relate to algae as a source of bioactives. For example, a recent review by Bermano *et al.* (2020) focused on seaweed bioactives as potential energy regulators in obesity and Type-2 diabetes. A related study was conducted in University College Dublin (UCD) in 2019/2020 on the glucose control and antioxidant potential of powders prepared from two brown algae. The study was carried out by Mary Sexton (4th year food science research project) in cooperation with Dr Heleena Moni Bottu, Professor Lorraine Brennan and Professor Ronan Gormley of the UCD Institute of Food and Health. The outcomes are presented below.

Test samples

Commercially dried samples (whole powders circa 12% moisture) of *Alaria esculenta* and *Ascophyllum nodosum* were supplied by Paul O'Connor of 'This is Seaweed LTD' (NovaUCD) and were tested 'as is' and also as alcohol-insoluble-solids (AIS) powders. AIS are the fraction of finely blended (pureed) algae (250g lots) insoluble in boiling 80% aqueous ethanol (see *PlantFoods-ucd*, Issue 4). AIS powders comprise dietary fibre, protein, minerals, insoluble carbohydrate and small amounts of other compounds. Many solubles such as simple sugars are washed out in the aqueous ethanol. A study by Mayne *et al.* (1982) showed that apple AIS had a positive effect on Type-2 diabetes control in a clinical trial with 12 volunteers and hence the current interest in algal AIS. The % composition of the algal AIS (*Alaria/Ascophyllum*) was: moisture (0.92/2.57), carbohydrate (58.4/64.0), protein (14.1/9.8), oil (0.12/0.57) and ash (26.4/23.1). The high ash content (mostly minerals) was expected as algae are noted for their high ash content. The 'process losses' in converting from whole powder to AIS powder were 26.2/18.3% for *Alaria/Ascophyllum* indicating a significant removal of soluble materials. The proximate analysis carbohydrate fraction above is a 'catch all' fraction and contains a large amount of dietary fibre; Jiménez-Escrig &

Sánchez-Muniz (2000) have shown dietary fibre contents of different algal species ranging 35 to 75% on a dry weight basis.

Effect of algal powders on rat pancreatic beta cell insulin secretion

The insulin secretion potential of the algal powders was tested using BRIN BD11 pancreatic β -cell lines (Drummond *et al.*, 2018; see also *PlantFoods-ucd*, Issue 4) and control solutions of (i) 16.7mM glucose and (ii) 16.7mM glucose plus 10mM alanine (well-known insulin stimulator) were used. Insulin secretion values (ng/mg protein in 20min) for the controls were 12 and 31 respectively. Corresponding values for algal AIS/whole powder were 49.9/24.4 (*Ascophyllum*) and 13.5/9.5 (*Alaria*). This suggests that *Ascophyllum* AIS has potential for aiding glucose control through stimulation of insulin secretion in BRIN BD11 pancreatic β -cell lines and so may have application for controlling Type-2 diabetes. However, further studies are needed to examine the effects *in-vivo*.

Antioxidant status of algal powders

A DPPH (2,2-diphenyl-1-picrylhydrazyl) assay was used to test free radical scavenging activity (FRSC) of the algal powders (see *PlantFoods-ucd*, Issue 7). Aqueous ascorbic acid (1mg/ml) was used as the standard antioxidant and results are expressed as % free radicals scavenged. FRSC values (%) for algal AIS/whole powders were 35.5/66.1 (*Ascophyllum*) and 8.2/10.3 (*Alaria*). These data contrast with those for insulin secretion in that AIS powders proved best for insulin secretion whereas whole algal powders had the best antioxidant activity. On the basis of these results *Ascophyllum* whole powder could be classed as an antioxidant dietary fibre and could have potential as a food ingredient and/or a pharma product.

Conclusions: The data show that *Ascophyllum* powders outperformed *Alaria* powders for both insulin release and antioxidant potential. Extensive further research is needed on the compounds responsible for the effects.

References

- Bermano, G., Stoyanova, T., Hennequart, F. & Wainwright, C.L. 2020. Seaweed-derived bioactives as potential energy regulators in obesity and Type-2 diabetes. *Advances in Pharmacology*, 87, 207-248
- Drummond, E. & 15 co-authors. 2018. Casein hydrolysate with glycaemic control properties: Evidence from cells, animal models & humans. *J. Agriculture & Food Chemistry*, 66, 4352-4363.
- Jiménez-Escrig, A. & Sánchez-Muniz, F.J. 2000. Dietary fibre from edible seaweeds: chemical structure, physiological properties & effects on cholesterol metabolism. *Nutrition Research*, 20, 585-598.
- Mayne, P.D. & 5 co-authors. 1982. The effect of apple fibre on diabetic control & plasma lipids. *Irish Journal of Medical Science*, 151, 36-41.

The previous 33 issues of *Seahealth-ucd* can be viewed at:
<https://www.ucd.ie/foodandhealth/newsandevents/seahealthucd/>



Compiled by Professor Ronan Gormley (UCD Institute of Food and Health, School of Agriculture & Food Science, Belfield, Dublin 4). More information from ronan.gormley@ucd.ie **DISCLAIMER:** While every care has been taken in ensuring the accuracy of the material presented, no liability as to its use or interpretation is accepted by the author or by UCD.