

# Introduction to CyberColloids Seaweed Research

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- CyberColloids been working with seaweed derived ingredients for many years.
- As experts in the hydrocolloids world – routinely working with agar, carrageenan and alginate.
- Combined experience spans the entire value chain from raw material to end use.
- Hydrocolloids industry traditionally wasteful - based on mass extraction of one component.
- We realise that seaweeds have far more to offer than just the hydrocolloid components.
- In 2005 started to look at seaweeds differently.



- Through Irish national funding and EU funded FP7 projects we have built a knowledge platform on:
  - nutritional benefits of edible seaweeds;
  - bioactives from edible seaweeds;
  - different processing approaches;
  - market for seaweed derived functional foods;
  - application in food and drink products.
- Overall aims to:
  - maximise the use of the whole biomass;
  - multi-stream processing;
  - improved palatability/inclusion for ingredient development.



- Early projects focussed on developing a better understanding of the potential use of seaweed ingredients for health & nutrition.
- In particular issues re. use of edible seaweeds & seaweed derived ingredients :
  - industry & consumer perception;
  - fundamental requirement of palatability (taste);
  - how processing can affect/modify palatability;
  - commercially sustainable sources;
  - regulatory restrictions re. processing – use of kitchen science and approved food use processes.



- InterTrade Ireland funded project (2005/7): investigating the nutritional potential of edible seaweeds for the development of ingredients for functional foods. For more detail see: MacArtain et al. (2007) DOI: 10.1301/nr.2007.dee.535-543 and [www.intertradeireland.com/innovate/casestudies/name,711,en.html](http://www.intertradeireland.com/innovate/casestudies/name,711,en.html).
- Irish Marine Institute Industry Led Award (2008/9): investigating the flavouring and taste components of Irish seaweeds for use in reduced salt products. For more detail see: <http://www.cybercolloids.net/news/seaweed-flavour-report>.
- InterTrade Ireland funded project (2010/11): developing extraction and characterisation techniques for the production of seaweed extracts with anti-cancer potential. For more detail see: Murphy, C., Hotchkiss, S., Worthington, J. & McKeown, S. (2014). The potential of seaweed as a source of drugs for use in cancer chemotherapy. *Journal of Applied Phycology*, February 2014. 10.1007/s10811-014-0245-2.



## HYFFI Project (2008-2011):

- To produce a range of LMW alginates and agars through controlled depolymerisation.
- To assess and compare the prebiotic potential of these substrates with Inulin – the standard industry prebiotic.

## Key findings:

- No evidence for prebiotic potential *in vivo*.
- Prebiotic potential of LMW *Gelidium* – *in vitro*.
- Increases in SCFA production *in vitro* & *in vivo* – evidence that seaweed derived fibres being fermented.
- LMW alginate had significant effect on post-prandial glucose response.



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## SWAFAX Project (2010-2013):

- Investigated the antioxidant and anti-inflammatory potential of phlorotannin rich extracts from *Ascophyllum nodosum*.

### Key objectives:

- to develop methodologies for phlorotannin rich extracts from *Ascophyllum nodosum*;
- to screen these *in vitro* for potential antioxidant and anti-inflammatory benefits;
- to evaluate the bioavailability of the phlorotannins *in vivo*;
- to evaluate antioxidant & anti-inflammatory biological activity *in vivo*.



## Key findings *in vivo* bioavailability study\*

- A variety of metabolites were detected in the urine and plasma of 15/24 human volunteers after the ingestion of a seaweed.
- First evidence that seaweed derived polyphenols actually metabolised.
- Some metabolism at 0-8hr after ingestion but most at 8-24hr.

## Key findings *in vivo* intervention study\*\*

- No significant changes in any of the parameters for the study population as a whole – not really surprising.
- Subset of subjects who were obese (n=36/80) a number of significant differences in antioxidant status after an 8 week intervention.
  - differences in peroxide levels; reduction in basal DNA damage
  - 28% reduction in the acute inflammatory marker CRP – n.s.

## The TASTE project (2012-2014):

- Aim to develop new healthy flavour ingredients from edible seaweeds with the potential to replace sodium in food products that traditionally contain high levels of NaCl.
- Focussing on 3 commercial viable species:
  - *Ascophyllum nodosum*;
  - *Fucus vesiculosus*;
  - *Saccharina latissima*.
- Using a combination of physical & enzymatic processing to “unlock” the important flavour components.
  - physical pre-processing to open up seaweed structure;
  - enzymatic hydrolysis using commercially available enzymes and seaweed specific enzymes from partner Prokazyme.



- Wanted to explore use of whole seaweed;
  - issues with colour, odour and taste;
  - non-specificity of commercial enzymes limited the release of taste enhancing compounds;
  - protein rich extracts – better results but not cost attractive - NaCl extremely cheap ingredient.
- Novel enzyme combination successful.
  - for use on whole seaweed;
  - no odour issues, umami like taste with mouthfeel;
  - limited sensory evaluation;
  - definitely a longer-term commercial opportunity.



## The SEAREFINERY project:

- Started November 2015 for 3 years.
- Aims is to develop eco-friendly chemical and enzymatic processing technologies to extract and valorise high value-added components such as antioxidants, antimicrobial components and hydrocolloids from cultivated seaweed species in an integrated biorefinery.
- Utilising cultivated brown seaweed species:
  - *Saccharina latissima*;
  - *Alaria esculenta*.
- CyberColloids responsible for developing and optimising extraction protocols for various polysaccharides and antioxidants.



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For more information about our research activities see -  
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