Proceedings of the Nutrition Society (2011), **70 (OCE3)**, E77 doi:10.1017/S0029665111001170

Joint Irish Section and American Society for Nutrition Meeting, 15–17 June 2011, 70th anniversary: 'Vitamins in early development and healthy ageing: impact on infectious and chronic disease'

The influence of the extraction method on the DNA protective effects of seaweed extracts in Caco-2 cells

A. M. O'Sullivan[1], Y. C. O'Callaghan[1], M. N. O'Grady[1], M. Hayes[2], J. P. Kerry[1] and N. M. O'Brien[1]
[1]*School of Food and Nutritional Sciences, University College Cork and* [2]*Teagasc Ashtown Food Research Centre, Ashtown, Ireland*

Brown seaweeds contain a variety of compounds such as phlorotannins, carotenoids, vitamins, phospholipids and peptides that may benefit human health(1). The extraction method and type of solvent used influences the nature of compounds extracted from seaweeds(2). The solvents in the present study (water, ethanol and methanol) are of a polar nature and extract a range of hydrophilic compounds including the phlorotannins.

The objective of the present study was to determine the potential protective effect of extracts obtained from *Ascophyllum nodosum* (AN) and *Fucus serratus* (FS) against hydrogen peroxide (H_2O_2) and tert-butylhydroperoxide (tert-BOOH)-induced DNA damage in Caco-2 cells. Compounds were extracted using 100% H_2O, 60% ethanol (EtOH) or 60% methanol (MeOH). Caco-2 cells were pre-treated with each seaweed extract for 24 h followed by exposure to either 50 μM H_2O_2 or 200 μM tert-BOOH for 30 min. DNA damage was assessed by the comet assay.

	tert-BOOH (% tail DNA)		H_2O_2 (% tail DNA)	
	Mean	SE	Mean	SE
Control	10.0	2.0	10.0	2.0
Positive control	30.0	3.5	55.0	3.0
AN (100% H_2O)	20.5	2.0	35.0#	6.0
AN (60% EtOH)	18.5#	1.0	46.0	3.0
AN (60% MeOH)	30.5	1.5	61.0	1.0
FS (100% H_2O)	17.5†	1.5	47.0	5.5
FS (60% EtOH)	21.5	2.5	48.0	2.0
FS (60% MeOH)	26.0	1.5	45.0	5.5

#Denotes significant protection ($P<0.05$) compared to oxidant control. †Denotes significant protection ($P<0.01$) compared to oxidant control. N 4 individual experiments. Statistical analysis was by ANOVA followed by the Dunnett's test.

The addition of 50 μM H_2O_2 and 200 μM tert-BOOH increased the DNA damage in Caco-2 cells to 55 and 30%, respectively. Preincubation of Caco-2 cells with AN (60% EtOH) and FS (100% H_2O) extracts offered significant protection against tert-BOOH-induced DNA damage. Only the AN (100% H_2O) extract significantly reduced H_2O_2-induced DNA damage. The MeOH extracts of AN and FS did not protect against either H_2O_2 or tert-BOOH-induced DNA damage. The DNA protective effects of the seaweeds may indicate their potential use in the pharmaceutical and functional food industry. The presence of hydrophilic polysaccharide compounds may account for the antioxidant ability of the 100% H_2O extracts, whereas the antioxidant behaviour of the aqueous ethanol extracts may be due to the presence of a mixture of polar and less polar compounds.

Funding for this research was provided under NutraMara. The Marine Functional Foods Research Initiative (NutraMara project) is a programme for marine-based functional food development established by the Marine Institute and the Department of Agriculture, Fisheries and Food (DAFF). It is supported by funds provided under the Strategy for Science, Technology and Innovation 2006–2013 (SSTI) and the Food Institutional Research Measure (FIRM), to establish a Marine Functional Foods Research Programme.

1. Shahidi F (2009) *Trends Food Sci Tech* **20**, 376–387.
2. Shanab SMM (2007) *IJAB* **9**, 220–225.