

# Seaweed in Weight Regulation and Nutrition

by Simon Ranger

**2012 saw the publication of some independent, ground-breaking peer-reviewed research conducted by the Centre for Food Innovation at Sheffield Hallam University.**

It was the first time that the efficacy of whole food seaweed had been scientifically tested as potentially useful in the treatment of obesity.

A teaspoon of Seagreens® human food quality™ seaweed was fed to a group of overweight but otherwise healthy men, as an ingredient in an otherwise normal breakfast of toast and scrambled eggs.

After eating the breakfast, the men who ate the seaweed consumed an average 179 less calories per day than the control group (1) - significant, because a daily reduction of 100 calories is already known to be sufficient to prevent weight gain (2).

The trial subjects had no idea that the bread they were eating contained Seagreens. The Seagreens bread and the control bread were thoroughly tested for taste acceptability prior to this single blind crossover trial.

In subsequent months, Seagreens® human food quality™ seaweed became the most searched-for ingredient on



Innovadex, the world's leading food and health sciences internet resource. "Seaweed toast is same as half an hour on treadmill", said the Daily Telegraph (3).

Now, Seagreens seaweed ingredients are finding their way into many food products, from bread and other baked goods (4) to ready meals - including the world's first nutritionally balanced pizza (5), free from and dietetic foods as well as superfood and therapeutic formulations.

The relevance of this is that it may not be necessary to deliver 'weight regulation' in a single product or meal, but through the ingredients across a range of perfectly ordinary 'mainstream' foods, likely to be ingested in a normal, average daily diet.

## The broader interest for weight management

Seagreen's most obvious benefit in obesity may be only one factor in its longer term use in weight management. A broader range of issues promises to sustain interest in this preliminary study.

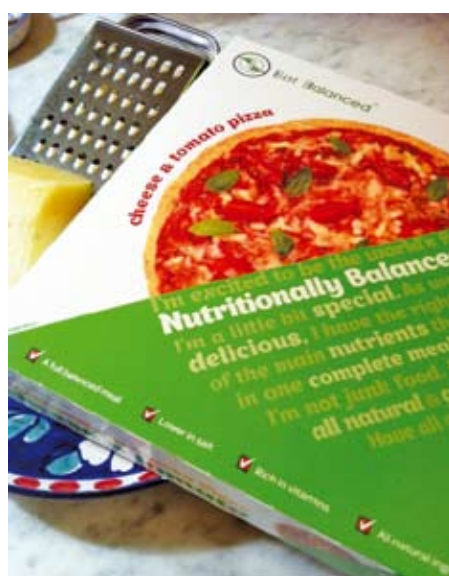
Seagreens are high in specific phenols,

which naturally inhibit the carbohydrate digesting enzymes  $\alpha$ -amylase and  $\alpha$ -glucosidase, and therefore slow the release of sugar into the blood, effectively making us feel fuller for longer. This is similar to the effect of eating lower GI (Glycemic Index) foods (36).

Between 2007 and 2010, a different health focus also being pursued by Sheffield researchers, demonstrated that whole food Seagreens can be used as a salt replacement in manufactured foods. They showed that there is no loss in flavour or shelf life, the two primary reasons why there is an unhealthy excess of salt, especially in our daily bread.

The amount of seaweed used in this study ranged from partial replacement of salt, up to 100%. Replacing 100% of the salt in a typical loaf of bread, equates to the same concentrated level of seaweed used in the obesity research.

Whilst salt in its cheapest chemical form as sodium chloride, is commonly an ingredient in a very wide variety of foods (about 75% of salt intake is from processed foods), industrial scale bread production alone is responsible for most of the excess salt in the average daily diet (6).



Even replacing 50% of this salt would be likely to have the same satiety effect as achieved in the Sheffield study, researchers believe.

In 2012 the BBC warned that “the salt intake in some bread is so high it is killing 7,000 people a year” (37).

For its work on salt replacement, in 2012 Seagreens was among the top ten research innovations of the previous 5 years at British Universities and featured in ‘Big Ideas for the Future’ published by the UK Research Councils. The Daily Telegraph described it as “a life changing idea” (7).

## Nutritional benefit in our daily food

Reducing the amount of salt in foods with Seagreens has the corresponding benefit of increasing the amount and balance of virtually all the nutrients (see nutritional table below) including a number which may have particular value in obesity because it is a multifactorial disease (8).

This is of special importance in weight management because many weight loss diets and therapies restrict the dietary intake of nutrients.



Nature's vegetable garden beneath the waves  
- Seagreens wrack species in the Scottish Outer Hebrides

In the case of ‘special diets’ - those which seek to reduce or eliminate certain foods to which a patient may be allergic or intolerant - the problem is equally exacerbated.

The loss of these foods often removes valuable nutrients like vitamin E with all its isomers, normally found in wheatgerm; or

vitamin B12, normally obtained from meat and dairy products (9).

Not only do Seagreens contain all these nutrients; they are certified vegetarian, nonallergenic, Kosher for Passover and Organic throughout Europe and the United States.

Some of the seaweed nutrients may specifically bind and remove toxic waste which is stored in fat and released during fat reduction (10); others may be relevant due to the increased risk of type 2 diabetes mellitus, hypertension (11), general cardiovascular disease, certain cancers (12) and poor psycho-social well-being (13).

In obesity there is often inflammation and an acidic system. The wild wrack seaweed harvested by Seagreens is a natural anti-inflammatory, and it is some 7 times more alkalizing than apples! With a pH between 8 and 10, it is one of the most alkalizing of all foods.

Overall, certain seaweeds are an unparalleled source of organic minerals and trace elements - in fact all the naturally occurring micronutrients which are often depleted in our soils and deficient in manufactured foods.

**“ I am particularly pleased with the taste of the Seagreens® range. Many patients are on restricted diets, and often complain that the food is ‘bland’ and lacking flavour. By using the Seagreens® condiments they still enjoy a flavoursome diet. The iodine is also a useful ingredient for those patients with an underactive thyroid who are looking for a natural approach”**

- Helen Heap, Nutritionist, Women's Nutritional Advisory Service, England, 1999

**“ If my patients are taking Seagreens® they are getting the nutrients they might have been getting in their normal food 50 years ago, such as the trace minerals, and that makes a huge difference. It also works brilliantly**

**on weight loss, in conjunction with a properly controlled diet, especially when the additional pounds round the midriff result from excess cortisol”**

- Anne Gardner, Nutritionist, Middlesex, 2006

**“ Having a good diet and making sure that you are not deficient in certain nutrients can make the difference between having a difficult or easy menopause. Using seaweeds at this stage in your life can be beneficial as they will contain good levels of trace minerals such as zinc, manganese, chromium and selenium and the macro minerals calcium, magnesium, iron and iodine”**

- Dr Marilyn Glenville, Nutritionist, Tunbridge Wells, 2010

**“ Most enzymes in the body require minerals as co-factors, so ensuring optimum mineral levels is vital for optimum metabolism. Even more important is the electrical potential across the cell membrane, which is only maintained when sodium and potassium are at optimum levels and ratios. Nutrients and oxygen can then enter the cell and waste products can leave. This allows the body to rid itself of the toxins it is storing in fat, eliminate extra water and increase the rate of all the metabolic processes. For someone whose body has been functioning in sluggishly, they suddenly start feeling vital and motivated. It will positively affect their lifestyle choices such as food and exercise. So there are huge benefits from optimum mineral balance”**

- Dr Jane Jamieson, Naturopath, Edinburgh, 2012

An annual analysis of 72 foods between 1940 and 2002 shows an average loss of 19% magnesium, 29% calcium, 37% iron, and 62% copper. Over a similar post-War period saturated fat in beef and chicken has risen more than 400%, whilst essential omega-3 fats critical to nervous, immune, cardiovascular, respiratory, digestive and eliminatory systems have declined in the same proportion (14).

Not only is Seagreens the most comprehensive source of minerals and trace elements, but across the nutritional spectrum it compares favourably to the most nutrient dense species of any fruit or vegetable. For example, Seagreens in a loaf of bread has approximately the same amount of vitamin B2 as 100g of blackberries or broccoli (15).

Wild harvested Seagreens can thus be described as an ideal modern dietary ingredient: an organic, nutrient-rich, high fibre, low energy whole food - exactly what is needed to compensate for declining levels of physical activity among most of the population.

## What is a significant amount of seaweed for daily use?

The level of seaweed used in the obesity study, and in the earlier salt replacement research, corresponds closely to the level of excess salt in the so-called Western diet.

This is important, because salt is found predominantly in manufactured foods - precisely the kinds of foods associated with the rise of obesity throughout the Western world.

22.6% of 4-5 year olds are already overweight or obese when they enter primary school. That is one in five children. In the final year, 33.9% of 10-11 year olds are in the same condition, which is up 33% on 2011. That's one in three children overweight or obese by the time they leave primary school (28). And each and every week, who buys what kinds of foods, mainly at their local supermarket? The same statistics are unequivocal - twice as high in the poorest areas as in the richest.

Another 2012 study of 700 teenage girls, by none less than the prestigious Society for Endocrinology, found that

two-thirds were iodine deficient. The Society says that: "endocrinologists, often by default, play the leading role in the management of obesity and related diseases, but there is a need to develop a more co-ordinated strategy to support training, research and provision of specialist clinical services (and communication and interaction) with stakeholders in related disciplines (such as Diabetes)".

The daily population intake of salt is calculated to be in the region of 9 grams with many people eating far more than this. The British government target, and the target set by WASH (16), is 6 grams per day - a 66% reduction in our daily intake of salt.

A 66% reduction in salt corresponds to approximately 4.5 grams, which is almost exactly the amount of seaweed used in the obesity trial, and in the 100% replacement of salt in bread (4 grams). And this corresponds rather precisely to the 4.6 grams of wild seaweed used in the traditional Japanese diet, at least until the mid-1960s when the last statistics were recorded there (17).

Finally, this is also the level at which nutritionists, naturopathic health practitioners and doctors in the UK and USA have quite independently found Seagreens to become therapeutic in many health conditions.

It would seem that after hundreds of years of use the Japanese instinctively arrived at some kind of optimum level of dietary seaweed. Still today, a little seaweed turns up at most meals in traditional Japanese homes.

I knew nothing of Japan or its seaweed tradition before my first visit there in 2007, yet my instinct too, and hence Seagreens founding product mission in 1998, was "to make it easy to get a gram a day of the best seaweed into our daily diet" (18).

## The seaweed option in obesity

The reader may find it strange that this is the first time that whole food seaweed has been studied in obesity, whilst alginates extracted from seaweed are already used in many weight loss products (19).

Only recently, two phenomena have combined to make this possible. First, it was not until the last decade

## Summarised typical nutritional values per gram Seagreens Food Capsules and Granules

<http://www.seagreens.co.uk/University/NutritionalProfileOfSeagreens.aspx>

**Protein** : 50mg

**Carbohydrate / Fibre** : 550mg of which Dietary Fibre 500mg (including the non-starch polysaccharides Algin, Fucose, Fucoidan, Mannitol, Methylpentosans, Laminarin, Mannuronic Acid and Chlorophyll

**Enzymes (units per gram)** : Lipase 254 (pH 7.4), Carbohydrase 53.75 (pH 8.0), Protease 653.50 (pH 7.4)

**Essential Fatty Acids (EFA)** : Total EPA + DHA Omega-3 1.43mg, Omega-3 3.43mg, Omega-6 9.50mg, Omega-9 16.30mg, Alpha-linolenic Acid 1.143mg, Eicosapentenoic Acid 1.42mg

**Vitamins** : A (antioxidant carotenoids including beta carotene, fucoxanthin and violaxanthin) 178µg, B1 (thiamin) 0.62µg, B2 (riboflavin) 0.15µg, B3 (niacin or vit PP) 104.13µg, B9 (folate) 0.554µg, B12 (cobalamin) 0.0014µg, C (antioxidant) 66.35µg, D (cholecalciferol) 0.01µg, E (antioxidant) 62.15µg, H (biotin) 0.30µg, K (menadione) 10µg

**Minerals** : Calcium 12.33mg, Magnesium 8.03mg, Nitrogen 8.10mg, Phosphorus 1.58mg, Potassium 19.35mg, Sodium 34.8mg, Sulphur 23.38mg

**Trace Elements** : Antimony 0.05µg, Barium 6.48µg, Boron 87.71µg, Cerium 0.27µg, Cobalt 0.47µg, Copper 0.75µg, Germanium 0.07µg, Gold 0.05µg, Iodine 390µg, Iridium trace, Iron 139µg, Lanthanum 0.06µg, Lithium 0.33µg, Manganese 44.9µg, Molybdenum 0.54µg, Palladium 0.76µg, Platinum trace, Praseodymium 0.013µg, Rhemium 0.1µg, Rubidium 6.79µg, Ruthenium 0.004µg, Scandium trace, Selenium 0.04µg, Silicon 63.34µg, Silver 0.064µg, Thallium 0.006µg, Tellurium trace, Titanium 2.15µg, Vanadium 1.79µg, Zinc 70.84µg. A total of 67 mineral elements have been analysed in all Seagreens human food species

**Amino Acids** : Alanine 2.15mg, Arginine 2.88mg, Aspartic acid 7.53mg, Cystein +Cystine 0.83mg, Glutamic acid 5.35mg, Glycine 3.69mg, Histidine 0.53mg, Isoleucine 1.323mg, Leucine 4.74mg, Lysine 1.60mg, Methionine 0.88mg, Phenylalanine 1.36mg, Proline 1.83mg, Serine 1.52mg, Threonine 1.53mg, Tryptophan 0.54mg, Tyrosine 0.85mg, Valine 1.23mg

**Betaines** : Glycine Betaine trace, Gamma Amino Butyric Acid Betaine trace, Delta Amino Valeric Acid Betaine trace, TML (Laminine) trace, L-Carnitine trace, Trigonelline trace, and enzymes, lipids, lipoproteins and many compound nutrients which cannot be artificially replicated or formulated.

**Key**: 1g (gram) = 1000mg (milligram) = 1,000,000µg (microgram)

that Seagreens developed the means to produce consistent human food quality™ seaweed in Europe, ensuring international compliance for its food and nutraceutical ingredients (20).

Second, only recently has a new generation of nutritionists and food technicians in the mainstream food and health industries begun to look for natural replacements for artificial additives and ingredients. These initially made food cheaper and easier to manufacture but at the cost of consumer confidence.

In some quarters food ingredients are recognised as vital in our modern health concerns. A few years ago, a British Nutrition Foundation scientist observed: “The healthiness of a food alone, seems to be an important determinant in food choice for only a small sector of the population. For this reason, implicit improvements in the nutrient profile of foods, by the food industry, are essential to have any substantial influence on public health” (21).

Despite cynical opposition, some food industry leaders are also committed to a change in food quality. The following year, addressing the International Food New Product Development Conference, Cathryn Higgs of Co-operative Food, the UK’s fifth largest food retailer, urged: “It’s not about yet another new range of the same kind of foods; (what is needed) is a fundamental change in the way we consider reformulations and new products” (22).

Seaweed is now beginning to be seen as an attractive option by manufacturers as well as consumers, because it complies with clean label declarations which are finally finding favour across the food industry.

Also, various problems have been encountered with alginate research. The alginates, which are chemical seaweed derivatives, make people feel full (23), but their artificial flavour requires further masking and they may have nutritionally deleterious side effects. Unlike the whole food seaweed, they act as an artificial bulking agent, swelling inside the stomach. Other satiety studies have focused on different extracts such as an alginate-pectin combination (24) and lupin fibre (25).

Some of these materials are not well accepted by consumers, whereas seaweed has a very long history of safe culinary use in almost every culture. Specifically, Seagreens have been used as a food

ingredient for 15 years with no recall, intolerance or allergic reactions.

Other species of seaweed have been explored in obesity. Nori was found to significantly reduce the uptake of nutrients (26). In the Sheffield research, however, using Seagreens’ wild harvested *Ascophyllum* species, there was no effect on the uptake of nutrients and there were no significant differences in AUC glucose or cholesterol between the men who ate the Seagreens enriched bread and the the control group.

“This suggests that neither gelation nor nutrient encapsulation occurred,” said the Sheffield

researchers. Again, the whole food Seagreens seaweed ingredient in the bread in this trial, contained only about 1.15 grams of natural polysaccharides (from which alginates are extracted) per 100g portion of bread.

Our own extensive analytical studies show the comprehensive ‘antioxidant’ content of Seagreens is again several times higher than from conventional seaweed production. And the ‘antioxidant’ capacity remains high through the initial stages of gastro-intestinal digestion. This suggests that a high concentration of ‘antioxidants’ will be released within the gut lumen where it could provide protection from oxidative damage (36).

## Many clean label food and health products now contain Seagreens brands available in most British supermarkets, extending the vari



Artisan’s biodynamic bread, available at natural food stores and by mail order, provides extensive consumer information.



Clearspring’s range of Organic Oatcakes includes ‘Sea Vegetable and Black Pepper’ baked in the Scottish Highlands, using the finest organic ingredients.



Pukka’s range of Organic Bio Nutrients includes an excellent weight regulation and detox duo ‘Weight Balance’ and ‘Clean Greens’.

The Sheffield researchers concluded: "it is unlikely that intra-gastric gelation occurred". Perhaps the satiety effect, which led the seaweed-eating overweight men to eat fewer 400 gram bowls of pasta than their non-seaweed-eating colleagues, resulted from several factors, including the nutrient density of the seaweed, reduces the 'craving' which characterizes a consistent diet of nutrient imbalanced foods.

### A natural multi-nutrient for a multifaceted condition

In this way we return to the broader picture of overweight and obesity which

extends into the cardio-vascular system in one direction, the endocrine and digestive systems in another, to mental health and the need for balanced, unadulterated nutrition.

The endocrine system, so often implicated in eating and metabolic disorders, is hugely dependent on the dietary balance of micronutrients to trigger digestive acids, enzymes, and the production of hormones.

A recent example is the suppression of overeating driven by the hormone leptin and by glucose, which was found to be obstructed in diet-induced obesity research at Yale School of Medicine (27).

Unlike the extracted alginates, the whole food seaweed is rich in stable, organic iodine, naturally bound to its minerals. Iodine contributes to normal energy-yielding metabolism, the normal functioning of the nervous system and specifically the production of thyroid hormones and normal thyroid function.

At Seagreens we have been learning over the past 15 years from consumers and practitioners involved in all of these areas, what can be achieved with an adequate daily inclusion of seaweed in the diet.

It was through the work of Dr J. G. Levenson who founded the British Society for Mercury-Free Dentistry, that in the early 2000s we began to understand how Seagreens could help remove mercury in pre- and post-operative dental amalgam extraction (29).

This proved to be of interest to clinical nutritionists like Jonathan Tommey and Dr Natasha Campbell-McBride, working with children on the autistic spectrum, because they also had problems of heavy metals toxicity – and so on.

Iodine of which Seagreens is an ideal natural source, has been shown to increase the antioxidant status of human serum similarly to vitamin C and remove biological toxins and the toxic environmental chemicals flouride, bromide, lead and aluminium as well as mercury.

But it isn't just the iodine. Seagreens are also rich in polysaccharides which bind the heavy metals; there is a significant content of phenols and tannins; the antioxidant vitamins and minerals are comprehensively represented. One of Seagreens' quality factors is its significantly higher level of vitamin C than conventionally produced brown wrack seaweeds.

Canadian researchers at the University of Laval in Quebec looked at the increased risks of food and environmental toxicity in obesity, noting that industrial chemicals and particularly those that act like hormone disrupters - all of which have been found to accumulate in body fat cells - profoundly alter several aspects of human metabolism and appetite control.

Weight loss without proper detoxification, they found, leads to toxic substances stored in fat cells being released into the bloodstream, and as levels of these toxins rise, so levels of essential thyroid hormones necessary to maintain efficient

## Our 'human food quality'™ ingredients including 'mainstream' food quality of opportunities to introduce Seagreens into the daily diet.

Viridian's 'Organic Mineral Complex' offers a natural source of more than 80 essential trace minerals for everyday supplementation.



In Italy, Natural Point's 'Green Plus' product has the full-range of seaweed nutrients.



In Finland Bioteekki has teamed up with Seagreens to produce 'Merilevä Rouhe', a granulated all-purpose daily food ingredient for all the family.



Napiers' Hebridean Seagreens Organic Kelp Capsules "a natural source of iodine to support a healthy metabolism and thyroid function".



metabolism, fall dramatically.

A concomitant reduction in muscle oxidative enzymes - which determine how efficiently muscles use energy - results in energy again being stored as fat, completing the cycle: weight loss, rising contaminants, loss of oxidative enzymes, increased fat.

Other cycles, they reasoned, may be set up through impaired hormonal function and imbalance including over-eating, under-eating, or any obsessive dietary imbalance (30).

Other researchers have found that obesity significantly increases the daily requirement for iodine (31).

Like most modern health concerns, there is no single cause of 'obesity' and no single solution. Whatever is presented, there will be numerous cycles to try to get to grips with and treat. Some approaches will succeed. The body's own resolution to its deep malaise is usually at a profound chemical level, in the relationship between these cycles.

Put another way, none of us is the Average Person beloved of medical research. "A study of 50 individuals may conclude that the low-fat diet worked best. However, what was the ethnic group studied and even more importantly, what really worked for each of these 50 individuals, because what we are really studying is 50 different physiological interactions with food?" (32).

Dr Natasha Campbell-McBride in CAM magazine and in her GAPS training, constantly emphasizes digestion, and the existence of an auto-immune component "in (virtually) every patient whether it is an autistic child or a depressed adult, an individual with epilepsy

or an eating disorder, someone with rheumatoid arthritis or diabetes type 1, or a disorder like eczema or chronic cystitis" (33).

The least I can hope to have shown is that underpinning all of these different cycles, physiologies and remedial approaches, is the availability of some very nutritious, primordial green stuff which has been with us since the beginnings of life, a microcosm of our own physiological history (34).

In obesity we see a body screaming for its rebalancing potential (35) to be recognised and supported: to restore homeostasis. Nowhere is this balance more natural and more sustained in its original form, than in the oceans and the virtually unaltered vegetation that grows there. ■

## About the author



**Simon Ranger**  
founded  
Seagreens<sup>®</sup>,  
Europe's leading  
human food  
seaweed™ brand,  
15 years ago. The  
company has

won awards for its scientific research, consumer and practitioner products, and sustainable Organic production among remote islands in Norway and Scotland. Among the hundreds of edible seaweeds found in many parts of the world, Seagreens wild wrack species have the broadest balance of macro and micro nutrients.

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