Thyroid Health – Scientific Review Paper
Seaweed, Iodine & the Essential Role in Thyroid Health

Abstract

Iodine is an essential nutrient required throughout life. It has to be obtained through diet and is required for the normal functioning of the thyroid and the subsequent impacts of wider health in which the thyroid is involved.

A deficiency in iodine can lead to an underactive thyroid and various other health concerns. Some of these associated concerns are commonly reported in women, which may be a sign of a thyroid issue and would warrant investigation.

There are increasing reports of widespread iodine deficiencies, and which are likely linked with the decline in intake of mainstream sources of iodine such as white fish and dairy.

With various countries in the West having deficiencies in iodine, particularly amongst young girls and women, we explore the only natural good vegan source of iodine – seaweed, and why it is a forgotten food being re-discovered.

An introduction to thyroid health

The thyroid is a butterfly shaped gland located in the neck, sitting in front of the windpipe. Its two lobes each resemble about half of a plum in size. The thyroid is part of the endocrine system and is responsible for producing and releasing hormones into the blood stream. These hormones are known as T3 (triiodothyronine) and T4 (thyroxine). The numbers in the names represent the amount of iodine atoms in each hormone[i]. These hormones play an essential role for metabolism, which is essentially the speed at which your cells work and can therefore influence the rate at which they burn energy. Therefore, if the thyroid produces a larger quantity of hormones than required, it could cause the metabolism to increase. Likewise, if the thyroid produces a smaller quantity than required then the metabolism could decrease.

Excessive iodine can cause hyperthyroidism (an overactive thyroid) while too little iodine in the diet causes hypothyroidism (an underactive thyroid), which is the most prevalent of the two. Common symptoms of an underactive thyroid include weight gain; tiredness; sensitivity to cold; depression; constipation; brittle hair and nails; dry skin and more[ii]. Consequently, normal thyroid function is essential to maintain a

healthy functioning body, and a good source of iodine is essential for normal thyroid function.

An introduction to Iodine

Iodine is an essential mineral that must be obtained through diet and is an integral component of the hormones produced by the thyroid gland. The UK Reference Nutrient Intake (RNI) is 140µg as advised by the European Food Safety Authority (EFSA) and this is mentioned in The Scientific Advisory Committee on Nutrition (SACN) report from 2014[iii]. However, it is recommended that a further 50-100µg should be consumed for those who are pregnant and lactating. Furthermore, it is advised that iodine should be consumed regularly prior to conception to ensure adequate iodine stores[iv]. This is because iodine is essential for the growth of the brain during foetal development, and deficiency, in extreme cases, can cause cretinism and, even in moderate cases, can reduce mental capacity[v].

There is evidence to suggest that iodine insufficiency is a growing issue within the UK, with the UK currently ranking seventh among the ten most iodine-deficient nations in the world, and one of only two high-income countries on the list[vi]. The groups that are at the most risk are adolescents, especially more so in girls, in addition to those who are pregnant or follow a particular diet where certain foods are deliberately omitted[vii]. As a specific high-risk group for example, vegans will not be consuming key sources of iodine such as seafood (especially white fish) and dairy, as they are excluded from the diet. Therefore, iodine has to be obtained from elsewhere – one solution being through artificial supplementation (which has its limitations – see below), or seaweed as a food or natural wholefood supplement.

Seaweed, of the right type, can be a good, safe, natural, and vegan source of iodine. A good source of iodine enables six EU Approved Health Claims, enabling statements on the front of the pack of products and within marketing materials, as highlighted below.

Thyroid Disorders

Consuming too much or too little iodine can cause issues with thyroid health. Whilst these issues can occur naturally, diet often plays a large role. Achieving adequacy ensures that the thyroid performs optimally and can prevent the diseases and disorders that are associated with hypo and hyperthyroidism. An example of one of these disorders is Goitre. This is where the thyroid tries to keep up with the demand for iodine but cannot due to a low dietary intake. As a response, the thyroid begins to swell in order to have more blood pass through it and thus extract more iodine[viii]. There

is also a similar disorder known as post-partum thyroiditis which is a temporary thyroid disorder that is triggered by pregnancy. Notably, this disorder passes shortly after giving birth. However, it can return if the subject becomes pregnant again in the future[ix].

Iodine deficiency is a problem throughout the world and the World Health Organisation (WHO) has stated that "iodine deficiency is the world's most prevalent, yet easily preventable, cause of brain damage" and that globally there are more than 2 billion people with a diet deficient in iodine[x]. In regard to the UK, SACN have not updated the RNI for iodine since 1992 but have published a report in 2014 stating that they felt there was not enough evidence to update the recommendations[xi]. This is despite growing evidence of deficiency within the UK. One such study reported that a staggering 66% of 15-year old girls could be iodine deficient[xii]. Meanwhile, Dr Mark Vanderpump, in a prominent study from 2011, stated that 69% of the participants had iodine levels equal to or lower than 100µg (which is 50µg less than the RNI)[xiii]. In further support of these findings, a study from 2018, that used NDNS (National Diet and Nutrition Survey) data, reported similar figures. They found that the median urinary iodine concentration (UIC) for women aged 16-49 years was 102µg/L while 17% of the population had a concentration of less than 50µg/L which is an indication of severe deficiency[xiv]. These worrying statistics have caused leading iodine specialists to publish a damning report in the 'The Lancet Diabetes & Endocrinology' condemning SACN, stating that they felt SACN were "out of step on the issue with iodine deficiency" and that "immediate action, based on existing evidence, is needed before the problem gets any worse"[xv]. To put these findings into perspective, the NHS issued an average of around 2.5 million units of Levothyroxine Sodium - which is used to treat thyroid disease – monthly for the last 5 years[xvi].

Seaweed for Thyroid Health

Seaweed is a collective term used for a variety of large marine macro-algae found growing in the ocean. Seaweed is naturally rich in iodine, although levels in different species can vary dramatically[xvii]. Knowing the supply, species, and processing of any seaweed that may be consumed is essential and labelling of nutrition products should state the iodine levels. Seaweed is the only natural vegan good source of essential iodine, and so for plant-based diets, it might be the only way to naturally obtain sufficient iodine and support thyroid health. Finding convenient and appealing ways to get seaweed into a diet can be a challenge for some, as most people would be unsure about how to consume seaweed as part of an everyday meal. For this reason, taking seaweed as a nutritional food supplement, or as an ingredient, within foods and

beverages is an ideal solution. This ensures adequate iodine intake, and in a way that is extremely easy, as a natural whole food source of iodine, and also containing a wide range of other nutrients.

The PureSea® range of seaweed ingredients, available as powder and granule options, offers highly appealing flavour profiles, and even with no flavour at all, to deliver the nutritional benefits of seaweed in easy-to-use and accessible formats. The seaweed used is the species *Ascophyllum nodosum*, which has a rich source of iodine, is well researched, and every batch is measured for its iodine levels with a consistent and long history of use. The seaweed is sustainably wild harvested around the remote islands of the Scottish Outer Hebrides. These pristine waters are carefully monitored and managed, with the supply source having exclusive harvesting rights from the Crown Estate. This ensures quality and safety, and each batch is DNA authenticated to ensure full traceability. Gram-for-gram PureSea® seaweed is more nutritionally dense in key nutrients than other commonly eaten whole foods, with just 1 gram having the equivalent level of iodine from typically eating three whole mackerel. Importantly, the PureSea® ingredients are well researched, and continue to be used in projects with British universities investigating the benefits of PureSea® for thyroid health.

Unlike many seaweed or kelp products on the market, that can have widely varying iodine levels when tested against what is reported on their labels, PureSea® ingredients and the supplier, Seaweed & Co., has in-depth knowledge of the product, with the batch testing of iodine, and a long history of data from independent accredited laboratories

Research published in the British Journal of Nutrition that compared the PureSea® seaweed as a natural iodine source to an artificial source (potassium iodide) concluded that the iodine is released more slowly from seaweed as it is bound within the fibres, as compared to the artificial and extracted sources (figure 1)[xviii]. The study also stated that surplus iodine was excreted from the body when the subjects were found to be replete in iodine after consuming seaweed.

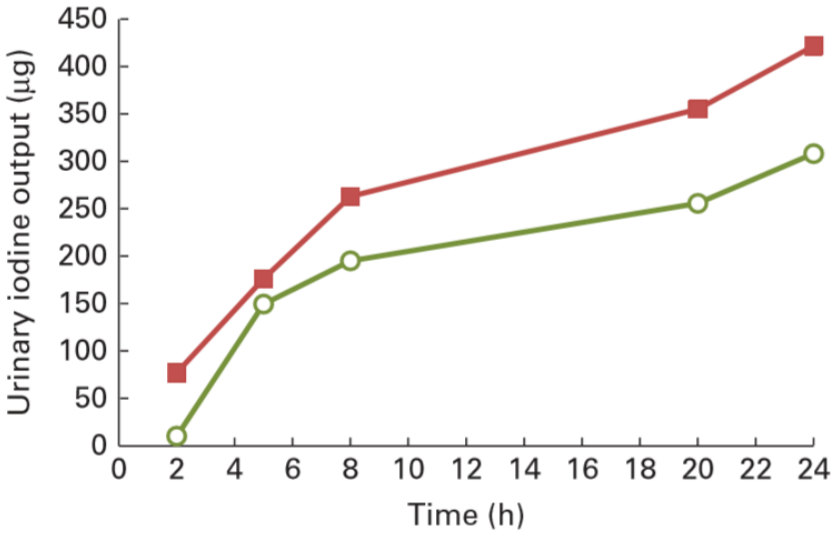

Figure 1. Urinary iodine output (µg) over time (h) after consuming PureSea® species (green line with circles) and Potassium Iodide (red line with squares).

Approved Health Claims

The natural and vegan iodine source of PureSea® seaweed enables six EU Approved Health Claims, enabling statements on front of pack of products and use in marketing materials. These claims are that iodine is a nutrient that supports normal:

- Thyroid Health
- Cognitive Function
- Healthy Skin
- Energy Yielding Metabolism
- Development in Children
- Nervous System

The European Food Safety Authority (EFSA) is responsible for evaluating the scientific evidence supporting health claims to ensure there is a sufficient amount of evidence and that the contributing evidence is reputable and unbiased.

Conclusion

In conclusion, iodine is an essential mineral, required for normal thyroid function and with subsequent impacts on wider health due to the nature of the thyroid's role in supporting normal cognitive health, metabolism, nervous system, and skin. This is especially the case in the UK where research suggests that there is a high proportion

of iodine deficiency, as well as amongst key groups such as vegans and others with special diets or intolerances. Symptoms of an under active thyroid may appear common place in many women, and in these cases, an evaluation of diet and consultation with a medical professional is recommended. One universal solution is the right type of seaweed. There is a wider opportunity for food, nutrition and beverage manufacturers to utilise seaweed ingredients, requiring just small amounts, to provide natural fortification in products, and enabling several pertinent EU Approved Health Claims to be made.

About the Authors

Dr Craig Rose is a marine biologist, founder and managing director of Seaweed & Co. Craig has worked commercially and on research projects on the benefits of seaweed for around 15 years, and leads several research projects with university partners, is on industry advisory bodies and has presented at numerous conferences and to the media.

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Seaweed & Co. as a company advise on, supply and accredit seaweed, using proprietary technologies and techniques. Their seaweeds are sustainably wild harvested, naturally rich in iodine, uniquely DNA Authenticated for world class analytical traceability, and extensively batch tested and accredited for safety and quality. Seaweed & Co.'s PureSea® range is Organic and Kosher certified and is supplied into the food, health and nutrition markets.

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