Sporty Seaweed – Scientific Review Paper: Natural Iodine for Energy and Endurance

Summary

The right nutrition to support energy and metabolism is key for everyday living as well as sports performance and recovery. Iodine is a critical nutrient for thyroid function, yet the majority of people are deficient. Thyroid function impacts metabolism, which is the effectiveness of how food is turned into energy. As iodine is excreted in urine and sweat, the more people exercise and drink, the more iodine they lose. A study showed that, as iodine intake in the diet is not increased for most people when exercising, a group of footballers had lower iodine levels than sedentary people due to the loss of iodine in their urine and sweat. An underactive thyroid results in tiredness, fatigue and low energy. PureSea® seaweed as a safe, natural source can support energy and metabolism, with EFSA Approved Health Claims.

Abstract

Iodine is an essential nutrient which is required to support a high energy yielding metabolism. This is important for any athlete in order to ensure optimal performance. Adequate iodine needs to be consumed to achieve sufficiency and to ensure iodine lost through sweat and urine is replenished.

There is growing evidence of the prevalence of iodine deficiency within developed countries. This is partly due to the fact that iodine has to be obtained through diet and now varying trends within the food industry, such as veganism and food intolerances, can cause the main sources of iodine such as fish and dairy, to be completely excluded from the diet. One way to address this is through the consumption of seaweed – the only natural and vegan good source of iodine. Seaweed is naturally rich in iodine, and research also shows benefits blood glucose management, and so energy levels and endurance.

Seaweed, and specifically sources such as PureSea®, can offer a safe, natural and vegan source of iodine that can readily be incorporated into any food, nutrition and beverage product aimed at sports nutrition.

An introduction to iodine

Iodine is an essential nutrient that has to be obtain through diet. Nutritionally, iodine is required by the thyroid gland for its proper function, and which has numerous

implications for wider health. The thyroid is a gland that is situated at the front of the neck and is responsible for producing the hormones triiodothyronine (T3) and thyroxine (T4). These hormones are transported through the blood stream and are used to regulate the metabolism[i]. The metabolism is the regulation of cellular respiration; oxygen and fuel being converted into energy[ii]. Consuming too much or too little iodine can have health implications. Too much iodine in the diet can result in hyperthyroidism (also known as an over-active thyroid) whereas too little iodine can cause hypothyroidism which is (an under-active thyroid). Hypothyroidism is the most common of the two, and an under-active thyroid has several associated symptoms. These include: tiredness; sensitivity to cold; weight gain; constipation; depression; slow movements and thoughts; muscle aches and weakness; muscle cramps; dry and scaly skin; brittle hair and nails; loss of libido (sex drive); pain; numbness and a tingling sensation in the hand and fingers (carpal tunnel syndrome); and irregular periods or heavy periods[iii]. In extreme cases, iodine deficiency can result in a disease known as goitre, which is when the thyroid swells and causes a visible lump in the throat[iv].

Iodine is sourced primarily through seafood (white fish being the best source), diary, and seaweed. Seaweed, of the right type, is the only safe, natural and vegan source of essential iodine.

Iodine deficiency

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". Globally there are 5 billion people (68% of the population) with a diet deficient in iodine[v] and this is not an issue just confined to the developing world. In developed countries, the levels of iodine deficiency often range from mild to moderate, but it is very important to note that even at these lower levels of deficiency, there can still be serious health implications. The UK, as an example, is mildly iodine deficient and now ranks seventh amongst the ten most iodine-deficient nations in the world, and one of only two high-income countries on the list[vi].

More specific to sports nutrition, research has suggested that athletes, such as footballers, are at a higher risk of iodine deficiency due to loss of iodine from sweat and urine, which is higher when exercising and consuming more fluids. If the diet is already insufficiency in iodine, then the risk is much greater[vii]. Some of the symptoms of iodine deficiency are important to consider within sports nutrition, as they can impact on overall performance and recovery.

The opportunities for sports nutrition

As iodine is excreted from the body through urine and sweat, it can be a major issue for athletes, especially if they are already deficient to begin with. Iodine is essential for supporting a high energy yielding metabolism and is therefore particularly important for those who are concerned with sports performance and recovery. The issues of iodine deficiency and sports activity are addressed in a number of research projects.

One study found that after vigorous activity, the mean sweat lost was 4-5 litres, of which contained 35-40µg/L of iodine. This suggests that the average sweat lost during the activity period is the equivalent to the UK reference nutrient intake (RNI) of 150µg per day[viii]. Therefore, it is easy to see how, over time, consistent sweating during exercise could result in severe deficiency. In further support of these findings, a similar study investigated the loss of iodine from sweat of footballers. The study analysed 13 male footballers' sweat and urine samples that had been collected over an 8-day period. The results suggested that the average footballer lost around 52µg/L of iodine an hour. It was also observed that urinary iodine was significantly lower in comparison to the control group of 100 sedentary students with 38.5% of footballers below the average of 50µg/gm. To put these findings in perspective, there were only 2% below average in the sedentary group tested in the same study. In addition, 46% of the footballers were found to have stage 1 goitre in comparison to 1% in the sedentary group[ix].

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. 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 claim linked to metabolism is particularly pertinent for sports nutrition.

Dietary Considerations

Generally, nutrition and diet play an important role within the lifestyles of athletes from an amateur to a professional level. Ensuring athletes are sufficient in macro and micronutrients is essential to ensure optimal performance. This is particularly important when exploring more plant-based diets, which can be lacking in certain vitamins and minerals. Popular diets that support "clean" eating can appear to be healthy (and they can be) provided there is an awareness of risks that are associated with following such diets. For example, one diet known as the Palaeolithic diet (or Paleo diet as it is more commonly known) aims to only consume food that is believed to have been available to prehistoric humans. This includes only whole foods that can be caught, killed or foraged. Therefore, it omits one of the most modern mainstream contributors of iodine in the diet: dairy produce. One investigation in Norway compared the paleo diet to the Nordic Nutrition Recommendations (NNR). The NNR is based on recommendations for a balanced diet for the general population and so acted as the control. The study found that those following the paleo diet had significantly lower

iodine urinary levels than those following the NNR diet and therefore had a higher risk of iodine deficiency.

For those that do not consume sufficient white fish or shellfish, dairy may be the exclusive sources of iodine within the diet. Regarding milk, iodine levels can vary depending whether it is organic to the season it has been produced. A study that attempted to address this issue found that cow's milk varied in iodine content throughout the year. The study associated this with various factors which were mainly constrained by the methods used within farming cattle. During the winter months the cows cannot graze on grass and are given silage mixed with an enriched feed which results in a higher milk iodine content[x].

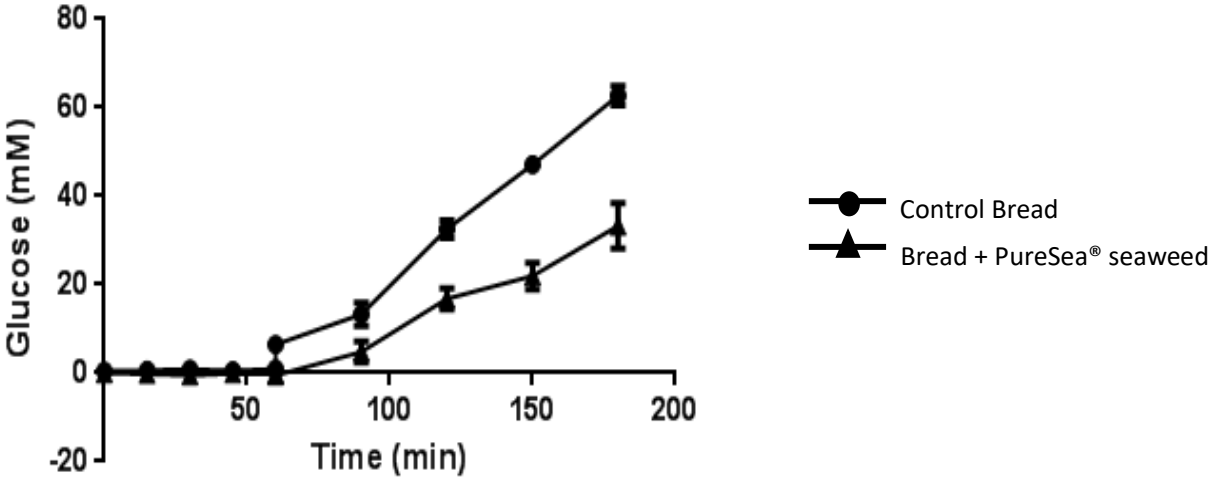
Other dietary trends include exclusion of diary, and a move towards dairy alternatives. An example of this is veganism. However, these alternatives are often low or lacking iodine altogether. This was investigated in a study that analysed dairy alternatives. They concluded that they were not a situatable alternative to cow's milk as they were not naturally high in iodine, nor were they fortified to a comparable level[xi]. Therefore, should an athlete follow a restrictive diet that omits or replaces the main sources of iodine – fish or diary – then they may have to consider supplementation to avoid deficiency.

It is important re-iterate that seaweed, of the right type, is the only natural, safe and vegan good source of iodine. PureSea® seaweed ingredients provide a range of format options, with known batch-tested iodine levels.

Blood sugar management

When exercising, the management of energy release from carbohydrates to the blood can help with endurance and ensuring a feeling of satiety and sustained release throughout a workout or activity. Independent studies have demonstrated links between PureSea® seaweed consumption and blood sugar management[xii]. In these studies where seaweed was consumed alongside bread, it was demonstrated that seaweed actually reduced the blood glucose levels by as much as half (figure 1).

Figure 1. A comparison of the quantity of blood sugar glucose (nM) produced after the



consumption of control bread to bread + PureSea®.

Blood sugar management is important for an athlete because elevated blood sugar levels (hyperglycaemia) can cause a number of health issues if left untreated. Examples could be the development of Type 2 diabetes and, in serious cases, can cause life-threatening complications such as diabetic ketoacidosis (DKA) or hyperosmolar hyperglycaemic state (HHS). DKA is caused by the body breaking down fat into sugar which can lead to a diabetic coma and HHS is a mechanism where the body tries to excrete excess blood sugar and cause fatal dehydration[xiii]. In addition, elevated levels of sustained blood sugar are toxic and cause damage to various body parts such as the eyes or blood vessels. In another study, it was stated that the brown seaweed group (of which PureSea® is) influenced glycaemic control and may be effective in lowering blood lipids and improving antioxidant enzyme activities.

Conclusion

Iodine is an essential mineral, required for normal thyroid function and with subsequent impacts on wider health. This is primarily due to the nature of the thyroid's role in supporting a high energy yielding metabolism which is essential for sports nutrition and recovery. The importance appears particularly prevalent within developed countries, such as the UK, where research suggests a high level of iodine deficiency. Research on sports people suggests that they may be more susceptible to iodine deficiency than sedentary people due to the amount of iodine lost through sweat and urine. Therefore, the need for supplementation may be far greater to ensure adequate levels are achieved and maintained, especially if on any specialist diets excluding certain foods. Furthermore, PureSea® seaweed's potential to manage blood sugar

release, offers benefits to managing energy and endurance during exercise and activity helping to maximise athletic performance.

There is a wide 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 Organic and Kosher certified seaweeds are supplied into the food, health and nutrition markets. 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.

FOR ADDITIONAL INFORMATION ON PURESEA®

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