

Pregnancy Scientific Review Paper: Iodine, seaweed and the importance during pregnancy

Summary

Iodine is a key component of thyroid hormones, namely thyroxine (T4) and triiodothyronine (T3). These hormones are essential for regulating the body's metabolism, including the menstrual cycle in women and sperm production in men. Iodine helps in the synthesis and regulation of sex hormones like oestrogen and testosterone which are necessary for reproductive health in both men and women. In women, iodine deficiency can disrupt the menstrual cycle, leading to irregular periods or even amenorrhea (absence of menstruation). Iodine is also important for men's fertility. Adequate iodine levels can support healthy sperm production and function.

During pregnancy also, iodine is critical for foetal brain development, and children born from women deficient in iodine can have lower IQs. Higher iodine intake is suggested during pregnancy by the World Health Organisation.

Abstract

Iodine is an essential nutrient required throughout life. It has to be obtained through diet, and during pregnancy is said to be needed in higher levels, as it is essential for normal foetal development. This is supported by evidence which demonstrates that deficiencies can impact the cognitive health and development of children.

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 that is being re-discovered.

What is iodine and why is it important in pregnancy and beyond?

Iodine is an essential nutrient that can only be obtained from within the diet and is one of the key components of the hormones that are produced from the thyroid gland – most importantly thyroxineⁱ. Without sufficient iodine in the diet, the thyroid cannot function properly. Subsequently, this may lead to an underactive thyroid, resulting in a lowered metabolic rate along with several other possible health issues, including possible weight gain.

Specifically, during pregnancy, iodine is essential for foetal brain development. Therefore, more iodine may be needed within the diet to account for the additional requirements of both the mother and the baby. This is supported by the World Health Organisation (WHO). Iodine is also continuously required following pregnancy, during breast feeding and throughout childhood to ensure optimal brain development and to ensure normal development.

Knowing the source of the iodine is extremely important to ensure safe and natural levels.

What can happen if someone is deficient in iodine?

The European Food Safety Association (EFSA) recommends an intake of 150µg of iodine per day. EFSA and the World Health Organisation recommend consuming a further 50-100µg for those who are pregnant and lactatingⁱⁱ. Ideally, it is advised to consume adequate iodine regularly before conception if possible, which helps to ensure sufficiency. Research has shown that it is better to consume iodine through natural sources and not artificial supplementationⁱⁱⁱ. When there is an insufficient amount of iodine consumed it can lead to a condition named hypothyroidism (also known as having an underactive thyroid). The symptoms of hypothyroidism are, but not limited to, a reduced metabolic rate, weight gain, feeling tired, sensitivity to cold, brittle hair and nails, reduced sex drive, and a poor memory^{iv}. These symptoms can have an overall and combined effect on motivation and quality of life^v. In extreme cases, iodine deficiency can lead to diseases, one example being goitre. This causes the thyroid gland to swell up to try and absorb more iodine and so compensating for the insufficient iodine that is available within the body.

Iodine deficiency in pregnancy

Various countries are experiencing growing levels of iodine deficiency, and this is particularly true in the UK. In at least five recent studies it has been reported that a substantial number of women in their first trimester of pregnancy are iodine deficient^{vi}. This was highlighted by Professor John Lazarus, a specialist in hormone disorders and Chair of the UK Iodine Group. To highlight the extent in young women and girls, one report even suggested that a staggering 66% of 15-year-old girls in the UK could be iodine deficient^{vii}. In order to tackle dietary insufficiencies, some countries utilise food fortification such as fortifying table salt with iodine. Despite this, the UK currently has no plans to fortify table salt. However, fortification could be paradoxical as salt consumption is generally in decline due to the reported links that excess salt in the diet can increase the risk of high blood pressure and cardiovascular disease.

The Scientific Advisory Committee on Nutrition (SACN), who determine nutritional intake requirements for the UK, state that insufficient scientific evidence is available to justify updating the national recommendations for iodine requirements during pregnancy. This is a contentious topic within the scientific community with 'The Lancet Diabetes & Endocrinology' condemning SACN, stating that they felt they 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."^{viii}

This is supported by a study carried out by Glasgow University^{ix} where it was reported that about 90% of mothers knew of the importance that nutrition played within pregnancy. However, 28% were not confident they could achieve the recommended daily amount for iodine while only 12% were aware of the iodine-specific recommendations. Findings from the food frequency questionnaire (FFQ) data also demonstrated that the median pregnancy iodine level was 190µg which is below the recommended amount.

Evidence behind the science

One of the major findings to come out of current scientific research is the effect that iodine deficiency has on foetal and early childhood brain development^x. The research suggests that iodine deficiency results in a lower IQ. One prominent recent study^{xi}, conducted in Norway, found that low iodine levels (below 100µg/L) in mothers during pregnancy were associated with lower language skills in children up to 18 months of age. One of the standout findings was that, out of the 851 mothers who participated in the study, 28% were classified as having severe iodine deficiency. These findings are comparable to the UK population, where it has been stated since 2011 that the population is mildly iodine deficient. In fact, the UK currently ranks seventh among the ten most iodine-deficient nations in the world, one of only two high-income countries on the list^{xii}. In support of this, one UK study consisting of 1040 mothers^{xiii} found that 62% were deficient in iodine and those within this category had a higher chance their children would be in the bottom 25% of IQ test results. That is an alarming percentage and one that could arguably be easily addressed through increased awareness and nationwide fortification and/or supplementation.

Diet and how to obtain iodine

The most common sources of iodine are found predominantly in white fish, shellfish and dairy. However, access to iodine from these sources can be problematic if the

mother has allergen issues, is vegan, or is generally reducing meat and dairy intake, as they might not be consuming enough iodine rich foods. Overall, people are generally eating fewer white fish, with dairy alternatives becoming a trend. Now 23% of Britons are using dairy alternatives^{xiv}, which offer little to no iodine, naturally or artificially. One solution that is naturally rich in iodine is seaweed – which is in fact the only naturally good vegan source of iodine.

Specific groups such as vegans, those with lactose intolerances or other special diets may be at higher risk of iodine deficiency.

Humans have consumed seaweed for millennia as a readily available and nutrient dense source of essential nutrition. Archaeological evidence supports that it was this dietary inclusion that was key in the evolution of the larger and more intelligent modern human brain from early *Homo sapiens* 2-2.5million years ago^{xv}.

Several organisations and public health professionals advise against consuming seaweed and “kelps” (a type of seaweed) due to the potentially high and varying levels of iodine. However, it is crucial to note that, whilst this may be true of some species or some brands/products, the right type of seaweed remains a safe and viable source providing that the iodine levels are clearly stated and there is proof that tests and measurements on batches to ensure consistency. Equally, if using supplements, it is important to consider that they contain pure seaweed and not tablets that contain various bulking agents and fillers. It is these types of tablets, and other unmeasured products, where variances in iodine levels can be large and wide ranging.

PureSea® is a brand of seaweed ingredients that measures the iodine levels of every batch and have evidenced stable levels of natural iodine over many years of production. The powders and granules are supplied in various formats, for ease of use in nutrition, food and beverage products, and can provide safe natural levels of iodine, which allow for EFSA approved health claims that iodine supports normal:

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

The species of seaweed underpinning the PureSea® range, *Ascophyllum nodosum*, is produced by Seaweed & Co. with every batch measured and recorded to ensure consistent natural levels of iodine, as well as factors of safety and quality. In addition, research published in the British Journal of Nutrition^{xvi} compared the PureSea®

seaweed species as a natural iodine source against an artificial source (potassium iodide) concluding that the iodine is released in a more sustained way from seaweed as it is bound within the fibres, as compared to the artificial and extracted sources. The study also reported that when iodine stores were found to be replete involving the seaweed, most of the iodine surplus iodine was excreted. For these reasons, having levels of iodine from the PureSea® seaweed higher than 100% of RDA is the approach taken to ensure sufficient iodine is absorbed from this natural whole food source.

In further support, the World Health Organisation (WHO) recommend that nations that do not engage in fortification should consider supplementation. The NHS have stated that, in reference to an economic modelling study, they predicted that by giving iodine supplements to pregnant women would not only save the NHS money but it would also benefit the infant - and society as a whole - due to the implications of having a higher IQ^{xvii}.

Conclusion

In conclusion, iodine is an essential nutrient, required in higher amounts before, during and following pregnancy. Adequacy is required to ensure the thyroid can operate effectively, supporting normal cognitive health, metabolism, nervous system and skin. Iodine is essential during foetal development and during breastfeeding. This is critical within the UK where current research suggests there could be a high level of deficiency. There is also compelling evidence from several recent studies suggesting a link between iodine deficiency and lower IQ in children. Tackling this issue could potentially be simple and cost effective through increased awareness and supplementation. One viable option is the inclusion of the right type of seaweed into the diet through use in ingredients within food, beverages and nutrition products.

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.

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