



IODINE

This information is brought to you by many of the Australian nutrition professionals who regularly contribute to the Nutritionists Network ('Nut-Net'), a nutrition email discussion group.

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The following series of questions and answers address the need in our diet for an essential mineral, iodine, and how we can minimise the risk of iodine deficiency.

What is iodine?

Iodine is a chemical element that is required for growth and survival. It is widespread in the environment, but is chiefly derived from the ocean and the soil. Iodine is typically present in relatively low concentrations in the sea and soil; because of its biological importance, iodine tends to be present in living organisms in higher concentrations. It is found in varying amounts in plants and animals, and the quantity we obtain from plants depends on the concentration of iodine in the soils in which they were grown. The most potent source of iodine in the human diet is marine fish and other seafood.

Iodine is an essential micronutrient in the human diet. It's most important known function is as a component of thyroid hormones. Thyroid hormones are produced by the thyroid gland (located at the base of the neck). Thyroid hormones play a vital role in the regulation of metabolic processes such as growth and energy expenditure. They are essential throughout childhood for normal brain and physical development. They are also critical for normal development of the baby in the womb, so for women who plan to become pregnant, iodine intake is one of the important nutritional factors they need to take into account.

How much iodine do I need?

A teaspoon of iodine is all a person requires in a lifetime. However, the thyroid gland does not have the capacity to store this amount, so small amounts of iodine must be consumed regularly in the diet. The World Health Organization recommends the following daily intake for optimal iodine nutrition:

Adults: 150 µg/day
Pregnancy and Lactation: 200 µg/day
Children (6-12 years): 120 µg/day
Infants (0-5 years): 90 µg/day
(µg =micrograms)

What happens if I don't get enough iodine?

Iodine deficiency occurs in individuals who do not obtain adequate iodine from their diet. The thyroid gland is presented with the challenge of maintaining production of thyroid hormones for metabolic demands, despite one of the essential components (iodine) being in short supply. Under these circumstances, the thyroid gland enlarges in order to become more effective at its job. This is known as 'goitre', and is the most obvious sign of iodine deficiency.

However, other changes in physiology can also occur, such as a reduction in thyroid hormone synthesis resulting in lower blood levels of thyroid hormones—a condition known as hypothyroidism. This poses a health hazard for all affected people because it can lead to weight gain, lethargy, intolerance to cold, increased blood cholesterol, mental slowness and reduced heart function.

What are iodine deficiency disorders?

A diet lacking in iodine is associated with a wide spectrum of adverse health effects collectively known as iodine deficiency disorders (IDDs). IDD's can impact on people of all ages, but impact most severely on the baby while it is developing in the womb or in the period soon after birth.

Goitre is the best known, but least important of the disorders. Iodine deficiency has the greatest impact during pregnancy, due to its devastating effects on the baby's developing brain and also on physical growth. In the worst cases of severe iodine deficiency, a child may be born with cretinism, a condition characterised by severe mental retardation, growth stunting, apathy, and impaired movement, speech or hearing.

However, even mild iodine deficiency can impair development and cause subtle deficits in visual motor skills, hearing and intelligence. Iodine deficiency is regarded as the world's greatest cause of preventable brain damage, resulting in an estimated 80 million children suffering from some form of permanent mental retardation. In women of child-bearing age, iodine deficiency undermines fertility; and in pregnancy it puts the developing baby at greater risk of miscarriage, abortion or stillbirth. IDD's are a significant threat to the health, wellbeing, and productivity of communities worldwide.

What is the extent of ID in Australia and New Zealand?

Many geographical regions of the Australian continent are composed of ancient, weathered soils, which have been depleted of their iodine by millions of years of erosion. These include the mountainous areas of northern and eastern Tasmania, the Atherton Tablelands of north Queensland, the Great Dividing Range in NSW, the plains surrounding Canberra, the eastern region of Victoria and the Adelaide Hills.

New Zealand soils are also naturally low in iodine. Endemic goitre was noted as a problem in these areas of Australia and New Zealand early last century, but over the following decades it was virtually eradicated. The devastating effects of iodine deficiency and the measures that had to be taken to combat it are a fading memory for older people in Australia and New Zealand.

However, recent studies undertaken in Sydney, Tasmania and Melbourne have indicated that levels of iodine in schoolchildren, healthy adults, people with diabetes, and pregnant women are sub-optimal. The findings of these relatively small surveys suggest that mild iodine deficiency may be a widespread problem in the general population. In New Zealand the emergence of mild iodine deficiency has also been reported.

Further, a food survey conducted in 2008 by the national food regulator (FSANZ) found that 43 per cent of Australians don't get enough iodine, while 70 per cent of women of child-bearing age and about 10 per cent of children between the ages of two and three are iodine deficient.

What are the best dietary sources of iodine?

The richest natural food sources of iodine are seafood and seaweed (such as kelp and nori), because the ocean is a rich reservoir of iodine. Two or three serves a week of seafood will provide sufficient intake of iodine.

Although generally lower than that of most seafoods, the iodine levels of foods of animal origin (eggs, meat and dairy products) are higher than that of most foods of plant origin, and may have been further enriched by the use of iodine supplemented animal feed. The variation of iodine content in natural foods can be considerable. For example, in Britain iodine levels in fish varied from 110–3,280 micrograms per kilogram. The iodine content of whole milk samples collected in Tasmania in 2002/03 ranged from 110 to 440 micrograms per litre (average level 213 micrograms per litre). Analysis of Australian milk in 1991 showed an average content of 50 micrograms per litre.

Any salt used at home should be an iodised salt (that is, iodine has been added). In Australia, iodised salt contains 25–65 micrograms of iodine per gram of salt. In NZ it varies from 40–80 micrograms per gram. Iodised salt is available at all major supermarkets (either in a green container or with a green label). Note that sea salt is a poor source of iodine—it contains less than two micrograms per gram.

What about supplements, and is overdosing a potential problem?

Supplements of iodine may be an important source for individuals who do not eat seafoods, animal flesh, animal products, or iodised salt, or who have a greater requirement for iodine (such as pregnant or breastfeeding women). Iodine is a listed ingredient in a range of multivitamin supplements available at health food stores, and the dose can vary from 50–150 micrograms per tablet. Kelp tablets are a type of seaweed extract, and can provide an alternative iodine source.

But check with your doctor before starting to take iodine (or any other) supplements. As with many supplements and over-the-counter drugs, too much iodine can be toxic. Although most individuals can tolerate a wide range of iodine intake, exposure to extremely high levels (above 1,000 micrograms per day) is potentially harmful. Excessive iodine intake is especially dangerous for those people with a

predisposition to Grave's Disease, because high levels of iodine can trigger this condition in susceptible people.

Use only those tablets that state the iodine content on the label, so you know how much you are getting. And, as mentioned above, don't forget to check first with your doctor that the iodine content of the supplement is appropriate.

Is there anyone who should not take supplements of iodine?

People with certain thyroid disorders—those that result in an overactive thyroid gland (leading to hyperthyroidism)—are often recommended by their doctor to have low iodine diets. Individuals with a family history of thyroid disorders, or who have an existing thyroid problem, may need to take special care and seek medical advice from their doctor.

Why is iodine status apparently changing in Australia and New Zealand?

A number of reasons have been suggested to explain why iodine status appears to be declining. These include:

1. Declining use of iodised salt, due to a low level of public awareness of the importance of iodine, and also due to greater awareness of the health benefits of reduced salt intake;
2. Changing food consumption patterns, including a greater consumption of manufactured refined foods (possibly including a reduction in the consumption of iodine-rich foods); and
3. Changes in food industry practices—in particular, reduced use in the dairy industry of iodine-based disinfectants after milking, although it is not known to what extent this change has affected the iodine content of milk.

However there is insufficient evidence to conclude which (if any) of these explanations are significant for Australia. In fact, it is not even clear whether there has been a decline in iodine status in Australia in recent decades, or whether the marginal status has been longstanding. The reason for this uncertainty is that, unlike New Zealand, most Australian states do not regularly conduct surveys of iodine status or intake; nor do they regularly analyse for iodine content in foods. Further investigation is required to assess the extent of the problem of iodine deficiency in Australia.

What has been done about iodine deficiency in other countries?

Iodine deficiency is a massive health problem in over 133 countries worldwide. The simplest and most common strategy that has been adopted is iodine supplementation on a population level, using iodine fortification of all salt for human and animal consumption.

The World Health Organization, United Nations International Children's Fund (UNICEF) and other public health organisations endorse this strategy, which is aimed at achieving sustainable elimination of IDD. Alternative strategies that have been employed include the oral administration of iodised oil (in remote areas where salt iodisation is not feasible), iodised water, iodine tablets, and other food vehicles such as grain and dairy products. New methods are being tested, such as adding iodine to irrigation water in China and to sugar in Sudan.

What should Australia and New Zealand do regarding iodine?

There is some evidence that iodine intake has steadily declined in New Zealand, Tasmania and probably in mainland Australia. In view of the serious consequences for individuals and communities, this is a problem that should not be ignored. Policy makers are faced with the challenge of developing a solution that is appropriate for the population and the food industry. Simply iodising all salt for human consumption in Australia may not be the best solution for two reasons:

1. It may discourage people from reducing their salt consumption (and high salt intake is associated with increased risk of heart disease and stroke through raised blood pressure); and
2. A wide range of iodine consumption would result, because some people eat little salt and some people eat a lot.

Currently, most of the salt we get is through processed foods. Adding iodine to some of the more widely consumed foods may present a better solution (for example, the addition of iodine to bread improvers). However, supplementing salt with iodine for use in one food—bread—has been shown to be of benefit. In Tasmania, a voluntary program was trialled for several years, whereby commercial bread manufacturers were encouraged to use iodised salt in baking at an average level of 45 mg iodine per kg salt. This led to an improvement in the iodine status of a mildly deficient population.

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