

## Iodine Fact Sheet

### The need for iodine

Iodine is an essential mineral for normal thyroid function, mammary gland development, and foetal and infant neurological growth. Despite this, iodine deficiency is epidemic in developing countries, parts of Europe and the United States<sup>1</sup>. This deficiency is largely responsible for an epidemic of hypothyroid-linked illnesses and breast cancer. Such illnesses are being successfully treated with high dosages of iodine equivalent to the Japanese daily intake, which are particularly high as a consequence of a diet of seafood and seaweeds. These levels of iodine intake are 50-fold greater in Japan than in the US<sup>2</sup>.

In the UK, 76%<sup>3</sup> of school aged girls and 66% of adult women<sup>4</sup> are iodine deficient

The cost of iodine deficiencies can be significant with, for example, Germany spending one billion dollars annually in both healthcare expenditures and lost work time as a result of iodine deficiency and resultant thyroid disease<sup>5</sup>.

### Sources of iodine

The oceans are the worldwide repository of iodine; very little of the earth's iodine is actually found in soil. Within the natural environment, iodine is found in various forms (table 1):

- inorganic sodium and potassium salts (iodides and iodates),
- inorganic diatomic iodine (molecular iodine, I<sub>2</sub>),
- organic monoatomic iodine

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<sup>1</sup> Patrick L. (2008) Iodine: Deficiency and Therapeutic Considerations. *Alternative Medicine Review* Volume 13, Number 2

<sup>2</sup> Miller (2008) Iodine – high doses treat the thyroid, breast disease and cancer. *Caduceus*, Issue 75, P 18

<sup>3</sup> Vanderpump MP et al. (2011). Iodine status of UK school girls: a cross-sectional survey. *Lancet* 377(9782):2007–2012

<sup>4</sup> Combet et al. (2011) Unpublished. University of Glasgow Medical School, pilot study

<sup>5</sup> Gutekunst R. Iodine deficiency costs Germany over one billion dollars per year. *IDD Newsletter* 1993;9:29-31. (cited in Patrick 2008)

Table 1: Sources of iodine:

Soil	
$\text{NaIO}_3$	Sodium iodine
$\text{NaIO}_4$	Sodium periodate
Seaweed/micro algae	
KI	Potassium iodide
NaI	Sodium iodide
$\text{I}_2$	Iodine
$\text{I}^-$	Iodide
Seawater	
$\text{I}^-$	Iodide

Seaweeds, widely consumed in Asian cultures, contain high quantities of iodine in several chemical forms, including iodine in the molecular form ( $\text{I}_2$ ) and iodine organified to proteins. These forms of iodine are absorbed through the intestinal tract via two different mechanisms:

- 1) Molecular iodine ( $\text{I}_2$ ) is transported by facilitated diffusion.
- 2) Iodides ( $\text{I}^-$ ) are absorbed via a transport protein in the gastric mucosa called the sodium-iodide symporter, a molecule found in a variety of tissues in the body that utilise and concentrate iodine<sup>6</sup>

### Iodine in seaweeds

Depending on the species, seaweeds can have 10–100 times higher mineral content, such as iodine, than land-based vegetables<sup>7, 8</sup>.

The species of seaweed used by Seagreens® have relatively moderate and highly beneficial levels of iodine in their naturally occurring forms. These species include *Ascophyllum nodosum*, *Fucus spiralis*, *Fucus vesiculosus*, and *Pelvetia canaliculata* which have been

<sup>6</sup> Spitzweg C, Harrington KJ, Pinke LA, et al . Clinicalreview 132: the sodium iodide symporter and its potential role in cancer therapy. J Clin Endocrinol Metab 2001;86:3327-3335.(cited in Patrick 2008)

<sup>7</sup> Arasaki S, Arasaki T (1983) Low calorie, high nutrition vegetables from the sea to help you look and feel better. Japan Publications, Tokyo, 196 pp (cited in Holdt & Kraan (2011))

<sup>8</sup> Nisizawa K (2002) Seaweed Kaiso, bountiful harvest from the seas. Sustenance for health and well-being by preventing common lifestyle related diseases. Kochi University, Kochi, 106 pp (cited in Holdt & Kraan (2011))  
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authorised for human consumption in France, the only country to date to define which species can be eaten<sup>9</sup>.

Following from the requirements and health benefits of iodine discussed above, research has demonstrated that Japanese women who consume a traditional high-seaweed diet also have a low incidence of benign and malignant breast disease<sup>10,11</sup>. On the contrary, Japanese women who consume a Western diet low in seaweed or who emigrate to the United States lose this protective advantage and gain the same risk for fibrocystic breast disease and breast cancer as their Western counterparts<sup>12,13</sup>. Furthermore, Japan also has a low incidence of iodine-deficiency goiter and autoimmune thyroiditis<sup>14</sup>. Consequently, it has been hypothesized the amount of iodine in the Japanese diet has a protective effect for breast and thyroid disease<sup>15</sup>.

This antioxidant effect of iodine may explain the therapeutic effects of seaweed baths or iodine-rich solutions known as thalassotherapy used historically to treat ocular diseases, thyroid disease, diabetes, cardiac and respiratory disease, and arteriosclerosis<sup>16</sup>.

Overall, seaweeds form an essential source of natural iodine, being described as an ideal food-safe natural source of the mineral iodine<sup>17</sup>. Iodine is proven to be highly beneficial in the diet, and significantly deficient in western diets.

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<sup>9</sup> Burtin P (2003) Nutritional value of seaweeds. *Electron J Environ Agric Food Chem* 2:498–503 (cited in Holdt & Kraan (2011))

<sup>10</sup> Pisani P, Parkin DM, Bray F, Ferlay J. Estimates of the worldwide mortality from 25 cancers in 1990. *Int J Cancer* 1999;83:18-29. (cited in Patrick 2008)

<sup>11</sup> Cann SAH (2006) Hypothesis: dietary iodine intake in the etiology of cardiovascular disease. *J Am Coll Nutr* 25:1–11

<sup>12</sup> LeMarchand L, Kolonel LN, Nomura AM. Breast cancer survival among Hawaii, Japanese, and Causcasian women. Ten-year rates and survival by place of birth. *Am J Epidemiol* 1985;122:571-578.(cited in Patrick 2008)

<sup>13</sup> Minami Y, Takano A, Okuno Y, et al. Trends in the incidence of female breast and cervical cancers in Miyagi Prefecture, Japan, 1959-1987. *Jpn J Cancer Res* 1996;87:10-17. (cited in Patrick 2008)

<sup>14</sup> Konno N, Yuri K, Miura K, et al. Clinical evaluation of the iodide/creatinine ratio of casual urine samples as an index of daily iodide excretion in a population study. *Endocr J* 1993;40:163-169. (cited in Patrick 2008)

<sup>15</sup> Cann SA, van Netten JP, van Netten C. Hypothesis:iodine, selenium and the development of breast cancer. *Cancer Causes Controls* 2000;11:121-127.(cited in Patrick 2008)

<sup>16</sup> Smyth PA. Role of iodine in antioxidant defence in thyroid and breast disease. *Biofactors* 2003;19:121-130 (cited in Patrick 2008)

<sup>17</sup> Teas J. Dietary brown seaweeds and human health effects. Section 9. *Advances in applied phycology utilisation*. In: Critchley AT, Ohno M, Largo DB. eds. *World Seaweed Resources*. Amsterdam, ETI Bioinformatics 2006 (cited in MacArtain et al (2007))

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## Seagreens specific information

Seagreens® *Ascophyllum nodosum* is sourced from the Scottish Outer Hebrides, and the highest of Seagreens®' species in terms of iodine levels.

The iodine levels are typically **712mcg iodine per 1g Seagreens® *Ascophyllum nodosum***

With the reported range of iodine in the average Japanese diet being between 5.3mg and 13.8mg of iodine per day, this equates to between 7.5 and 20g of Seagreens® per day, assuming no iodine from elsewhere in the diet.

This far exceeds the conservative 140mcg Reference Nutrient Intake<sup>18</sup> in the UK, where 66% of adult women are iodine deficient.

Consequently, within a balanced diet consisting of other iodine sources, an intake of between 1 to 4.5g of seaweed per day (the Seagreens® ambition for the UK) would provide a healthy daily dose of iodine, meeting the UK RNI and contributing to the healthy higher levels of iodine intake seen in Japan.

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<sup>18</sup> Reference Nutrient Intake (RNI) is the amount of a nutrient that is enough to ensure that the needs of nearly all the population (97.5%) are being met  
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