

## Message to Healthcare Colleagues on Dietary Iodine Intake in Hong Kong Adults

### Part 1 – Background information

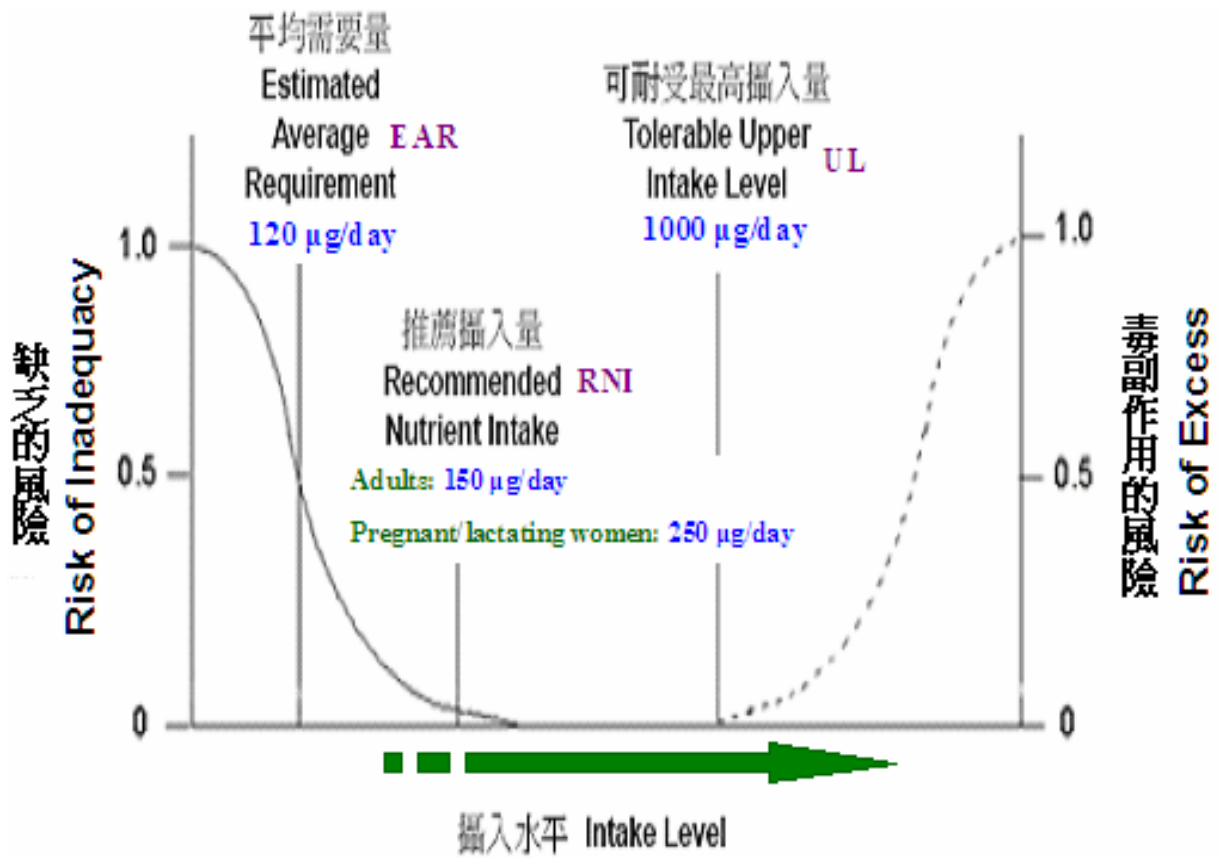
#### (A) Iodine and health

1. Food, including water, is a major source of iodine intake. The iodine content of foods reflects, to a certain extent, its level in the environment (e.g. soil, seawater). Naturally, foods such as seaweeds, seawater fish and shellfish are relatively rich in iodine. Vegetables, fruits and cereals are usually poor dietary sources of iodine.
2. Iodine is an essential micronutrient required for normal thyroid function, growth and development. Its deficiency and excess intake both have adverse consequences on the body through effects on the thyroid gland. The thyroid gland requires trapping about 50-75 micrograms ( $\mu\text{g}$ ) iodine daily to maintain an adequate supply of thyroid hormones. When daily iodine intake is below 50  $\mu\text{g}$  threshold, goitre may develop.
3. Iodine is essential for the synthesis of thyroid hormones (i.e. thyroxine  $\text{T}_4$  and triiodothyronine  $\text{T}_3$ ) by the thyroid gland. These hormones play a major role in the growth and development of the brain and central nervous system, and control several metabolic processes.
4. Across the life-span, inadequate thyroid hormone production due to insufficient iodine intake is associated with a range of adverse health effects collectively termed as Iodine Deficiency Disorders (IDD), including damage to the developing brain, goitre (an enlarged thyroid), cretinism (severely stunted physical and mental development), hypothyroidism, and varying degrees of other growth and developmental abnormalities. People living in areas affected by severe iodine deficiency may have an intelligence quotient (IQ) of up to 13.5 points below that of those from comparable communities in areas where there is no iodine deficiency. Pregnant/lactating women and infants/young children are particularly vulnerable to IDD.

#### (B) Dietary iodine intake recommendations

1. The United Nations Children's Fund (UNICEF), International Council for Control of Iodine Deficiency Disorders (ICCIDD) and the World Health Organization (WHO) recommend that the daily intake of iodine at 150  $\mu\text{g}$  for adolescents/adults and 250  $\mu\text{g}$  for pregnant/lactating women. WHO opined that for healthy adults, daily iodine intakes of up to 1,000  $\mu\text{g}$  appear to be entirely safe.
2. The Chinese Nutrition Society has set the estimated average requirement (EAR), the recommended nutrient intake (RNI), and the tolerable upper intake levels (UL) of iodine at 120, 150 and 1,000  $\mu\text{g}/\text{day}$  respectively for Chinese adults aged 18 years and above. The Chinese RNI and UL levels are in line with those recommended by WHO.
3. The EAR is the average daily nutrient intake value that meets the needs of 50% of the healthy individuals in a particular age and gender group. The RNI is the daily intake, set at the EAR plus 2 standard deviations, which meets the nutrient requirements of almost all (97.5%) apparently healthy individuals in an age- and gender-specific population group. The UL of nutrient intake is defined as the maximum intake from food, water and supplements that is unlikely to pose risk of adverse health effects from excess in almost all apparently

healthy individuals in an age- and gender-specific population group. The range of intakes between RNI and UL should be considered sufficient to prevent deficiency while avoiding toxicity.



**Part 2 – Centre for Food Safety (CFS)’s “Dietary Iodine Intake in Hong Kong Adults” Study**

(A) Iodine in foods

- The study found that locally available foods such as seaweeds, iodised salt, crustaceans and molluscs, egg & egg products, milk & milk products including frozen confections, fish, and sashimi & sushi contain higher iodine content than meat and poultry, cereals & grains products, legumes and vegetables, and non-alcoholic beverages.

Food group	n	Iodine level (µg/kg)	
		Mean [Range]	Median
<b>Seaweeds</b>	<b>18</b>	<b>460,000 [840-2,900,000]</b>	<b>38,000</b>
<b>Condiments &amp; sauces</b>	<b>24</b>	<b>3,900 [4-36,000]</b>	<b>94</b>
▪ <i>Iodised table salt</i>	3	30,000 [26,000-36,000]	29,000
▪ <i>Non-iodised table salt</i>	3	120 [56-240]	78
▪ <i>Other sauces</i>	18	110 [4-440]	82
<b>Crustaceans and Molluscs</b>	<b>39</b>	<b>970 [32-6,100]</b>	<b>490</b>
▪ <i>Crustaceans</i>	12	1,200 [230-6,100]	490
▪ <i>Molluscs</i>	27	880 [32-4,200]	590
<b>Egg &amp; egg products</b>	<b>12</b>	<b>490 [82-2,300]</b>	<b>260</b>
▪ <i>Egg yolks</i>	3	1,200 [200-2,300]	1,100
▪ <i>Whole eggs</i>	9	250 [82-430]	250
<b>Milk &amp; milk products including Frozen confections</b>	<b>40</b>	<b>340 [40-2,000]</b>	<b>240</b>
▪ <i>Milk</i>	17	420 [55-2,000]	280
▪ <i>Cheese</i>	9	420 [160-1,400]	240
▪ <i>Others</i>	14	180 [40-300]	190
<b>Fish</b>	<b>78</b>	<b>190 [4-830]</b>	<b>130</b>
▪ <i>Seawater fish</i>	54	170 [50-600]	130
▪ <i>Freshwater fish</i>	9	12 [4-30]	9
▪ <i>Others</i>	15	360 [11-830]	360
<b>Sashimi &amp; sushi</b>	<b>12</b>	<b>86 [28-140]</b>	<b>91</b>
<b>Meat and Poultry</b>	<b>12</b>	<b>42 [ND-480]</b>	<b>3</b>
<b>Cereals &amp; grains products</b>	<b>12</b>	<b>13 [3-68]</b>	<b>6</b>
<b>Legumes and Vegetables</b>	<b>12</b>	<b>8 [ND-28]</b>	<b>3</b>
<b>Non-alcoholic beverages</b>	<b>12</b>	<b>6 [ND-13]</b>	<b>5</b>
<b>Total</b>	<b>271</b>	<b>31,000 [ND-2,900,000]</b>	<b>130</b>

- The study also found that cooking had little to marked reduction on the iodine levels in foods, depending on the cooking method. However, when taking the weight changes into account, the relative amount of iodine in the raw and cooked portions was mostly constant except for boiling foods because iodine dissolved into the water. The results were also consistent with other studies that more iodine is lost in boiling than in stir-frying or in steaming.

(B) Estimated dietary iodine intake in the local adult population

1. The study found that the median iodine dietary intakes from the 11 food groups in adults were estimated to be 44 µg/day and around 59% of the population had iodine intakes below 50 µg/day, the threshold for normal thyroid functioning. Only 5% adult population had iodine intake at the safe range (i.e. sufficient to prevent deficiency while avoiding toxicity), 93% had intake below RNI (the risk of inadequacy) and 2% had intake above UL (the risk of toxicity).
2. The top 5 dietary iodine contributors were seaweeds (46%), sashimi & sushi (16%), non-alcoholic beverages & soups (11%), fish (8%) and crustaceans & molluscs (5%).
3. It is understood if the local population takes 5-10 g iodised salt a day, an extra 150-300 µg of iodine would be added to the diet, and the total dietary iodine intake would be above the RNI but below the UL.

**Part 3 – Key messages to patients**

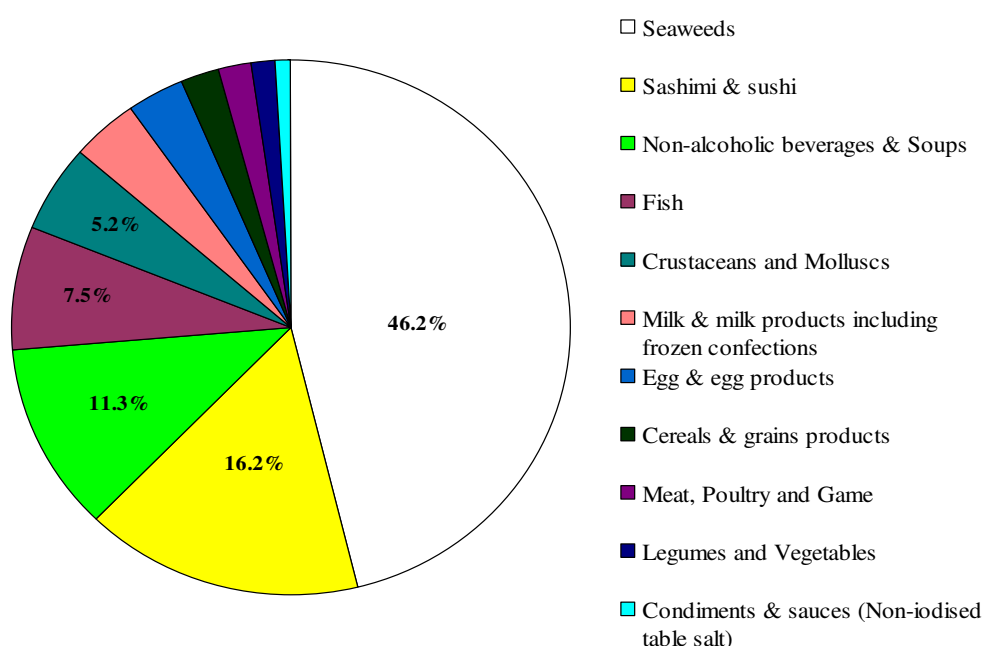
1. Eat a variety of high-iodine foods (e.g. seaweeds, seafoods, egg/egg products, milk/milk products) as part of a healthy balanced diet to ensure sufficient iodine intake.
2. Follow WHO recommendation on taking less than 5 grams of salt per day (which may be added with 20-40 mg iodine per kg of salt as recommended by WHO), and replace non-iodised salt with iodised salt.
3. To retain the maximum amount of iodine in foods, steam or stir-fry them with little oil, cook crustaceans intact, and add iodised salt just before serving the food.
4. Apart from the above advice, to prepare for pregnancy women should have adequate iodine intake. Pregnant/lactating women need additional iodine for their baby. If they cannot consume iodine rich food, they should seek advice from health professionals on choosing iodine supplements.

## Part 4 – Q&A

### (A) General

#### 1. Why Hong Kong people can access high iodine food (e.g. seafoods) easily but the dietary iodine intake is low?

- ✦ The dietary iodine intake depends on the amount of foods eaten and their iodine content. The Hong Kong Population-based Food Consumption Survey (2005-2007) showed that an average adult ate about 57g of fish daily. Assuming the fish had the average iodine content measured in this study (190µg/kg), the iodine intake from fish (11µg/day) is less than that from 2 litres of water (20µg/day).
- ✦ The estimated contribution of iodine intake from different food groups (mean 127 µg/day) are as below:



#### 2. Can the CFS study confirm that the local adult population have iodine deficiency?

- ✦ No. The determination of the presence or absence of iodine deficiency requires the integration of clinical, biochemical (such as urinary iodine (UI)) and nutritional data. Although the CFS' result suggests that the dietary iodine intake for the adult population is insufficient, we cannot conclude the iodine status of the adult population without local biochemical and clinical data.

#### 3. Can you give some practical examples on the amount of seaweed/ seaweed products one can eat so as to meet the daily iodine intake recommendations?

- ✦ There are many types of seaweeds 藻類 and products, e.g. laver or nori 紫菜 used in nori sheet for sushi, seaweed snack 零食紫菜, and agar agar 大菜 in desserts. They could be eaten in MODERATION. For example, about 2 small bags (1.1g seaweed per bag) OR 1 medium packet (2.5-3.0g seaweed per packet) of seaweed snack 零食紫菜 is enough to meet the iodine requirement of 150µg/day.
- ✦ However, some seaweeds contain very high levels of iodine, e.g. kelp 海帶, kombu 昆布, wakame 裙帶菜. Generally speaking, they are SAFE for adults if consumed in MODERATION, such as not more than once a week or so of one serving. The Food

Standards Australia New Zealand\* advises the public not to over consume these items for a long time as they can adversely affect thyroid function.

\* <http://www.foodstandards.gov.au/scienceandeducation/factsheets/factsheets2011/adviceonbrownseaweedforpregnantwomenbreastfeedingwomenandchildren27june2011/>

#### **4. What are the concerns about hijiki consumption?**

- ✦ Hijiki 羊棲菜(海草莖) is an uncommon kind of seaweed harvested mainly from seas off Japan and Korea. It is generally sold in dry and shredded form (short coarse strips) and is almost black in colour, and is commonly used as starter or appetiser in Japanese and Korean cuisines. Hijiki can also be used as an ingredient in salad, soup and vegetarian dishes. In Hong Kong, hijiki seaweed is usually sold in Japanese supermarkets and restaurants.
- ✦ Hijiki may contain arsenic naturally at high levels, especially the more toxic inorganic form. Exposure to high levels of inorganic arsenic has been linked with gastrointestinal effects, anaemia and liver damage. Consumers are advised:
  - To avoid consumption of hijiki and avoid choosing hijiki as food ingredient.
  - To choose foods from markets carefully in particular prepackaged ones by reading their labels to make sure they do not contain hijiki.
  - Except the hijiki variety, there is no need to stop eating other varieties of seaweed as they contain high levels of minerals and trace elements such as iodine that are beneficial to health.
- ✦ To find out more about hijiki and arsenic, please visit the CFS website at: [http://www.cfs.gov.hk/english/programme/programme\\_rafs/programme\\_rafs\\_fc\\_02\\_08.html](http://www.cfs.gov.hk/english/programme/programme_rafs/programme_rafs_fc_02_08.html)

#### **(B) Risk of excessive iodine intake**

#### **5. What is the maximum amount of iodine-rich foods (e.g. seawater fish, seaweeds) that one can consume which will not exceed the UL of iodine?**

- ✦ As estimated in the study, the high iodine intake (95<sup>th</sup> percentile) adults consumed 277 µg/day of iodine, i.e. about 30% of the UL. If 5-10 g/day iodised salt is included an extra 150-300 µg/day of iodine will be added to the diet, the total dietary iodine intake will still be within the safe range. The potential toxicity from dietary iodine intakes seems not a concern from the current assessment.
- ✦ Consuming iodine-rich foods as part of a healthy balanced diet shall be safe for most adults. However, individuals that already have thyroid problems and those used to very low iodine intakes for prolonged periods of time should avoid a sudden increase in iodine intake from iodine-rich foods. Furthermore, overindulgence of any foods should be avoided to prevent excessive iodine intake or other food safety hazards (e.g. some ready-to-eat seaweed snacks may have high sodium content, hijiki (a kind of seaweed) naturally contains very high levels of inorganic arsenic, large predatory seawater fish (e.g. tuna) may be contaminated with heavy metals such as mercury).

#### **6. What is the consequence of excessive iodine intake?**

- ✦ It is generally considered that intake of not exceeding 1000 µg iodine from diet daily would not cause adverse health effect to average adults. Excessive intake of iodine can cause thyroid disorders, including hypothyroidism and hyperthyroidism, especially in individuals that already have thyroid problems. The effects of high iodine intakes on thyroid function are variable and depend on the health of the thyroid gland. Very high intakes (e.g.

<p>exceeding UL) of iodine may inhibit thyroid hormone production. In patients with underlying thyroid disease, a sudden increase in iodine intake in those used to very low intakes for prolonged periods of time can produce iodine-induced hyperthyroidism or thyrotoxicosis.</p>
<p><b>7. What to do if I suspect that I am sensitive/ allergic to iodine?</b></p> <ul style="list-style-type: none"> <li>⊕ Very high iodine foods and supplements, such as some seaweed and kelp products may affect sensitive individuals but the forms of iodine used in iodised salt are too small by themselves to cause an allergic reaction. If you suspect increasing iodine intake causes your body to react badly, seek advice from doctor and obtain appropriate dietary advice on how to avoid consuming large amounts of iodine-rich foods and substances.</li> </ul>
<p><b>(C) Iodised salt and iodine supplements</b></p>
<p><b>8. Why some salt in the market is being iodised?</b></p> <ul style="list-style-type: none"> <li>⊕ Salt is recommended by WHO as a vehicle for iodine fortification for the general population. In some countries (especially developing countries), the population intake of iodine is relatively low. Salt iodisation is mandatory or recommended in these countries to prevent the risk of iodine deficiency of the population. The choice of using salt as a vehicle is based on the following factors: <ul style="list-style-type: none"> <li>● salt is one of the few commodities consumed by everyone;</li> <li>● salt consumption is fairly stable throughout the year;</li> <li>● salt production is usually limited to a few geographical areas;</li> <li>● salt iodisation technology is easy to implement and available at reasonable cost;</li> <li>● the addition of iodine to salt does not affect its colour, taste or odour; and</li> <li>● the quality of iodised salt can be monitored at the production, retail and household levels.</li> </ul> </li> </ul>
<p><b>9. Will the consumption of iodised salt cause thyroid cancer?</b></p> <ul style="list-style-type: none"> <li>⊕ Currently, there is no scientific evidence showing that iodised salt is a causative agent of thyroid cancer.</li> </ul>
<p><b>10. Must all salt in the market declare the iodine content?</b></p> <ul style="list-style-type: none"> <li>⊕ If the salt has been fortified with iodine, it must be clearly stated on the label. However, there is no requirement for declaring the amount of iodine added. CFS therefore, encourages the trade to label its iodine content for the public to make an informed choice.</li> </ul>
<p><b>11. How do I know if iodised salt has been added to foods?</b></p> <ul style="list-style-type: none"> <li>⊕ This information will be available in prepackaged foods if the trade indicate it on the food label voluntarily. For unpackaged foods or restaurant foods, this information may be available on request.</li> </ul>
<p><b>12. Where can I get iodised salt in HK? Is it more expensive than non-iodised salt?</b></p> <ul style="list-style-type: none"> <li>⊕ Prepackaged iodised salt is generally available in supermarkets, although it has fewer varieties/ brands than the non-iodised salt at the moment. The price varies among brands and shops, and on a per 100g basis the price is similar to non-iodised salt.</li> </ul>
<p><b>13. Does sea salt contain similar iodine content as iodised salt?</b></p> <ul style="list-style-type: none"> <li>⊕ In the CFS's study, the iodine content of non-iodised (56-240 µg/kg) and iodised</li> </ul>

(26,000-36,000 µg/kg) table salt was measured in a limited number of samples. We do not have the iodine content in non-iodised sea-, rock- or low-sodium salts. Since iodine is a constituent of sea water, it is often incorrectly assumed that sea salt contains sufficient iodine for nutritional purposes. However some overseas food safety authorities found that non-iodised sea-, rock- or low-sodium salts (e.g. 1-2mg/kg) contained about much less iodine than the iodised salts (e.g. 32-64mg/kg).

**14. How to prevent the iodine loss in iodised salt during storage and cooking?**

- ⊕ Iodine in the iodised salt will be lost due to moisture, humidity, exposure to heat and sunlight, and so on. To retain the maximum amount of iodine in salt,
  - add iodised salt just before serving the food, and
  - store iodised salt in a tight, coloured container at a cool, dry place.

**15. Is there any health concern on iodised salt?**

- ⊕ Currently, there is no known adverse health concern on consuming iodised salt for the apparently healthy individuals, however people allergic/sensitive to iodine or with thyroid problems should seek doctor advice prior to consuming iodised salt.

**16. What are the adverse effects of consuming too much salt?**

- ⊕ Consuming 5-10 g/day iodised salt will add an extra 150-300 µg/day of iodine to one's diet, however excessive intake of salt is not recommended. Many studies revealed that excessive intake of salt could lead to hypertension (high blood pressure) and increased risk of cardiovascular disease. In order to prevent chronic diseases, WHO recommended that salt intake should not exceed 5g/day.

**17. Should supplements containing iodine be recommended to consumers?**

- ⊕ Care needs to be taken when considering iodine supplementation as it may lead to an intake of iodine beyond the UL (1000 µg/day). For children and the general population, iodine supplements are generally not recommended unless consulted with the medical professionals. As iodine is especially important for the foetus and young children, besides eating foods which are important sources of iodine and using iodised salt in the diet, women who are pregnant, lactating or considering becoming pregnant should ask their doctor or dietitian for advice on their individual needs of iodine supplements.

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