

**A survey of UK centres on low iodine diet recommendations prior to radioiodine ablation therapy for differentiated thyroid cancer**

**Supplementary documents.**

**1) The UK Low Iodine Diet Sheet (p 2 – 4)**

**2) UK Low Iodine Diet Working Group Supporting Documents (p 5 – 12)**

**3) Survey items (p 13 – 14)**

# The Low Iodine Diet

This diet is suitable for people who are to be treated with radioactive iodine. This information leaflet explains the reasons for limiting foods that are high in iodine and suggests low iodine alternatives.

## **Why follow a low iodine diet?**

A diet which is rich in iodine could interfere with your radioactive iodine treatment. A low iodine diet aims to reduce your iodine intake before your treatment and helps to maximise your body's uptake of the radioactive iodine when you receive your treatment. It is not possible or necessary to follow a no iodine diet.

## **Where is iodine found?**

Iodine is found in many foods in varying amounts. It is essential for good health. The richest sources are foods from the sea as well as dairy produce and eggs. In some countries iodine is added to salt. This does not happen in the UK, therefore it is fine to use ordinary table salt, but best to avoid imported food items

## **How long should the low iodine diet be followed for?**

The diet is for a short time only. Evidence suggests that a duration of one or two weeks is sufficient.

Please start your diet on: \_\_\_\_\_

After you have received the radioactive iodine treatment you can return to your normal diet.

## **What if I eat something high in iodine by mistake?**

Eating a high iodine food accidentally is unlikely to affect your treatment, just carry on with the low iodine dietary advice provided here.

## **Should I look on the internet for further information?**

No, most internet information suggests avoiding all foods that contain salt. This is not necessary in the UK.

If you have any questions or queries please contact: \_\_\_\_\_

If you are taking nutritional supplements please contact your dietitian.

# The Low Iodine Diet

## Low iodine foods you can eat freely

- ✓ Fresh/frozen fruit and vegetables, including potatoes
- ✓ Cooked green vegetables like spinach and broccoli
- ✓ Fresh/frozen meat
- ✓ Ordinary table salt and sea salt
- ✓ Rice and dried pasta
- ✓ Fresh bread (including fresh sliced bread)
- ✓ Non dairy spread such as Vitalite or Pure or Flora non-dairy
- ✓ Olive oil, vegetable oils and nut oils
- ✓ Water, soft/fizzy drinks, fruit juices & alcoholic drinks
- ✓ Tea and coffee without milk
- ✓ Milk substitutes such as rice, coconut, almond or soya milk (please check labels for ingredients and avoid brands that contain carrageenan which is a seaweed derivative)
- ✓ Dark/plain chocolate with a minimum of 70% cocoa
- ✓ Crisps

## Foods which should be limited

- Milk - limit to a maximum of 25ml per day which could be used in tea and coffee (i.e. about 5-7 teaspoons of milk per day)
- Butter - limit to a very thin scraping (one teaspoon or 5g) per day
- Cheese - one ounce or 25g once per week
- Dairy produce like yoghurt, dairy ice cream etc (limit to one portion per week)
- Egg - one per week only
- Egg containing products like mayonnaise, custard, fresh egg pasta, egg fried rice, pancakes, Yorkshire puddings etc.

## High iodine foods which should be avoided

- ✗ Fish, seafood, seaweed, kelp, laverbread
- ✗ Raw green vegetables like spinach or broccoli
- ✗ Cakes and biscuits containing butter and eggs
- ✗ Milk chocolate and white chocolate
- ✗ Take away- meals and fast foods/restaurant foods (as ingredients are unknown)
- ✗ Iodised salt and Pink Himalayan salt if imported/bought outside the UK
- ✗ Vitamins and mineral supplements, nutritional supplements and cough mixtures (unless prescribed by your medical team, for example vitamin D)

# The Low Iodine Diet

## Meal suggestions

### Breakfast

- Toast with non dairy spread and marmalade, jam, honey, marmite
- Porridge made with water or milk substitute (specific brands cannot be suggested as ingredients might be changed over time by the producer), topped with fruit, honey or syrup
- Cereals with water or milk substitute
- Fresh fruit or fruit salad or Grapefruit cocktail
- Cooked breakfast (without eggs) such as bacon, sausages, tomatoes, mushrooms, hash browns, baked beans, toast

### Lunch

- Sandwich made with non dairy spread filled with ham, chicken, bacon or quorn and salad
- Salad (such as cucumber, lettuce, tomato, avocado, sweetcorn, peas) with olive oil and vinegar (no raw spinach or raw broccoli) topped with chicken breast
- Jacket potato (without butter) with baked beans or chilli con carne
- Beans or tinned tomatoes on toast
- Soup (without cream, butter or milk) with bread
- Couscous with meat, chicken or chickpeas and vegetables such as roasted peppers, courgettes, tomatoes

### Dinner

- Spaghetti Bolognese
- Pork or lamb chops with potatoes and vegetables
- Steak served with roasted mushrooms, grilled tomatoes, chips or jacket potato
- Roasted meat, vegetables and roasted potatoes with gravy
- Chicken, meat, Quorn or tofu stir fry with vegetables and rice
- Stewed meat (chicken, beef, lamb or pork) with potatoes, carrots and swede
- Chilli con carne with rice and peas
- Jacket potato (without butter) with baked beans, ham or chicken and salad
- Sweet and sour chicken with rice
- Risotto (without cheese) with chicken, butternut squash, peas and sweetcorn
- Curry dishes without cream

### Snacks & Puddings

- Tinned or fresh fruit, stewed or poached fruit
- Jelly, sorbet, meringue
- Soya dessert or soya yoghurt
- Dairy free custard or single cream alternative
- Vegetable crudities and homemade avocado dip (guacamole) or soya plain yoghurt & mint sauce
- Nuts (maximum 30g/1oz per day)
- Sweet or salted popcorn
- Potato crisps or rice cakes
- Dark chocolate

## Supporting Document for Low Iodine Diet

By United Kingdom (UK) Low Iodine Diet Working Group 2016 (Version 1)

### Rationale

The British Thyroid Association (BTA) guidelines recommend a low iodine diet (LID) for the management of thyroid cancer (2014). However, there is no consensus regarding duration and dietary strictness of the LID to ensure its effectiveness.

Evidence to support guidelines is limited. Many have been written pre 2000 using methodology viewed to be out-dated. More recent studies from Asia refer to a diet that is generally different from a traditional UK diet. We considered minority groups within the UK who may also follow different diets consistent with their culture and ethnic traditions. Sawka et al (2010) suggest that it is impossible to ascertain the potential impact of regional and geographical variations with regards to dietary iodine intake and food production. Consideration must be given to these factors, however, in any recommendations.

Some observations from the studies which were reviewed have to be highlighted:

- It is uncertain whether a LID will lead to better clinical outcomes in the long term.
- Only limited data is available on the effects of LID on the effective treatment of distant metastases.

Available studies use certain absolute criteria to measure and evaluate the outcome, e.g. a urinary iodine excretion (UIE) of <50µg/l of iodine. Yet the question remains untested whether a relative reduction in iodine intake for each individual (e.g. by 50% compared to their usual intake) would be equally effective.

A number of psychological observations have been considered. Firstly, the LID is often the only part of the thyroid cancer treatment that is within the control of the patient, so this can be a positive aspect for some. It can however also contribute to stress and angst for a patient that they might 'get it wrong' and jeopardise their treatment. Professionals and thyroid cancer support organisation staff are regularly faced with patients who are worried about the LID in terms of extent and content as well as conflicting advice. By trying to standardise the approach across the UK the group hopes to minimise this concern and allow outcomes to be assessed more easily.

What seems most important is to ensure appropriate dietary education for the LID i.e. why, how and "what if?".

In summary:

- Keep it simple!
- Emphasise – this is a low iodine diet, not a no-iodine diet
- Emphasise that the diet is advised to help and support treatment, but the success of radioiodine ablation (RAI) is not determined by it.
- Be positive – emphasise what a patient can eat.
- Stress that it is not a no-salt diet.
- Focus on the priorities for that individual, not the minute detail of what is allowed and what is to be avoided.

## **Duration**

The reported duration of a LID in research studies ranges from 4 days to 4 weeks which limits the comparison of results (*Tomoda et al 2005; Park et al 2004* as quoted by *Sawka et al 2010*). Both studies report a lower urinary iodide excretion following two weeks of LID compared with one week of the diet. In contrast, a more recent study by Lee et al (*2014*) has shown no clinical difference in outcome following a LID for one week. The BTA guidelines suggest compliance with a LID for a one to two week duration. Therefore the advice for patients is to follow the local policy in their cancer centre, whether this is a one week or two week duration.

No evidence was found examining the effect of the time of restarting the normal diet on the outcome of RAI. It is known that the initial uptake of radioiodine is very prompt, with further uptake over the next 24 – 48 hours. In clinical practice patients are asked to abstain from food and drink for at least one hour post administration of the radioiodine capsule to minimise the risk of vomiting. Hereby absorption will commence unhindered within this first hour and good uptake is facilitated.

Following a change in local practice from continuing the LID during the inpatient stay to recommencing a normal diet once the radioiodine capsule had been administered, a clinician at one UK centre has reported no evidence of reduced uptake or a decline in successful outcome. However, a significant improvement in the psychological welfare of inpatients being allowed a normal diet was noted.

A practical consideration is the lack of specific LID-compliant menu options whilst in hospital and the stress it causes patients when inadvertently offered a non compliant LID menu. Continuation of the LID until discharge after RAI could result in patients needing to bring in their own food (e.g. milk alternatives) and potentially risk poor nutrition during their inpatient stay. A pragmatic approach, whereby a normal diet is resumed following the administration of the radioactive iodine, seems reasonable and offers the best clinical and emotional outcome. Resuming a normal diet in hospital can also promote the patients' well being, especially as they are dealing with the inherent challenges of being in isolation.

## **Contentious food items**

Throughout the UK discrepancy exists amongst numerous food items. We looked at available evidence in order to provide more clarity.

### ***Dairy produce and eggs***

The UK diet is typically rich in dairy components that may contain high amounts of iodine (*McCance and Widdowson 2002*). Reducing daily consumption of dairy produce in the diet would impact significantly on the total amount of iodine in the diet.

### National daily iodine intake in Adults

	Men 19-64 yrs old	Men 65+	Women 19-64yrs old	Women 65+
Mean	180µg	213µg	160µg	188µg
Upper 2.5%	369µg	427 µg	336µg	410µg
Lower 2.5%	58µg	72µg	51µg	71µg

Table 1 – Adapted from the National Diet and Nutrition Survey (2014)

The recommended nutrient intake for iodine is 140µg/day (*DoH 1991*). Milk and milk products are the largest contributors to this for all age groups (*National Diet and Nutrition Survey (2014)*). For adults aged 19 to 64 years this amounts to 33% of their daily iodine intake. Cereals and cereal products provided 10-17% of iodine intake across the age groups. Adults derived 11-15% of their intake from fish and fish dishes and 5-10% from alcoholic beverages.

A number of studies have examined the role of dairy products in the LID. In the Netherlands Pluijmen's study (2003) proposed a urinary iodide excretion of 49.4µg/L when patients followed a LID incorporating one glass of milk per day, cheese 20 g/day, unsalted butter and margarine. They reported that it improved the efficacy of RAI treatment. Sohn (2013) reported that only urinary iodine concentration >250µg/gCr (which represents excessive iodine intake and equals 518µg/l urinary iodide excretion) led to poorer ablation outcomes. Their LID specifically excluded dairy products. Based on their results they suggest that a regionally modified LID would be adequate in preparing the patient for RAI.

It is important to note the iodine content for a number of dairy items in terms of their typical servings:

- Iodine content of milk is 30µg/100g.
- An average serving of milk in a mug of tea/coffee is 30g (approximately 10µg iodine).
- A splash of milk (catering milk portion) is 15g (approximately 5µg iodine).
- Two teaspoons of milk amount to 10ml of fluid, so contain 3µg of iodine.
- Cheese – a small matchbox sized piece is a 20 g portion. This contains up to 9µg of iodine depending on the type of cheese.
- Milk chocolate has 30µg iodine per 100g. Based on an average bar of 50g, this would be 15µg iodine. This is the same amount of iodine as 3 drinks/day made with a splash of milk.
- One cooked egg yolk has 25µg iodine.

In terms of potential risks relating to calcium deprivation, a LID should not affect serum calcium levels significantly due to its short duration. For patients with notable hypocalcaemia, endocrinological advice should be sought.

As dairy products are important components of the UK diet, it could be difficult for patients to maintain a dairy free diet by either eliminating dairy produce or replacing it with non-dairy alternatives completely. Therefore we agreed that allowing a small amount of milk (2 teaspoons maximum) in 2- 3 mugs of tea or coffee per day and the occasional treat of dairy produce would support adherence and compliance.

### **E 127**

Previously, it has been common practice to avoid the food additive Erythrosine (E127) due to its high levels of bound iodine. In the UK, E127 is only allowed in certain cherries, but not in tinned strawberries or other tinned food items. It can be found in the coating of some drug capsules (e.g. some pain killers and some codeine preparations).

Prestwich et al (2004) however clarified that the bioavailability of the iodine in E127 is limited and its impact therefore negligible. There is therefore no need to avoid foods containing E127.

### **Cough mixtures**

Some cough mixtures contain potassium iodide, which may be taken up by the thyroid gland. Therefore its use should be limited and alternative medication during the LID period should be discussed with the medical team who are treating the patient.

### **Vitamin and mineral supplements**

Many of these contain cod liver oil, seaweed/kelp or iodine. Due to the large number of available supplements it is impractical to list them individually. In the interests of simplicity and to ensure an easy to follow guide for the LID, we suggest avoiding them, with the exception of prescribed Vitamin D preparations.

### **Nutritional supplements**

Some nutritional supplements contain high amounts of iodine. If a patient requires these, the advice of a dietitian should be sought regarding the most appropriate supplement.

### **Sea salt**

Prestwich et al (2004) examined the available evidence on sea salt and found that it was very low in iodine (1.2-1.4µg iodine/g of non-iodised sea salt). During the crystallisation process of sea salt the iodine is left selectively in the sea water (Geertman et al 2000).

Therefore we reiterate Prestwich's conclusions (Prestwich et al 2004) that there is no need to avoid sea salt. An exception is sea salt bought outside the UK, where it is known to be possibly iodised. The patient dietary education needs to be explicit in its avoidance. Furthermore, pink Himalayan salt, if processed outside the UK, may also be iodised and is hence to be avoided.

### **Soya**

A few animal studies exist that examine the effect of soy isoflavones on thyroid hormone homeostasis though results are contradicting in relation to thyroid hormone levels. To date no research exists examining the possible interference with radioiodine uptake in patients with a high intake of soya. Schröder et al (2004) suggest that exposure of human follicular thyroid cancer cells to certain flavonoids led to an increased efflux of radioiodine from the cells while one flavonoid led to increased retention. Clearly, there is a need for further research. Based on existing evidence the group cannot reject soy products in a LID .

The FSA lists soya products like soya milk, flour, yoghurt and sauce as having only very little iodine contents, hence there is no need to avoid soya, and it can be used to replace some dairy produce.

### ***Goitrogens***

There seems to be a misconception among some patients regarding the potential goitrogenic effects of green vegetables like spinach or broccoli. There is limited evidence to support these concerns. During the cooking process the goitrogenic effects are destroyed (*Mahan et al 2008*). Consumption of green vegetables is allowed as long as they are well cooked. If a patient consumes salad with raw vegetables, e.g. spinach or broccoli, caution should be advised for the LID period.

### ***Fish/seaweed***

Fish and fish products provide about 11-15% of the iodine intake of adults as established in the National Diet and Nutrition Survey 2008-2013 (*2014*). This pertains to saltwater fish and as such fresh water such as trout and salmon could be allowed. However, for the sake of simplicity and ease in compliance with the diet, we considered it best to advise avoidance of fish in general.

Seaweed also has a high iodine contents and should be avoided. Some non-dairy alternatives such as almond and coconut products (milks, yoghurts and cheeses) contain carrageenan which is a seaweed derivative. If patients choose these substitutes for dairy produce it is our advice to check the ingredient labels and avoid brands that contain carrageenan.

### ***Take aways/restaurant food/fast food***

While some food bought in restaurants will certainly be low in iodine, it would be impossible to ensure in general that only 'safe' ingredients are used. Therefore the recommendation to exclude these during the short period of having to observe a LID seems the safest and most practical option.

### ***Miscellaneous items***

*Marmite and Jaffa cakes* currently appear on some LID lists as they contain some iodine. However the amount consumed would be negligible so that they can be considered safe within a LID. There is variation in the dietary information for the inclusion of *alcoholic beverages* within a LID. There is no evidence (based on the Food Standard Agency data) for a need to restrict these and hence are also permitted in the BTA guidance.

### **Conclusion**

We propose a LID patient information sheet based on a traffic light format that shows easily the products allowed and those to be avoided. For the benefit of any patients with red/green blindness it is still in a format in which the different groups can be easily identified.

Whilst evidence-based guidance is generally preferred for current health care issues, this is only possible to a certain degree with regards to the LID as studies are limited in their scope and comparability. We have therefore endeavoured to review as many studies as available, but also other recommendations like the Food Standard Agency publication. We have focussed our review and considerations on guidance for adults only. Our discussions and comments are based on best available evidence, experience from practice and consensus amongst a multi professional team.

## References:

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## **Update - 2018**

By UK Low Iodine Diet Working Group 2018 (Version 2)

A low iodine diet (LID) is recommended as part of the preparation for radioiodine ablation, subsequent I-123/I-131 therapies and I-123/I-131 whole body follow up imaging for well differentiated thyroid cancers. This is based on studies from the 1970s onwards (*Goslings & Hannon 1973; Goslings 1975; Maxon et al 1983; Maruca et al 1984 – cited by Pluijmen et al 2002*) which showed an increase in uptake of radio iodine and in its effective half-life when patients followed a low iodine diet (LID). Hence the conclusion was made that such diet would enhance the treatment and lead to better outcomes.

However it remains unclear how strict the diet needs to be and what the most effective duration of the LID should be (including when to restart the normal diet) – (*Tomoda et al 2005, Park et al 2014 and Lee et al 2014 as cited by Sawka et al 2010*). Scientific evidence regarding the details of a LID is scarce and somewhat ambiguous.

There is widespread variation across the UK in the details of LID recommendations in cancer centres. Patients are known to search the internet for more information and follow recommendations on different food items. Much online information is based on US advice which due to the use of iodised salt in the US food industry makes this information less relevant here in the UK.

Many healthcare professionals who are involved in dietary support and advice for this patient group report frequent and significant struggles and uncertainties on behalf of patients. Over a period of 6 months there have been 11 new discussions started involving low iodine diet queries with a total of 61 comments from patients within the Macmillan online thyroid cancer forum alone. While this may be partially attributed to patient caution or misunderstanding, it highlights how helpful clear guidance would be.

Therefore, interested healthcare professionals were invited via the Thyroid Cancer Forum-UK, professional bodies (British Thyroid Association (BTA), British Nuclear Medicine Society (BNMS), British Dietetic Association (BDA)) and other routes to form a working group. The aim of the group was to review current evidence and propose a simplified, but adequate LID recommendation which is hoped to be accepted by clinicians UK wide. The group consisted of:

Haupt-Schott, Ingrid, *National Macmillan Thyroid Cancer CNS, Velindre Cancer Centre, Cardiff (project lead)*

Dr Boelaert, Kristien, *Reader in Endocrinology and Consultant Endocrinologist, Institute of Metabolism and Systems Research, University of Birmingham, Birmingham. British Thyroid Association Executive Committee Member.*

Cook, Jane, *Macmillan Dietitian, University Hospitals Coventry and Warwickshire*

Elliott, Deborah, *Head & Neck/Thyroid Cancer CNS, The Christie, Manchester*

Hamilton, Geri, *Macmillan Thyroid Cancer Information Nurse, Glasgow*

Howland, Deborah, *Specialist Dietitian, BDA Oncology Specialist Group, Torbay and South Devon NHS Foundation Trust, Torquay*

Lory, Carolyn, *Senior Sister, Therapy Lead Nuclear Medicine, Medway Maritime Hospital, Gillingham*  
Dr Moss, Laura, *Consultant Oncologist, Velindre Cancer Centre, Cardiff*  
Dr Speakman, Julie, *Principal Clinical Scientist, Nuclear Medicine, BNMS member, Royal Derby Hospital*

The group focussed in their review and discussions on guidance for adults only. The document below outlines some of the review, thinking and considerations which led to the final recommendations for a low iodine diet for adults in preparation for radioiodine treatment.

The first version was published in 2016 and this diet information has been adopted in several centres in the UK. We collected patient feedback in these centres via an anonymous questionnaire. We had 59 replies and they were overwhelmingly positive. Patients commented that this diet information was easy to follow and clear compared to previous information material they had been given.

We recently revised our first version of the LID recommendation. To date there appears to be no new research which would require any changes to the original recommendations. Several patient suggestions from the questionnaires were incorporated into our revised version (version 2).



Document endorsed by



The Association  
of UK Dietitians



## Survey items

Question	Response type
1. Does your centre administer radioactive iodine (I-131) as part of routine treatment following thyroidectomy for differentiated thyroid cancer?	Yes / No (If no, directed to end)
2. Approximately how many newly diagnosed people are treated with radioiodine for thyroid cancer in your centre per year?	Respondent asked to estimate number
3. Does your centre usually advise a low iodine diet prior to RAI therapy?	Yes / No
3a. If no: why not	Not aware of low iodine diet recommendations / No evidence of effectiveness / Patient burden / No way of checking compliance / Other
3a1. If you selected Other, please specify	Free text (Once answered, directed to end)
4. Does your centre advise a low iodine diet for all (or almost all) thyroid cancer patients prior to radioiodine ablation therapy?	Yes / No / Other
4a. If you selected Other, please give more details:	Free text
4b. If not everyone is asked to follow a low iodine diet, please estimate roughly how many patients are NOT asked.	Respondent asked to estimate number
4b1. What determines which patients are asked to follow a low iodine diet?	Estimate of iodine intake from diet history or questionnaire / Measurement of iodine status / other
4b1a. If you selected Other, please specify:	Free text
4b1b. If you assess iodine intake or iodine status, please indicate what cut-off you use	Free number
5. For how many DAYS do you advise people to follow a low iodine diet?	Free number
6. When are people advised to resume a normal diet?	On day of admission when I131 administered / 24 – 48 hours after I131 is administered / After whole body scan post ablation (if done) / Other
6a. If you selected Other, please specify:	Free text
6b. Does your centre offer a low iodine diet menu for in-patients?	Yes / No / Not applicable / Not sure
7. Does your centre use the UK Low Iodine Diet Working Group document (click here) as the basis for LID advice?	Yes / No / Not sure
7a. If no, why not? (tick all that apply)	Not aware of the working group suggestions / no evidence for effectiveness / Disagree with some of the information / Other
7a1. If you selected Other, please specify:	Free text

Question	Response type
7a2. If you disagree with some of the information, please give details	Free text
7a3. If you do not use the low iodine working group suggestions, what do you use?	In house diet sheet / Other website / Other
7a3a. If you selected 'Other websites' please give details (web address or organisation)	Free text
7a3b. If you selected Other, please specify:	Free text
8. Is patient compliance with the low iodine diet assessed?	Yes / No / Not sure
8a. How is compliance usually assessed (tick all that apply)?	Diet assessment (eg. using a checklist, food frequency questionnaire, food diary or formal 24 recall / No formal assessment, but patients are verbally asked if they followed advice / Urinary iodine measure / Other
8a1. If you selected Other, please specify:	Free text
8a2. If patients are not compliant with the low iodine diet advice is radioiodine ablation delayed?	Yes / No / Not sure
9. How well do you feel patients cope with following a low iodine diet?	Very well / Somewhat well / Not very well at all
9a. Use this space if you would like to say more about how patients cope with the low iodine diet	Free text
10. Does your centre routinely measure urinary iodine or iodine/creatinine ratio?	Yes / No / Not sure
10a. Do you measure it on:	All or almost all patients / Only specific patients
10a1. If you selected 'only specific patients', please give more details	Free text
10a1a. When do you measure urinary iodine / iodine creatinine ratio? (tick all that apply)	Prior to starting a low iodine diet (if applicable) / During low iodine diet (if applicable) / Immediately before planned ablation / Other
10a1a1. If you selected Other, please specify:	Free text
10a1a2. If during the low iodine diet, at what point?	Free text
10a1a3. How is this information used?	To assess compliance with a low iodine diet / For treatment planning purposes / Information is not used / Other
10a1a3a. If you selected Other, please specify:	Free text