



## Diet & Exercise

### Part 1: Reducing the Iron Absorbed from Food

Thalassaemia is a complex condition and the ideal diet would need to take account of many factors.

This article concerns the iron present in food and also discusses Antioxidants in food, diet for the prevention of Osteoporosis and Diabetes, Zinc in the diet and diet for children with thalassaemia.

In thalassaemia, although most of iron overload is due to blood transfusion, increased absorption of iron from the diet is also important. Only a small amount of iron from the diet is absorbed into our body. The amount absorbed is higher when haemoglobin in the blood is low. People with low haemoglobin such as those with thalassaemia intermedia or those with thalassaemia major, in-between transfusions could therefore adapt their diet so that not only the total amount of iron in their diet is low but also the amount of iron absorbed into their body is low.

There are two kinds of iron in the diet: iron which is present in red meat (Meat iron) and iron which is widely distributed in the diet (Non-meat iron).

#### Meat Iron

Meat iron is present in red meat such as beef, lamb and pork and the dark meat of chicken as well as in seafood such as sardines, cockles and mussels. Liver is a very rich source of meat iron. Try to cut down on these and perhaps substitute meat with soy protein. It is not, however, a good idea to exclude meat, chicken and fish completely from your diet because they contain other important nutrients, particularly for children. Choose the white part of chicken rather than red meat as it contains less iron.

On average, after a meal with red meat, about 35% of iron will be absorbed into our body. However, this may vary between 10-40%, depending mainly on whether the meal contains milk or milk products. The calcium, present in milk, cheese, yoghurt, cream decreases the absorption of meat iron. Try to drink a glass of milk with a meat-containing meal and to use milk in cooking. Good examples are the white cheesy sauces in lasagna, pasticcio, mousaka and cannelloni, adding lots of cheese in spaghetti bolognese and using yoghurt and milk to cook your curries.

Milk intake should be at least one pint daily, particularly because it helps to prevent osteoporosis, as it will be discussed later. If you are worried about your weight, semi-skimmed or skimmed milk are just as rich sources of calcium as whole milk.

## Non-Meat Iron

Non-meat iron is widely distributed in the diet, present in eggs, chocolate, cereals, vegetables, fruits roots (potatoes, parsnips), beans and lentils. In the UK several foods are fortified with iron, such as breakfast cereals, wheat flour and bread. However this may not be the case in other countries.

The absorption of non-meat iron from the diet into our body is much less than that of meat iron, but it may vary more than 20 fold, depending on the composition of a meal. The foods which decrease its absorption are: (i) cereals (ii) dairy products. The foods which increase its absorption are: (i) fruit and vegetables rich in vitamin C, (ii) meat, fish, shellfish and poultry and (iii) pickles, sauerkraut, soy sauce, vinegar and alcohol.

It is difficult to avoid taking non-meat iron because it is present in most foods. However, diet can be modified by taking more of the foods which decrease and less of the foods which increase the amount of iron absorbed into our body.

## Foods that decrease non-meat iron absorption

### 1. Cereals:



Wheat bran, maize, oats, rice and soy, decrease the iron absorbed into our body and fight the effect of vitamin C. Foods rich in vitamin C increase iron absorption. It is good to eat a lot of cereals in your diet, but remember not to take a vitamin C-rich food with them, like orange juice. Try to combine milk and cereals (e.g. cheese sandwich, French toast, macaroni cheese, cereals and milk). In the UK, all wheat flour other than wholemeal is required by law to be fortified with iron. The fortification of breakfast cereals is voluntary. It may therefore be better to choose unfortified wholemeal wheat flour and bread, and to look carefully at the label of your favorite breakfast cereal. Unfortified breakfast cereals include porridge oats and some cereals in health shops but look at the label to make sure you choose an unfortified variety. In other countries, flour and breakfast cereals may not be fortified. Is this a good excuse for more holidays abroad then?

Soy protein also decreases the amount of iron absorbed into your body. Soy protein can work well in many recipes (e.g. spaghetti bolognese, stews and casseroles) and the taste can be improved by adding spices.

### 2. Tea, coffee and spices.

Tea, coffee and some spices (e.g. oregano) decrease iron absorption. Drink plenty of tea and coffee daily, particularly with your meals. Better yet, if you take it with milk. Tea is also a very good source of antioxidants as will be discussed later. And, keep adding oregano to spice-up your souvlaki!

### **3. Dairy products.**

Milk, cheese and yoghurt decrease the iron absorbed into our body. Calcium is also important for osteoporosis, so it is good to include as many dairy products as you can in your diet. Lower fat varieties of milk (skimmed or semi-skimmed) and cheese are just as high in calcium and may be preferred if you are watching your weight. At least one pint of milk should be taken every day.

## **Foods that increase non-meat iron absorption**

### **1. Vitamin C.**



Vitamin C is present in fruit, fruit juice and vegetables. It is better to avoid drinking fruit juice, such as orange juice, with your meal or your toast in the morning. Instead, a cup of tea or coffee is better options as they inhibit iron absorption. Alternatively, have a glass of milk! Beer increases iron absorption so it is better to avoid drinking it with your meal too often, but you could always have it on its own with some nuts! Fruit and fruit juice are, however, good

sources of antioxidants and should be taken on their own as snacks. Boiled vegetables contain much less vitamin C because the vitamin leaks in the water.

### **2. Meat, poultry, fish and seafood.**

Meat, poultry, fish and seafood not only contain a lot of meat iron but they also help to absorb more of the non-meat iron from your food! It would be unwise, however, to omit them from the diet altogether as they contain other vital nutrients, particularly important for children and adolescents.

### **3. Pickles, sauerkraut, soy sauce, vinegar, alcohol.**

Sauerkraut, pickled onions, turnips and carrots as well as fermented soy products (e.g. miso and soy sauce) enhance iron absorption. The amount of iron absorbed is even higher when the pickled vegetables are added to bread and rye- containing meals.

In general, a low iron diet would contain cereals (maize, whole-grain flour, beans) and root vegetables with little meat, fish or foods rich in vitamin C. A moderate iron diet would consist of cereals and root vegetables but would also contain some vitamin C-rich foods and meat. High iron diets contain generous quantities of meat, poultry and fish.

They also contain foods with high levels of vitamin C such as citrus fruits and some vegetables. A high iron diet can be reduced to a moderate one by the regular consumption of foods which decrease the amount of iron absorbed by our body, such as dairy products, cereals, beans, coffee and tea. Right, says Fred, let's have a cup of tea!!!

## **Part 2: Antioxidants in Food**

Paradoxically, oxygen is essential for life but is also lethal! This is because normal oxygen molecules can convert into different chemical forms known as 'free radicals'. When the activity of free radicals is harnessed and controlled, they have important uses in the body. Uncontrolled free radical reactions, however, can do great damage and lead to disease.

Antioxidants are important in any diet, because as their name suggests, they prevent oxidative damage in the body. In doing so, they play an important role in the prevention of diseases such as coronary heart disease and cancer. In Thalassaemia, because of the excess iron in the body, there is a higher risk of oxidative damage. In this article, I will concentrate on the four main antioxidants: Vitamin E, Vitamin C, Carotenoids and Flavonoids.

### **1. Vitamin E**

Vitamin E is the most important dietary antioxidant. Several studies have found that many Thalassaemics have lower levels of Vitamin E in their blood compared to non-Thalassaemics. This could be either because Thalassaemics do not take as much Vitamin E in their diet or because their needs are higher. In many studies, when Vitamin E was given as a supplement, Vitamin E levels in the blood improved. However, even if your Doctor or Dietician recommends you take a supplement, the best way for any vitamin to enter your body is through your food.

Vitamin E is fat-soluble which means that it is present in foods which have a high amount of fat. The best sources of Vitamin E are vegetable oils (olive, safflower, palm and soya oil). The best one to use is probably olive oil because the type of fat it contains can help to prevent heart disease. In Mediterranean countries where olive oil is used a lot (Greece, Portugal, Spain, Italy) heart disease is lower than in Northern Europe. Remember, however, that the vitamin is destroyed slowly with frying. Therefore, the best way to get the most out of your olive oil is to add it to food towards the end dressing. Olive oil mixed with lemon, for example, can make a delicious dressing for fish, chicken, boiled vegetables and salads.

Being Greek Cypriot myself, I can give you many recipes where olive oil features as the main ingredient! You can probably do better, however using your own imagination. Choose the extra virgin olive oil if you like the intense flavour and you tend to use it as a dressing, or experiment with more refined varieties if you want to use it for cooking, making cakes etc. Ghee also contains Vitamin E but since olive oil has additional health benefits, you may like to try using it in cooking.

Other sources of Vitamin E are dairy products, cereals, nuts, eggs and meat. Dairy products are particularly good to include in the diet not only because they contain Vitamin E, but also because they inhibit iron absorption from our food into our body and also because they contain a lot of calcium which can help to prevent Osteoporosis (weak bones). You can try to use milk in cooking or to have a glass of milk with your meal. Skimmed milk has lower levels of Vitamin E than full-cream milk although the amount of calcium is the same.

## 2. Vitamin C



You might remember from my Part 1 that Vitamin C increases the absorption of non-meat iron. Therefore, although Vitamin C is a very powerful antioxidant, I will not advocate using many Vitamin C containing foods in combination with foods that are high in non-meat iron. This is important for those with Thalassaemia Intermedia and are not regularly transfused.

Remember that non-meat iron is widely distributed in the diet, present in eggs, chocolate, cereals, vegetables, fruits, roots (potatoes, parsnips), beans, and lentils. In the UK, several foods are fortified with iron, such as breakfast cereals, wheat flour and bread, although this may not be the case in other countries.

Vitamin C is mainly found in fruit, fruit juices and vegetables. It might be better to have your piece of fruit or glass of fruit juice on their own, in-between meals and not during or immediately after your meal. As health professionals we recommend people to eat 5 portions of fruit and vegetables daily. Examples of what is one portion are: a glass of fruit juice, a piece of fruit such as apple, pear, banana, orange, half a grapefruit, one tomato, a helping of vegetables such as carrots, courgettes, French beans or a small salad. Vitamin C is water-soluble, so if boiling vegetables it will leak out in water. Light steaming preserves the vitamin better. Cooked vegetables with olive oil and lemon can make a very tasty snack or a light meal. Vitamin E and Vitamin C work better when they are together and therefore remember to fuel your vegetables with olive oil!

## 3. Carotenoids

Common dietary sources of carotenoids are carrots, yellow squash, corn, tomatoes, papaya, oranges and dark-green leafy vegetables. Again, most of these foods are high in Vitamin C and therefore the same caution applies as above. It is worth pointing out that the absorption of carotenoids from the diet is much higher when the food contains fat or oil. So, keep adding that olive oil!! Carotenoids can be destroyed when cooking at high temperatures, therefore keep the cooking low and short if you can.

## 4. Flavonoids

These are found in tea, red wine, fruit and vegetables. What better excuse to include a glass of red wine with your meal!

If it is a more sober occasion, have your meal with a cup of tea! I am sure the English amongst you are rejoicing now!



Tea will not only give you lots of antioxidants, but it will also inhibit the absorption of iron from your food, especially if you take it with milk.

Try to have several cups of tea daily. Remember that we need about 8 glasses of fluid daily to be well hydrated.

## Summary

Vitamin E is mainly found in vegetable oils such as olive oil and safflower oil. The best one to use is probably olive oil because it can help to protect against heart disease. Add it towards the end of cooking, after the food is cooked or on raw vegetables because heating can destroy the vitamin.

Vitamin C is present in fruit and vegetables. It is best not to consume many of those in combination with foods that are high in non-meat iron, if you have Thalassaemia Intermedia and are not being transfused. You could have fruit and vegetables in-between meals. Add olive oil to your vegetables because Vitamin C and Vitamin E work better together. Carotenoids are found in carrots, yellow squash, corn, tomatoes, papaya, oranges and dark-green leafy vegetables. As these foods are also high in Vitamin C, the above caution applies again to olive oil.

Tea and red wine contain flavonoids which are also antioxidants. Furthermore, tea inhibits iron absorption.

## Part 3: The Role of Zinc



Zinc has important biological functions which are still not fully understood. Among other roles, it is important for the growth of children, sexual maturation of adolescents, a strong immune defence system and healthy skin. Several studies have shown that people with thalassaemia tend to have low levels of zinc in the blood, probably because they excrete more zinc in the urine.

This is partly because iron chelators (such as Desferal and Deferiprone) not only bind iron but also some zinc and excrete it in the urine. So what can we do to help maximise the amount of zinc we get from our food and prevent us to get a deficiency? Unlike iron, zinc is not stored in our body. We are therefore dependent on a regular supply of zinc from our daily diet to provide our requirements. In this article, I will highlight the main sources of zinc in our diet and explain how to get the most out of the zinc in our food. Zinc supplements bought across the counter but it is not safe to use them unless recommended your doctor or dietician. Taking zinc supplements above our requirements can interact with other nutrients such as copper and can also be bad for the immune system.

The main nutritional sources of zinc are animal foods (meat and dairy products) and wholemeal cereals. These will be discussed below.

### 1. Animal foods:

Beef, pork, chicken and fish contain large amounts of zinc. Zinc is present in the lean part of meat and not the fatty part. Therefore, chose lean cuts of meat and skinless chicken, especially if you need to watch your calorie intake. As red meat is also high in iron, it may be better to chose chicken or fish instead.

Dairy products (milk, cheese, yoghurt) and eggs also contain a lot of zinc. Milk and milk products are very important in thalassaemia for a variety of reasons; they inhibit the absorption of iron, they can help to prevent osteoporosis, are important for growing children and are also useful sources of zinc. I cannot stress it often enough how important it is to take plenty of milk every day, either as a drink or as part of your meal recipes. Choose low-fat cheese, yoghurt and skimmed or semi-skimmed milk if you are watching your weight.

## **2. Cereals:**

Zinc is present in the outer part of the grain of most cereals. Therefore, unrefined varieties of wheat, maize and rice are good sources of zinc, while refined cereals are poor sources. Try to switch to wholemeal bread for sandwiches and use brown rice and wholemeal flour and pasta in cooking.



Cereals contain a substance called phytic acid which inhibits the absorption of zinc from food. What is interesting is that the animal food sources described above (meat, chicken, fish, milk, eggs) can prevent this. It is therefore beneficial to include some chicken, fish or milk with the unrefined cereals. Examples are chicken, tuna or cheese sandwiches and wholemeal bread, chicken curry with brown rice, wholemeal spaghetti with grated cheese, chicken or cheese pies made with wholemeal flour. I am sure you can add your own examples to this list! Taking your meal with a glass of milk or a cup of milky tea will give you an extra star!

## **3. Food preparation:**

The way we prepare our food can also affect the amount of zinc we get from our diet. Like many other nutrients, zinc can leach into cooking water during food preparation. It is better to avoid using too much water when boiling and to try steaming instead. When cooking chicken or fish, we can use the juices after roasting, frying or boiling to cook sauces which can compliment the meal. In this way, any zinc leaching into the cooking media will still be included in the meal. A few weeks ago, I was watching one of the TV chefs preparing a pasta meal and much to my surprise he added the water from boiling the pasta into the sauce! Apparently, it is supposed to make it more creamy! Certainly from the zinc point of view, it is not such a bad idea!