Dietary advice for *HFE*-hemochromatosis patients

The Wageningen University has recently completed a research project to answer the question: Which dietary advise can we give to *HFE*-hemochromatosis patients? Gerdien van Doorn, dietician and graduated nutritionist from Wageningen University performed an extensive literature study and talked with experts and patients. Based on all the information the following nutritional advise was compiled.

The choice to follow (part of) the advise is up to the patient. Based on the information below, he/she can decide whether or not to adjust his/her diet.

Are dietary changes meaningful?

The first question that should be answered is: Does it make sense to adjust the diet in hemochromatosis? Can it help to reduce the number of phlebotomies? The answer is unfortunately not easy to give.

The effect of dietary changes is dependent on the person. Also, the effects are not noticeable in a short period of time. The effect certainly depends on the degree and speed of iron loading. People with the C282Y/C282Y and C282Y/H63D gene mutations accumulate iron faster. They are expected to benefit more from following a diet than those with mutations that are less prone to iron overload (H63D/H63D and C282Y/wt). Due to the slow accumulation of iron, the influence of dietary changes are only expected in the longer term. This is also dependent on the number of phlebotomies that are necessary. The latter also determines how much time it takes for the effect to be 'measurable'. In consultation with the doctor, the serum ferritin could be determined more often. Based on what we found in the literature, we expect that dietary changes will result in the necessity for one to two less phlebotomies per year. However, as stated above, there is no certainty in this statement and it is not applicable to all patients.

Nutritional advice in hemochromatosis

The basis for dietary advice in hemochromatosis is the same as the healthy food advise for people without hemochromatosis. To ensure that adequate nutrients are ingested, the normal recommended amounts of nutrients from the National Nutrition Centre can be followed. Within the food groups (see below) more or less favourable types of food can be chosen (containing more or less iron or containing substances that do or do not promote iron absorption). To maintain a change in the diet for the long term, it is best to implement the changes in small steps.

Food Groups

Vegetables

Vegetables are an important source of iron. In hemochromatosis the intake does not need to be restricted. Vegetables provide many other valuable nutrients besides iron. In addition, it also contains substances that inhibit the uptake of iron.
It is important to eat a variety of vegetables with a minimum recommended amount of 200 grams per day. However, it is advisable to limit the intake of iron-rich vegetables (i.e. once a week). These are: dark green leafy vegetables such as chard and spinach as well as beans, such as green beans and fennel. Iron-rich vegetables are better not to be eaten with meat.

Fruit

Fruit contains vitamin C, this can increase the absorption of iron. Due to the presence of other valuable nutrients in the vegetables, it is recommended to eat two servings of fruit per day. However, it is best not to eat fruit in combination with other foods. This is to prevent the vitamin C influencing the absorption of iron from other food products.
Dried fruit contains a relatively high amount of iron. Therefore it is better to avoid large amounts of dried fruit (including apple syrup).

Potatoes, rice, pasta, legumes

For potatoes or substitutes (rice, pasta or legumes), a normal portion can be eaten. It is advised to eat 'wholemeal' varieties of rice or pasta. The amount of iron per serving for potatoes and white or brown rice are similar. Wholemeal pasta, has nearly three times as much iron as non-wholemeal pasta. However, wholemeal grains also have more substances that inhibit iron absorption. Uptake of iron from wholemeal products will therefore be relatively less, compared to that of the non-wholemeal products. In addition, whole wheat grains are richer in other valuable nutrients and fibres. For this reason, it is better to use wholemeal products.

Bread

As for eating wholemeal grain products (with a hot meal), wholemeal bread contains more iron as well as more phytate, that inhibit iron uptake. Therefore, the total absorption of iron for white and brown bread is equal to that of whole wheat bread. Wholemeal breads are preferred as they provide a variety of other nutrients.
Iron-enriched breads are obviously discouraged.
Bread alternatives (i.e. cereals like cornflakes, crackers and biscuits) are often fortified with iron. Cornflakes, puffed wheat, muesli and many other varieties are available in a non-iron enriched variety. For bread alternatives the whole wheat varieties are preferred due to their other valuable nutrients that include fibres.

Milk products and cheese

Milk and derivatives are relatively low iron foods and require no additional attention. The general recommendation for intake of milk and cheese can be followed.

Meat (products), chicken, fish, eggs, meat substitutes

Of all product groups, meat provides the largest contribution to the total iron intake; It contains a lot of iron in relation to other food products. Furthermore, it is the only source of heme iron. (It also contains non-heme iron.) The heme iron is better absorbed than the non-heme iron. Also, meat seems to promote the uptake of non-heme iron. For this reason, in hemochromatosis, the use of (large amounts of) meat is strongly discouraged. Organ meats (like liver) provide lots of iron and it is better to avoid it or only eat it very rarely. Occasionally, (i.e. three to four times per week) a slice of meat on bread will not directly lead to a huge increase in serum ferritin. If meat (products) are taken, it is better to choose the varieties that are relatively low in iron. Rule of thumb is, 'the redder the meat, the richer it is in iron'.

To guarantee protein intake when eating a warm meal, non meat products can be used as an alternative for meat. Ready-made *non iron-fortified* meat substitutes can be chosen. Also eggs, cheese, nuts, legumes (including soy products like tofu, tempeh), peanuts, fish and seeds are good substitutes.
For hemochromatosis patients, it is advisable to eat fish at least twice a week. One of these weekly portions should be a fatty variety of fish like salmon or tuna. This ensures the intake of other important nutrients that are found in meat.

Cooking products

Oils, (liquid) margarines and cooking products contain no iron.
Liquid cooking products, with high (poly) unsaturated fatty acids contents, are preferred to decrease the possible increased risk of cardiovascular disease.

Margarine

Bread spreads like margarine are free of iron. Also, in this case, products with a high percentage of unsaturated fatty acids are preferred.

Beverages (including milk)

For fluid, it is best to choose water, tea and soft drinks (no juices). These drinks contain no or a negligible amount of iron, vitamin C and alcohol.
It is best to drink fruit juice separately (without food) in order to prevent the vitamin C increasing the absorption of iron from other foods. All alcoholic drinks are seriously discouraged due to their iron absorption enhancing effects. Alcohol should also be avoided to prevent (further) liver damage.
Coffee also contains iron. It's better not to drink too much of it. It is possible that drinking strong black tea with meals works against the absorption of iron.

Other advice

• Black olives: Avoid consuming black olives, as iron is often added to prevent a colour change.
• Chocolate (products): Cacao contains iron. That's why chocolate (products) are relatively high in iron. The higher the cacao content, the higher the iron content. Hence milk and white chocolate have lower iron contents than dark chocolate.
• It is advisable to avoid raw seafood or prepared food that has been sprinkled with seawater. This is due to the risk of infection from the bacterium *Vibrio vulnificus*. The bacterium is not common in Europe. However, in America and Asia, it is particularly relevant to be alert to the bacterium.
• Iron fortified foods: Although there is a query regarding the uptake of iron from foods fortified with iron, it is not wise for hemochromatosis patients to use products fortified with iron. Of the products that are often enriched with iron (i.e. breakfast cereals and ready-made meat substitutes) there are sufficient alternatives available that are not fortified with iron.
• Dietary supplements: Should you worry about the intake of some vitamins and / or minerals, it is wise to consult a doctor. If your doctor does not object and you are not iron deficient, choose an iron and vitamin C free supplement.
• Cooking material: In the preparation of a meal, various substances from the cooking material are in contact with the food. To prevent an unnecessary increase in iron, food is best prepared in and with non-iron-containing material. (Do not use (wok) pans that are made of cast iron and stainless steel).
• Ensuring a balanced energy (calorie) intake and usage: If you eat more than you need, your weight will increase. Weight gain gives an increase in serum ferritin.

Finally

Adhering to the above dietary recommendations will not resolve any symptoms of hemochromatosis. The damage caused by iron accumulation in the joints, liver, pancreas, thyroid and the heart can not be restored by dietary adjustments. However, a healthy lifestyle with good nutrition, adequate exercise (walking, cycling) and not being overweight, will certainly improve your health. Your doctor or specialist can refer you to a dietician, if you are struggling to apply the dietary recommendations.

The above is a summary of the report with the research results. The entire report (also available in English) with appendices (only in Dutch) can be downloaded from the website of the Science Shop of Wageningen UR (University & Research centre): http://edepot.wur.nl/211899

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