

Recommendations for vitamin, mineral or trace element supplementation

Fact sheet

Vitamins, minerals and trace elements are essential for the maintenance of good health and for the prevention of chronic diseases. Virtually none of these micronutrients can be synthesised by the body. They must, therefore, be ingested as part of the diet. According to the Guidelines for a Healthy Diet ¹, a varied diet provides enough vitamins, minerals and trace elements for almost anyone.² However, this may not be the case for some population groups, who will then be advised to take a supplement.²

This includes special advice for infants (vitamins D and K), young children (vitamin D), women planning to become pregnant (folic acid) and during pregnancy (vitamin D and folic acid), the elderly (vitamin D), people with dark or tinted skin or people who do not spend enough time outdoors (vitamin D) and those who do not eat animal products (vitamin B12).

There are also recommendations to ensure that people do not consume excessive amounts of a given micronutrient. For instance, the entire population is advised to limit their salt intake. Pregnant women are advised to avoid vitamin A supplements and liver (or liver products). Another recommendation is that young children should only be fed a limited amount of liver products. Smokers would be well advised to avoid using supplements that contain high levels of beta carotene. Ideally, of course, they should give up smoking.

This fact sheet gives details of the Netherlands Nutrition Centre's recommendations for vitamin, mineral or trace element supplementation, and of the evidence on which the recommendations are based.



For whom is it relevant?

Our recommendations for supplementation are important for consumers in general, and particularly for high-risk groups within the population that consume either too few or too many micronutrients. The recommendations serve as a guideline for those professionals who instruct people about nutrition.

What issues are involved?

Both a deficiency and an excess of micronutrients can have adverse health effects.

Dietary supplements are important for special groups within the population. These are groups that need additional micronutrients, as they cannot obtain sufficient quantities from their diet.

However, most people do not need supplements, because they already eat a varied diet which supplies them with sufficient quantities of micronutrients. Numerous commercially available dietary supplements and fortified foods are claimed to have health benefits. Yet the use of supplements provides no additional health benefits, and may even be harmful.

Recommendations for vitamins, minerals and trace elements

Recommendations for the amount of vitamins, minerals and trace elements that people need every day have been drawn up by bodies such as the Health Council of the Netherlands and the European Food Safety Authority (EFSA). These are described in the fact sheet entitled "Recommendations for vitamins, minerals and trace elements".

See www.voedingscentrum.nl/factsheets.³

Does low intake lead to deficiency?

Recommendations for supplementation are provided for groups (including high-risk groups) in the population. These recommendations are based on data relating to the intake, status and health effects of micronutrients.

The Dutch National Food Consumption Surveys (FCS)⁴⁻⁶ give details of Dutch people's diets. They identify population groups that are at risk of micronutrient deficiency, or excess. For the majority of micronutrients, there is insufficient data available to determine whether low intake is associated with deficiency or adverse health effects.

Micronutrient deficiencies are often difficult to identify. In individuals with health problems, they can only be diagnosed by means of blood and urine tests. These tests involve the measurement of markers in blood or urine (status parameters) that reflect the body's status. A low status that is not associated with health problems is not the same thing as a deficiency of vitamins, minerals or trace elements, which does need to be treated. One problem in determining an individual's status is that the markers for a number of micronutrients are not sufficiently specific. In addition, it is not always possible to determine clear low-status cut-off points.²

Is the use of supplements worthwhile?

Around 40% of Dutch people use dietary supplements.⁴ For most people this is not necessary.²

A varied dietary pattern provides sufficient quantities of micronutrients. However, you can't compensate for a poor dietary pattern by taking supplements. This is because a varied diet contains nutrients that are not found in supplements, such as protein or dietary fibre.

Which groups can derive health gains from the use of supplements?

The Health Council has drawn up recommendations for supplementation for certain high-risk groups. It has been demonstrated that these groups can derive health gains by taking a supplement containing a specific micronutrient.

Recommendations for supplementation

The Netherlands Nutrition Centre follows the Health Council's recommendations for supplementation. These recommendations are listed below, for each individual micronutrient.

Folic acid

It is important to take folic acid just before conception and in the early stages of pregnancy. Extra folic acid reduces the risk of birth defects, such as spina bifida, cleft lip, and cleft palate. Women need to start taking extra folic acid at least four weeks before conception to ensure that they maintain the correct level during early pregnancy.⁷

| Recommendation for folic acid supplementation | |
|---|---|
| Who? | Advice about taking extra folic acid ⁷ |
| Women who have decided they want to try to become pregnant: from a minimum of 4 weeks prior to conception | 400 micrograms folic acid/day |
| Pregnant women: up to 8 weeks after conception | 400 micrograms folic acid/day |

Vitamin D

There is evidence that taking vitamin D supplements reduces the risk of rickets in young children.⁸ In the elderly, supplementation reduces the risk of falling and of breaking bones.⁹

The body synthesises vitamin D when exposed to sunlight. Fair-skinned people who are regularly exposed to the sun synthesise about two-thirds of their vitamin D requirement from sunlight.⁸ The rest comes from their diet. People with a dark skin and those whose skin does not get enough sunlight (because they spend too little time outside or because they wear a headscarf or veil) synthesise less vitamin D. For groups such as these, a healthy diet contains too little vitamin D to compensate for the reduced synthesis of vitamin D from sunlight.⁸

Furthermore, the Health Council has concluded that extra vitamin D may help to counteract bone loss in women aged from 50 to 70. The results of studies in pregnant women indicate that vitamin D reduces the risk of having a baby with a low birth weight (< 2500 grams).⁸

| Recommendation for vitamin D supplementation | |
|---|--|
| Who? | Advice about taking extra vitamin D ⁸ |
| Children up to the age of 3 | 10 micrograms/day |
| Girls and women aged from 4 to 50 with dark or tinted skin, or those who spend too little time outside, or those who wear a headscarf or veil | 10 micrograms/day |
| Boys and men aged from 4 to 70 with dark or tinted skin, or those who spend too little time outside | 10 micrograms/day |
| Pregnant women | 10 micrograms/day |
| Women above the age of 50 | 10 micrograms/day |
| Men and women above the age of 70 | 20 micrograms/day |



Vitamin K

Vitamin K is essential for effective blood clotting. Bacteria in the intestine synthesise limited amounts of vitamin K. However, the most important source of vitamin K is the diet. Supplements are recommended for breastfed infants to avoid the risk haemorrhage (including brain haemorrhage).¹⁰

Complete infant formulas contain vitamin K. Based on a consultation round among professional groups, the Netherlands Nutrition Centre also recommends a supplement of 150 micrograms of vitamin K for infants under the age of 3 months who drink less than 500 millilitres of complete infant formula.¹¹ Infants who drink more than this do not require supplements. In these cases, complete infant formula provides enough vitamin K.

Recommendation for vitamin K supplementation in infants

| Who? | Advice about taking extra vitamin K ¹⁰ |
|--|---|
| Breastfed infants from birth to 3 months | 150 micrograms of vitamin K/day |

Vitamin B₁₂

Vitamin B₁₂ is essential for the production of red blood cells, and to enable the nervous system to function effectively. Vegans are at high risk of developing an excessively low vitamin B₁₂ status, as they do not eat animal products.² The breastfed infants of vegan mothers who eat no animal products and take no vitamin B₁₂ supplements are at high risk of neurological symptoms caused by a vitamin B₁₂ deficiency.¹² The Health Council has drawn up a recommendation for vegans.

Recommendation for vitamin B₁₂ supplementation for vegans

| Who? | Advice about taking extra vitamin B ₁₂ ² |
|--------|--|
| Vegans | Take a vitamin B ₁₂ supplement or eat fortified foods until the recommended daily allowance is reached (2.8 micrograms per day for adults). ¹⁵ |

The elderly may suffer from reduced production of gastric acid. As a result, vitamin B₁₂ may be less well absorbed.¹³ Some elderly individuals may, therefore,

develop a deficiency. Also, the prolonged use of antacids may increase an individual's risk of developing a vitamin B₁₂ deficiency.¹⁴ A normal diet is insufficient to compensate for a deficiency.¹⁵ For this reason, physicians usually prescribe vitamin B₁₂ injections, or a high-dose supplement.

From 12% to 25% of elderly people have an excessively low vitamin B₁₂ status.⁷ The Health Council has issued no recommendations concerning vitamin B₁₂ supplements for the elderly. This is because it is not clear whether a low status actually results in adverse health effects in this group.²

Iron

The FCS has shown that, relative to the recommendations, adolescents and women of childbearing age have a low iron intake.⁴ A previous evaluation by the Health Council found a low iron status in nearly 50% of pregnant women, in about 35% of women of childbearing age, and in 20% of the children of asylum seekers.² Over time, an inadequate iron intake can lead to an iron deficiency. This needs to be confirmed by blood tests. In such cases, physicians may prescribe an iron supplement.

Multivitamins and minerals

Leaving aside the recommendations made by the Health Council, there may be circumstances in which it may be desirable to supplement the diet with multivitamins/mineral supplements. Energy intakes of less than 1,500 calories (kcal) per day, for instance, may put the supply of micronutrients at risk.¹⁶ Elderly people who eat very little, and individuals following an extreme weight loss diet, run the risk of not getting sufficient micronutrients. This also applies to people with unbalanced eating habits, such as alcoholics.¹⁷ It is especially important for these groups to improve their lifestyle, and to modify their dietary pattern.

Fortified foods

About 75% of people eat fortified foods.⁴ This is not usually necessary, provided that you eat a varied diet in accordance with the Wheel of Five. There are, however, some exceptions. To protect the population of the Netherlands from developing iodine, vitamin A and vitamin D deficiencies, special arrangements have been made with producers regarding the use of additives in salt (and iodised bakers' salt), margarines, low-fat margarine, and products used in baking and frying. Unlike other fortified foods, it is important to eat these products.

Iodine: Iodine deficiency can cause goitre. One characteristic of the Dutch diet is that it contains too little iodine. The iodisation of salt has enabled the Netherlands to largely reduce the incidence of goitre.²³ Iodised bakers' salt contains twice as much iodine as the iodised salt used in other foods. The bakery sector and the Ministry of Health, Welfare and Sport have reached agreements on the use of iodised bakers' salt. These are set out in the "Covenant on the use of iodised bakers' salt" (2008). Bread accounts for approximately 40% of iodine intake in the Netherlands.²⁴ Those who bake bread with non-iodised salt may be at risk of an excessively low iodine intake. Organic bakeries, for example, often use non-iodised salt. Furthermore, people who eat little or no bread must make sure that they get enough iodine from other sources, such as fish, milk (or skimmed milk), and milk products. The iodine content of kelp (seaweed) can vary considerably. As a result, these products may contain too little iodine, or too much.²⁵ For this reason, the Health Council advises against the use of kelp tablets.²³

Vitamin A and Vitamin D: To ensure that the Dutch population gets sufficient vitamin A and vitamin D, producers add vitamin A (8 micrograms/gram) and vitamin D (0.075 micrograms/gram) to low-fat margarine, margarine and products used in baking and frying. This is because these products are substitutes for butter, in which vitamin A and vitamin D occur naturally. This agreement was set out in the 1999 Covenant on the addition of vitamins to spreadable fats. The addition of vitamin D to artificial infant formulas, medical nutrition and energy-restricted diets is also permitted. To avoid excessively high intakes, vitamin A may only be added in situations where this vitamin is destroyed during the production process. The amount of vitamin A added must not exceed the original level. Manufacturers are also permitted to add up to 4.5 micrograms (per 100 kcal) of vitamin D to their products. The Dutch Commodities Act lists those vitamins and minerals that may be added to foods.¹⁹ This is in compliance with European regulations.²⁰⁻²²

More is not always better

It has been established that excessively high intakes of vitamin A, vitamin D, vitamin E, vitamin B6, niacin (nicotinic acid), folic acid, calcium, magnesium, iodine, copper, selenium, and zinc can be harmful to health.

The EFSA has drawn up tolerable upper intake levels for these micronutrients.^{3,26-28} There is evidence that, at certain intake levels, vitamin C, beta carotene,^{29,30} iron,³¹ phosphorus, potassium and manganese²⁶ can produce adverse effects. However, the EFSA has not determined tolerable upper levels for these substances.

With the exception of vitamin A, overdoses are only seen in conjunction with the use of high-dose supplements, an excess of fortified foods, or in individual cases of hypersensitivity (e.g. haemochromatosis). Some commercially available supplements stipulate doses that are far in excess of the tolerable upper level.³² Those taking vitamin supplements and eating fortified foods are advised not to exceed the recommended daily allowance (RDA) more than once.² The label indicates the individual contributions to the RDA (laid down in European law) made by each of the supplement's various micronutrients.²²

With respect to excessive intakes the Netherlands Nutrition Centre follows recommendations by the

Health Council and the EFSA with regard to the following micronutrients.

Vitamin A

Excessive doses of vitamin A can cause liver damage, as well as disorders of the eyes and skin. They can also affect pregnant women by increasing their risk of giving birth to infants with congenital abnormalities.²⁶ For this reason, pregnant women are advised not to take vitamin A supplements and to avoid eating liver (or liver products).³³ The tolerable upper intake level for children aged from 1 to 3 is 800 micrograms per day, well below the adult level of 3,000 micrograms per day. Many liver products contain high levels of vitamin A. Accordingly, the Netherlands Nutrition Centre recommends (independently of the Health Council) that children aged from 1 to 3 should not eat excessive amounts of liver (or liver products).

Beta carotene

Studies have shown that supplements that contain high doses of beta carotene increase the risk of lung cancer in smokers. Smokers are recommended to avoid supplements containing high doses of beta carotene (15 milligrams per day or more).^{29,30} More importantly, of course, this group should give up smoking.

Sodium

A high salt intake is a risk factor for high blood pressure, which means that it is also a risk factor for cardiovascular disease.¹ Average salt intake in the Netherlands is estimated to be 8.7 grams per day.³⁴ This is equivalent to a sodium intake of 3.5 grams. This is one and a half times higher than the maximum intake recommended by the Health Council (2.4 grams). Accordingly, the entire population is advised to reduce their sodium consumption.

Misconceptions concerning the health effects of supplements

It is often claimed that supplements have beneficial health effects. However, few of these health effects have actually been demonstrated. Manufacturers may only print such claims on the packaging of supplements if the effect in question has been scientifically substantiated. Legislation with respect to claim substantiation has been drafted in Europe.³⁵ The claims approved for micronutrients are usually generic in

nature. These are claims that involve the nutrient's effect on normal body functions, at normal doses. This has no implications in terms of reducing the risk of disease or of improving health. Furthermore, taking amounts in excess of the RDA would not be expected to provide any additional health effects. The use of high doses in dietary supplements, as in the case of orthomolecular nutrition, provides no additional health gains. Indeed, in some cases, it may even be harmful.

Looking to the future

By mid-2015, it is expected that the EFSA will have established dietary reference values for all micronutrients. Once EFSA has completed an evaluation of these standards, the Health Council will use this as a basis for determining the Dutch recommendations.

New recommendations and a deeper understanding of the relationship between the intake, status and health effects of micronutrients could lead to a revision of the current recommendations for supplementation.

Relevant links:

www.gezondheidsraad.nl/nl/adviezen/gezonde-voeding
www.efsa.europa.eu/en/topics/topic/driv.htm
www.efsa.europa.eu/en/ndatopics/docs/ndatolerableuil.pdf
ec.europa.eu/nuhclaims

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8. Gezondheidsraad. Evaluatie van de voedingsnormen voor vitamine D. Den Haag: Gezondheidsraad 2012: publicatie nr 2012/15.
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29. EFSA. Scientific Opinion on the Re-Evaluation of Mixed Carotenoids (E 160a (i)) and Beta-Carotene (E 160a (ii)) as a Food Additive. *EFSA Journal*, 2012. 10(3): 2593.
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