

LE ZOOM NUTRIACTIS® #OCTOBER



**BNP PARIBAS
CARDIF**



MICRONUTRIENTS

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Food is an **essential component of life**, it provides the energy (macronutrients) and micronutrients needed for the body to function properly. In our previous newsletter, we mainly presented the macronutrients (proteins, lipids and carbohydrates). This newsletter aims to introduce you to **the world of micronutrients**.



Micronutrients

Unlike macronutrients, micronutrients **do not provide energy**, but they are also **essential for the development and proper functioning of the body**. The majority of the micronutrients **cannot be produced by the body**, thus it is important to supply them to the body through the diet. Micronutrients have the characteristic of being active at very low doses (mg/ μ g) and include **vitamins, minerals and trace elements**.

Micronutrients perform a **variety of functions**, including regulating various biochemical reactions (e.g. energy production, muscles and bone health), modulating the immune system and acting as **antioxidants**.

Dietary Reference Intakes (DRIs) are reference values that are quantitative estimates of **daily nutrients needs** for healthy people to prevent the onset of a deficiency*. These requirements are represented by:



- **Recommended Dietary Allowance (RDA):** Average daily level of intake sufficient to meet the nutrient requirements of nearly all (97–98%) healthy individuals.
- **Adequate Intake (AI):** defined as the average intake of a population with no deficiency for the nutrient studied (Adequate nutritional status).

Vitamins

Vitamins are compounds that has an essential role in helping the body work properly. It is important to note that vitamins **cannot be synthesized by our body**, with the exception of vitamins K and D. They must therefore be **provided by a balanced and varied diet**.





*Deficiency: absence or insufficiency of an element essential for nutrition.


Vitamins can be divided into two categories:


	Water-soluble vitamins	Liposoluble vitamins
Definition	They can be dissolved in water	They can be dissolved in lipids
Vitamins	Vitamin C and B-vitamins: B1, B2, B3, B5, B6, B8, B9, and B12	Vitamins A, D, E and K
Storage	Rarely stored	Can be stored in adipose tissue or liver
Risk of toxicity	Low , as most water-soluble vitamins are not stored or are stored in small quantities (except B6 and B12).	High , since they can accumulate in the body


Daily vitamin requirements may vary **according to age, sex and the person's situation** (pregnancy, breast-feeding, kidney disease, etc.). Here are few examples of vitamins, their **Recommended Dietary Allowance (RDA) or Adequate Intake (AI)**, and some symptoms experienced in the event of a deficiency:


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- Vitamin C**
- **RDA:** 110 mg/d
 - **Role:** Collagen formation, iron absorption/storage, antioxidant, necessary for the functioning of some enzyme(coenzymes)...
 - **Deficiency:** Gastro-intestinal diseases, in cases of severe deficiencies scurvy can develop, it is a disease characterized by bleeding gums, pain, fatigue, anemia and hemorrhaging...

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- Vitamin A**
- **RDA:** Female: 650 µg/d Male: 750 µg/d
 - **Role:** Vision, functioning of the immune system, bone growth...
 - **Deficiency:** Drying of the conjunctiva (eyelid mucosa), ↓ night vision, ↓ immunity...

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- Vitamin B12**
- **AI:** 4 µg/d
 - **Role:** DNA synthesis, cellular and blood cell energy production, various neurological functions...
 - **Deficiency:** Anemia**, fatigue, shortness of breath, neurological disorders: motor and sensitivity disorders, neuronal disorders leading to irritability, memory and mood disorders....

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- Vitamin K**
- **RDA:** 110 mg/d
 - **Role:** involved in blood coagulation, bone metabolism...
 - **Deficiency:** bruising, bleeding (nose, heavy periods...), hemorrhage...

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- Vitamin B9**
- **RDA:** 330 µg/d
 - **Role:** Cell multiplication, production of red and white blood cells, necessary for the functioning of some enzyme (coenzymes)...
 - **Deficiency:** Anemia, muscle cramps, fatigue, headaches, fetal malformations...

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- Vitamin D**
- **RDA:** 15 µg/d
 - **Role:** Bone calcium binding, phosphorus metabolism, mineralization of bones, cartilage and teeth during and after growth...
 - **Deficiency:** ↓ muscle strength, bone disorders, osteoporosis (↓ bone mass), rickets...

Minerals and trace elements

Minerals are essential for the body to perform vital functions. They **cannot be synthesized by the body**, which is why it is important to satisfy the body's needs by eating a **variety of food**, and by drinking **water** (mineral, spring or tap). Trace elements are minerals present in small quantities in the body.

**Anemia: Decrease in the level of hemoglobin (the pigment in red blood cells that transports oxygen from the lungs to the tissues) in the blood.

Here are the **RDA/AI** for adults for some **minerals/trace elements**:

Magnesium



- **RDA:** Female: 300 mg/d Male: 380 mg/d
- **Role:** Maintains proper functioning of the nervous, immune and muscular systems, heart rate, blood pressure...
- **Deficiency:** Nausea, vomiting, fatigue and weakness, tingling, muscle cramps and spasms, palpitations, heart rhythm disorders...

Phosphorus



- **AI :** 550 mg/d
- **Role:** Participates in the production and storage of cellular energy, plays a role in bone structure and mineralization...
- **Deficiency:** Anemia, loss of appetite, muscle weakness, bone pain/fragility...

Iron



- **RDA:** 11 mg/d (except women with heavy periods: 16mg/d)
- **Role:** Cellular functions such as respiration, oxygen transport, DNA synthesis, energy production and cell proliferation, immune system function...
- **Deficiency:** Iron-deficiency anemia***, ↓ of immunity...

Calcium



- **RDA:** 1000 mg/d
- **Role:** Mineralization and structure of bones, muscle contraction, blood coagulation, hormone release, enzyme activation...
- **Deficiency:** Osteoporosis (↓ bone mass), osteomalacia (lack of minerals in bones), ↑ risk of fractures...

Potassium



- **AI:** 3500 mg/d
- **Role:** Acts on the nervous and muscular (digestive/cardiac) systems, protein synthesis, glucose metabolism...
- **Deficiency:** Disruption of glucose metabolism, cramps, fatigue, heart rhythm disorders and polyuria (↑ volume of urine)...

Micronutrients and health

As already mentioned, micronutrients are **essential** to the body's proper functioning and can help maintaining a good health, due to their **antioxidant activity** and their interaction with the **intestinal microbiota**.

Antioxidant activity



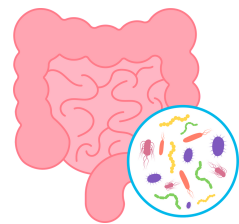
Certain vitamins such as A, C, E and K, and minerals such as iron, zinc and selenium, are known as **antioxidants**, molecules that limit the production of free radicals. The body produces **free radicals, unstable molecules which, when present in excessive quantities, promote ageing and the onset of various pathologies**. Several environmental factors (pollution, tobacco, alcohol, radicals, UV rays, etc.) can increase the production of free radicals.

By limiting the production of free radicals, antioxidants **can help the body limit its inflammation** and could **reduce the risk of the onset of various pathologies** such as arthritis, diabetes, cancer and cardiovascular diseases.

***Iron deficiency anemia: anemia due to a lack of iron in the body.

Gut microbiota and micronutrients

The intestinal microbiota may play a role in **the production and utilization of certain micronutrients**. In fact, certain bacteria present in the intestinal microbiota contribute to the production of certain vitamins, such as vitamin K and most of the B vitamins. The microbiota can also **promote the absorption of certain minerals** such as iron and calcium. In addition to that, the absorption of micronutrients can also **modify the intestinal microbiota and thus inflammation**. However, the causal link between intestinal microbiota and micronutrients (deficiency or excess) remain to be clarified.



Dietary supplements

Dietary supplements are **a concentrated source of nutrients used to supplement a normal diet**. They come in many forms, including tablets, capsules, soft gels, gel caps, and liquids. In the absence of a pathologies or special needs, a **varied and balanced diet provides micronutrients in sufficient quantities for the proper development and maintenance of the body's health**. However, under certain conditions, such as when taking medication or when elderly, dietary supplements may be prescribed.



Although available without prescription, **it is essential to consult a healthcare professional for appropriate advice when taking dietary supplements**. Without proper advice, taking those supplements can have toxic effects on the body. In fact, an excessive consumption of vitamins and minerals can lead to **toxicity**, which can cause symptoms like: loss of appetite, nausea, vomiting, diarrhea, insomnia, fatigue, muscle pain...

The advice of a doctor is also recommended when taking food supplements, because some micronutrients **can interact with each other and with certain drugs**, altering their efficacy (e.g. calcium can limit the absorption of iron).

Conclusion

Micronutrients are therefore essential to the development and proper functioning of our organism. Their **antioxidant** activity and their **interaction with the intestinal microbiota** contribute to their beneficial effect on our health. Most vitamins and minerals **deficiencies** can be avoided through a **balanced and varied diet**. However, under certain conditions, such as when taking medication or when elderly, **dietary supplements** may be prescribed and recommended.



It is essential to **consult a healthcare professional** for appropriate advice when taking dietary supplements to avoid toxicity, as well as interactions between different micronutrients and medications.

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