Lipofer® - A tasteless, non-pro-oxidative source of iron

Fatigue, Cognitive Health and the Immune System

Lipofer® is a **micronized and microencapsulated source of iron** that **does not taste metallic** or **oxidize unsaturated fats**. Claims on cognitive **function or development** (Article 14), **tiredness**, **energy** and **immune system** can be made for Lipofer®.

Lipofer® is available in **France** and **Benelux.**

Contact us

Description | Health Benefits | Regulation | Technological Properties | Health Claims

Summary :

Iron deficiency: effects on health

According to the World Health Organization (WHO, 2001), **iron deficiency**, especially **iron deficiency** anemia, remains the main severe nutritional disorder in the world today. Also affecting women and children in non-industrialized countries, **iron deficiency is the only nutrient disorder that is widespread in all industrialised nations**.

However, adverse functional consequences can occur even before anemia sets in. The increased fatigue and weakness, which leads to a reduced work capacity, is well-known (Haas & Brownlie, 2001). In addition, impairment of the immune system and cognitive development of infants are also linked to iron deficiency.

Immune System

Morbidity (affinity to contract diseases) from infectious disease is **increased in iron-deficient** populations. The immune system is impaired by iron deficiency because leukocytes have a reduced capacity to kill ingested microorganisms and B-lymphocytes have a decreased ability to replicate when stimulated by pathogens.In such cases, a lowered concentration of cells responsible for cell-mediated immunity occurs (Beard, 2001; Brock & Mulero, 2000).

In addition, **different studies reviewed by the WHO** have demonstrated a strong **relationship between iron deficiency** and an **impaired immune system**. For example, iron supplementation in iron-deficient children reduces morbidity from infectious diseases (WHO, 2001).

Physical performance and work productivity

In developing countries where people often work as farmers, physical work capacity is of **particular importance for family well-being**. According to the WHO (2001), **physical work capacity** and **performance** is **impaired by up to 30%** in **iron-deficient** men and women. Many studies have shown that work capacity is considerably improved after iron supplementation (Beard, 2001).

Cognitive development

It is well known that **anemia** during infancy and childhood can **severely affect** a **child's cognitive development** (Beard, 2003). Young anemic children will have great deficit in IQ compared with their classmates without anemia and they will show impaired performance in almost all tested skills (Lozoff, 1989).

Since later treatments are considered ineffective, it is essential that **iron supplementation of deficient infants and children** is administered as early as possible (WHO, 2001, Halterman et al., 2001). Not only anemia but also **iron deficiency** can **impair cognitive functioning**. In contrast to anemia, this effect seems to be able to be corrected by iron administration (Bruner et al. 1996).

Anemia

If iron deficiency is not treated for a long time, anemia can develop. About **25% of the world's population is estimated to be anemic** (WHO, 2008). Even in developed countries, the prevalence of anemia can be considered as relatively high: in Europe the prevalence of **anemia among preschool** children is **16.7%** (WHO, 2008).

During **pregnancy**, anemia is associated with **multiple adverse outcomes for both mother and infant**, including an increased risk of hemorrhage, sepsis (blood stream infection), maternal mortality, perinatal mortality, and low birth weight (Scholl & Hediger, 1994). Th risk of maternal mortality is higher when there is iron-deficiency anemia (International Nutritional Anemia Consultative Group INACG, 2002).

Recommended Daily Allowance (RDI) and Population Requirements Intake(PRI)

Nutritional requirements **depend on the specific needs of individuals**, especially for iron, which in turn depend on sex, age and physiological status (pregnancy, breastfeeding women), etc. Based on the population reference intake (PRI) values published by the Scientific Committee for Food (SCF, 1992 and 1993), the European Union set the **recommended daily allowance (RDA) for iron** to **14 mg/day** (Annex to Directive 90/496/EEC amended by Commission Directive 2008/100/EC).

Annex XIII of Regulation No. 1169/2011 on the provision of food information to consumers (that comes into effect by 13 December 2014) replaces the term RDA with “Nutrient Reference Values” (NRVs) without changing any nutrient values.

Children	Iron (mg/d)	Males	Iron (mg/d)	Females	Iron (mg/d)	Females	Iron (mg/d)
6-11 months	6	11-14 y	10	11-14 y	18	Post-menopausal	8
1-3 y	4	15-17 y	13	15-17 y	17	pregnancy	Suppl. necessary
4-6 y	4	18 +	9	18 +	16	Lactation	10
7-10 y	6						

PRI values established in 1992 for iron by the SCF for the EU: intakes of iron must cover the requirements of 95% of the various population groups, based on a biovailability of 15%.

Iron Deficiency in Europe

The European Nutrition and Health Report of 2004 (Elmadfa et al., 2004) showed an **insufficient iron intake in different groups of the population in almost all European countries.**

Babies and children

Infants have relatively high iron requirements because they are growing very rapidly. Infants are normally born with plenty of iron. However, after 6 months of age, the iron content of maternal milk is sometimes insufficient to meet an infant’s requirements. Low birth weight infants (less than 2500 g) are born with lower iron stores and are at high risk of deficiency as soon as they are 2 months old (WHO, 2001). Where iron-fortified complementary foods are not widely and regularly consumed by young children, infants should routinely receive iron supplements in the first year of life (WHO, 2001).

Female adolescents & women of childbearing age

Iron deficiency and the more severe iron-deficiency **anemia frequently occur in male and female adolescents** due to accelerated growth, rapid increase in blood volume and muscle mass. Additionally, female adolescents often do not consume sufficient iron to offset menstrual losses. As a result, a **peak in the prevalence of iron deficiency frequently occurs among females during adolescence** (WHO, 2001). The European Nutrition and Health Report of 2004 shows that especially girls at fertile age in all European countries do not absorb enough iron with their daily diet.

Moreover in industrialized countries, women tend to limit their food intake to control their weight. Slimming diets or poor eating habits lead teenage girls or women of childbearing age result in low iron intake.

The intra-uterine device is an additional risk factor because it can double mentrual blood volume whereas the pill is known to reduce menstrual blood volume.
According to the WHO, **10.3%** of **women** (15-59 years) living in **industrialized countries have anemia**, and **42.3%** in n**on-**

industrialized countries. In its 2001 report, WHO estimates that the prevalence of iron deficiency is two to five times higher than the prevalence of iron-deficiency anemia. This implies that **20% to 50%** of women living in industrialized countries and virtually all women in developing countries **suffer from iron deficiency**.

The European Nutrition and Health Report of 2004 (Elmadfa et al.) states that all women of childbearing age and older have an iron intake that is not sufficient to fulfill their needs.

Female and male athletes

Among the athletes, the prevalence of iron depletion without anemia seems to be significantly higher than in the general population. **Endurance athletes are particularly prone to iron deficiency**. The reasons for this iron depletion is footstrike hemolysis, poor dietary habits, increased iron losses through sweat, fecal blood losses and desquamated epithelial cells (Akabas & Dolins, 2005 ; Sinclair & Hinton, 2005). As mentioned above, **iron is needed for energy production.** The iron-containing heme group of hemoglobin transports oxygen from the blood to the muscles where oxygen is stored in myoglobin which also contains heme iron. Moreover, in the mitochondria, iron is an essential cofactor of the iron-dependent respiratory chain. When mitochondria are not supplied with enough iron, energy production is impaired. The result is an impact on physical performance which first affects athletes (Beard, 2001; Dubnov & Constantini, 2004).

Lipofer® efficacy

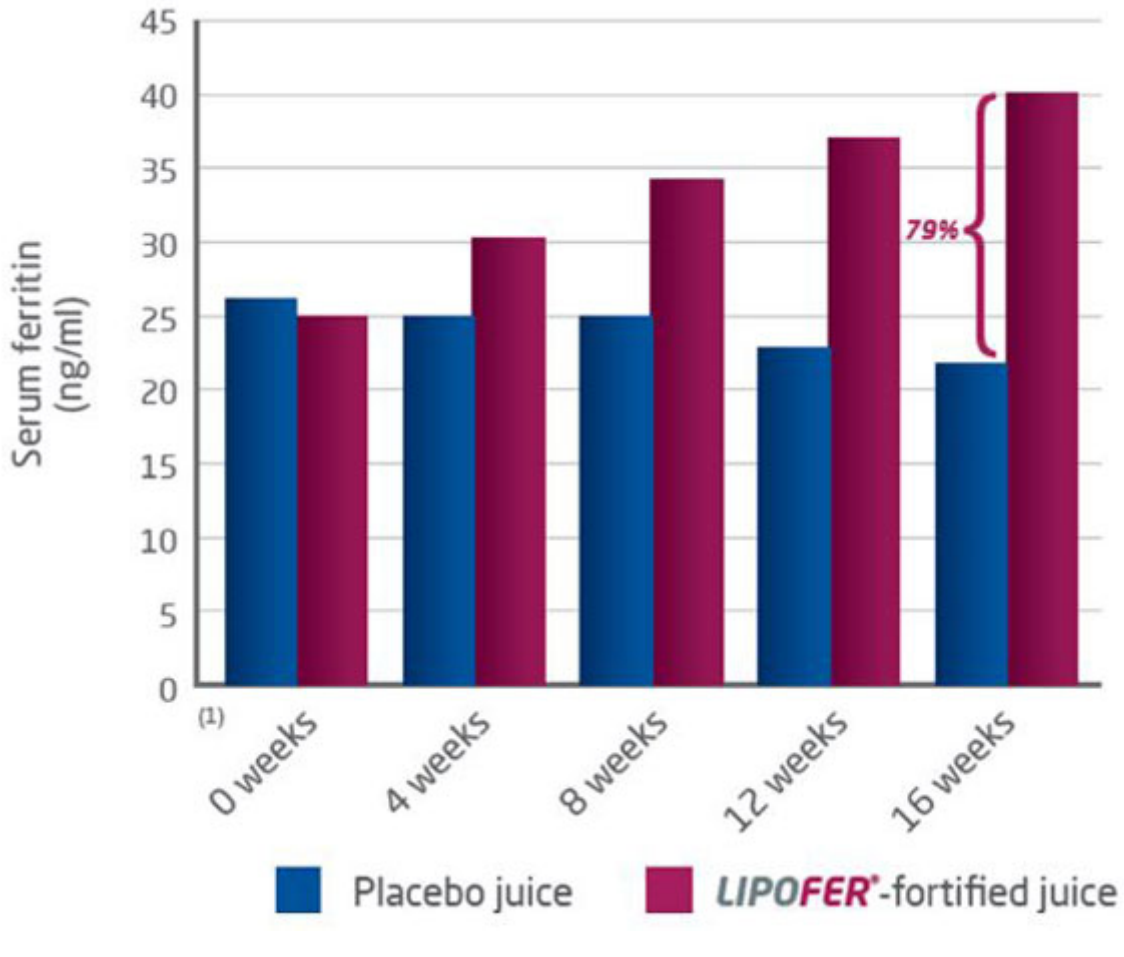
Lipofer®-fortified fruit juice improves **iron status** in **menstruating women** with low iron stores.

A double-blind study controlled by placebo investigated the influence of consuming fruit juice fortified with Lipofer® on iron status in 130 menstruating women, aged 18 to 35 years, with low iron stores.

Subjects were randomized into a placebo group and a fortified group who, as a supplement to their usual diet, consumed 500 ml per day of a placebo fruit juice or a juice fortified with Lipofer®, respectively, for 16 weeks. The fortified juice provided 16 mg of elemental iron.

Monthly blood samples were collected from the study participants and the concentration of serum ferritin was determined. by a Modular Analytics Serum Work Area analyser (Roche, Basel, Switzerland)

Lipofer®-fortified fruit juice consumption significantly **improved the iron status in the fortified group compared to the control group**: ferritin was **79% higher than in the control group** after 16 weeks. ($p<=0.001$).



Blanco-Rojo, R. et al. 2011. Efficacy of a microencapsulated iron pyrophosphate-fortified fruit juice: a randomised, double-blind, placebo-controlled study in Spanish iron-deficient women. British Journal of Nutrition vol.105:1652-91.

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