

MICRONUTRIENTS ROLE IN PERICONCEPTIONAL AND PREGNANCY PERIOD

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Micronutrients are nutrients, such as vitamins and minerals, that are calories free but essential for physiological functions. Part of his group are all the vitamins (vitamin A, B, C, D, E) and minerals (Iron, Calcium, Phosphorus, Zinc, Selenium, Magnesium,...).

During pregnancy micronutrients are essential not only for the maternal body, but also for the correct growing and development of fetus. For this reason the micronutrients requirements increase during pregnancy. This period requires a superior need of calcium (especially in the third trimester when it is essential for the fetal skeleton formation), iron (almost double demand than an adult woman), folates (essential for malformation prevention) and other vitamins, such as A, B1, B2 and B12. Vitamin D is indispensable for calcium adsorption and so for the bone health, but it has also an anti-inflammatory effect and a role in promoting innate immunity. It is rare in food, but sun exposure allows the body to synthesize it.

As far as micronutrients need redouble, overall caloric requirement has an increase of 15% (especially in the third trimester). Diet during pregnancy has to be really focused on the micronutrients contribution that eventually have to be specifically supplied.

Nutritional phenotype of pregnancy

- **Dynamic state:** adjustments in nutrient metabolism evolve continuously as the mother switches from an **anabolic condition** during early pregnancy to a **catabolic state** during late pregnancy

- **Three compartments model**, i.e., **mother/placenta/fetus**, each of them has different metabolism - fetal growth regulated by the balance between fetal nutrient demand and maternal-placental nutrient supply

Cetin et al, Hum Reprod Update 2010

Folic acid supplementation is recommended for all women of childbearing potential

Maximum benefit is derived from consumption **from one month before through two to three months after conception.**

- all women planning or capable of pregnancy should take a daily supplement containing **400 to 800 µg** of folic acid.
- Folate supplementation with **4 mg/day** for those **women at elevated risk** (Women with a previous child with a NTD and those taking anticonvulsants associated with development of NTDs)

ACOG 2003 – Wilson 2003 – CDC 1991 – USPHS 1999

What is the right daily dose?

The **optimal maternal folate status (RBC)** to reduce as low as possible NTDs risk should be **at least 906 nmol/L**

Leslie

Suggested strategy for the individual woman:
check woman folate status

IRON

Iron supplementation in pregnancy = controversial issue due to potential harmful effects of high doses of iron

Recommendations vary between 30-120 mg/d of elemental iron according to biomarker levels

Randomised controlled studies show **beneficial effects** of supplementation on iron status during early pregnancy in non-anemic women

Selective prophylaxis = screening of **ferritin levels** in early pregnancy: appropriate approach to identify women calling for supplementation:

> 70 µg/l: no supplementation
30-70 µg/l: 30-40 mg ferrous iron/d
< 30 µg/l: 80-100 mg/d

Millman et al. (1999) Acta Obstet Gynecol Scand 78: 749-757; Breymann (2002) Fetal and Maternal Medicine Review 13:1-29; Cogswell (2003) Am J Clin Nutr 78:773-81; Millman, Ann Hematol DOI:10.1007/s00277-008-0518-4; Scholl (2005) Am J Clin Nutr 81:S1218-S22

vitamin D

✓ **support maternal and fetal bone health**

increased vitamin D status during pregnancy may enhance **bone mineralization in the offspring**

Bischoff-Ferrari HA 2011

✓ **enable the maternal immunological adaptation required to maintain a normal pregnancy**

observational and intervention studies have suggested that vitamin D supplementation benefits immune function and the loss of tolerance of **preeclampsia**

Hypponen E 2011

increased levels are associated with long-term protection against immunological diseases (allergies, type 1 diabetes, asthma)

Bischoff-Ferrari HA 2011

a large proportion of pregnant women are vitamin D depleted!
however, strong need for future intervention studies