Factsheet folate and folic acid

Functions

Folate is a water-soluble B-vitamin and refers to the naturally occurring forms (pteroylglutamic acid) in foods as well as the forms found in fortified foods and supplements (folic acid). Folic acid is the most stable form of folate. The primary function of folate is as a coenzyme in single-carbon transfers in the synthesis of nucleic acids and metabolism of amino acids. One of the most important folate-dependent reactions is the conversion of homocysteine to methionine. Folate is also required in the formation of DNA and RNA. An impairment of this reaction initiates a process that can lead to megaloblastic anemia, one of the characteristics of folate deficiency. The main form of folate in plasma is 5-methyl-THF. Folate and vitamin B12 are interconnected in their capacity to donate and receive the single-carbon unit. Without vitamin B12, folate in its methyl form becomes trapped inside cells, unavailable to support cell growth. Folate is also essential for brain development and function.

Sources of folate

Dark leafy green vegetables, beans, lentils, asparagus, wheat germ, yeast, peanuts, oranges, strawberries.

Intake recommendations (D-A-CH)

	Unit	µg-equivalents/day
Infants	0 to under 4 months	60
	4 to under 12 months	80
Children and adolescents	1 to under 4 years	120
	4 to under 7 years	140
	7 to under 10 years	180
	10 to under 13 years	240
	13 to under 15 years	300
	15 to under 19 years	300
Adults	19 to under 25 years	300
	25 to under 51 years	300
	51 to under 65 years	300
	65 years and older	300
Pregnant women		550
Lactating women		450

Women of childbearing age should take 400 µg synthetic folic acid/day in addition to a folate-rich diet in order to reduce risk for neural tube defects.

Bioavailability

Folic acid from fortified foods and supplements is well bioavailable. Naturally occurring folates in food are less bioavailable, in addition the natural forms are highly unstable. Folate is easily destroyed by heat and oxygen.

Risk groups

Individuals with diets that lack sufficient quantity and variety of green leafy vegetables and legumes are at risk for inadequate folate intake. Folate requirements are increased during pregnancy, especially in the first couple of weeks of gestation. Low folate status is associated with the risk for neural tube defects in the growing foetus. Thus, women of childbearing age and pregnant women are advised to meet folate requirements using a combination of natural foods (folate forms) and fortified foods and supplements (folic acid). In many Western countries, governments have mandated flour to be fortified with folate.

Because folate is critical for cell growth and repair – especially for cells with a short lifespan (such as cells in the mouth and digestive tract) – visible signs of folate deficiency include digestive problems. Other symptoms are tiredness, loss of appetite, fewer but larger red blood cells (megaloblastic and macrocytic anemia) and neurological problems. A vitamin B12 deficiency will provoke a folate deficiency because vitamin B12 is not able to convert 5-methyl-THF as the main form of folate in plasma into its active form.

Tolerable Upper Intake Level (UL)

Based on the metabolic interactions between folate and vitamin B12, the Institute of Medicine (IOM) established a Tolerable Upper Intake Level (UL) for the synthetic forms of folate (folic acid) available in fortified foods and supplements. The IOM did not establish an UL for folate from food because high intakes of folate from food sources have not been reported to cause adverse effects.

The European Food Safety Authority (EFSA) confirmed the Tolerable Upper Intake Level (UL) for adults of 1000 µg folic acid/day. For children applies an age-dependent UL, which ranges from 200 µg folic acid/day for children aged 1 to 3 years up to 800 µg folic acid/day for adolescents aged 15 to 17 years.

References and further information

German Nutrition Society (DGE) (2015): Reference Values for Nutrient Intake. 1st edition, Neuer-Umschau-Buchverlag, Neustadt an der Weinstraße.

German Nutrition Society (DGE): Reference Values Folate. Online [23.04.2018].

German Nutrition Society (DGE) (2013): Press release. DGE publishes new reference values for folate. Online [23.04.2018].

German Nutrition Society (DGE) (2013): Selected questions and answers about folate. Online [23.04.2018].

European Food Safety Authority (EFSA) (2006): Tolerable Upper Intake Levels for vitamins and minerals. Online [23.04.2018].

Linus Pauling Institute (LPI), Oregon State University: Folate. Online [23.04.2018].

National Institutes of Health (NIH): Folate. Dietary Supplement Fact Sheet. Online [23.04.2018].

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