

Vitamin B₁ (Thiamin)

Function

Thiamin, like several other B vitamins, is essential for normal development, growth, reproduction, lactation, physical performance, and well-being. It is involved in releasing energy from the macronutrients that provide energy, especially carbohydrates. Thiamin is widely distributed in small amounts in foods. As a member of the water-soluble B-complex family of vitamins, thiamin is easily lost during the milling, heating, canning, blanching, and storage of foods. It is readily absorbed from the intestine, and readily excreted through the kidneys (Tanphaichitr 1999).

Thiamin is especially sensitive to the antinutritive effects of excess alcohol consumption (Tanphaichitr 1999), which decrease the absorption of thiamin and increase its excretion. Alcohol also inhibits the activation of thiamin to its coenzyme forms. Overt thiamin deficiency in Western countries occurs mostly among alcoholics. In Eastern countries, thiamin deficiency may result from dependence on unfortified, polished rice as the staple food and the consumption of a diet that is limiting in other respects.

Safety Evidence

Oral thiamin, or vitamin B₁, is nontoxic, as demonstrated by a long history of use as an oral supplement without adverse effect. There are no reports of adverse effect of oral thiamin, even at dosages of several hundred milligrams (SCOGS 1978; DHEW 1979; Food and Nutrition Board 1998). Rare cases of allergic sensitivity are documented and have occurred solely in patients who received thiamin by the parenteral route (Miller and Hayes 1982; Wrenn et al. 1989). These reactions have no apparent relevance to the safety of oral intake and may have been related to the injection vehicle. The efficiency of thiamin absorption rapidly declines when intakes reach 5 mg. This limitation has been cited as a possible explanation for the lack of toxicity of orally administered thiamin (SCOGS 1978; Hayes and Hegsted 1973). The absence of adverse effects, aside from a rare allergic reaction experienced after repeated daily doses of 100 mg injected intravenously, argues for an inherently low order of toxicity for thiamin.

Published Official Reviews of Vitamin B₁ (Thiamin) Safety

The FNB found no data to identify a LOAEL for oral thiamin in either humans or animals (Food and Nutrition Board 1998). Thus, with no adverse effects from oral thiamin that would support selection of a LOAEL or a specific NOAEL value, FNB did not set a UL.

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The EC SCF found evidence for adverse effects of injected thiamin, but since it found none for oral thiamin, it saw no need to set a UL value (Scientific Committee on Food 2001).

The UK EVM found that a small clinical trial (Meador et al. 1993) revealed no adverse effects of thiamin at daily oral intakes of 6,000 to 8,000 mg for five to six months (Expert Group on Vitamins and Minerals 2003). Based on a clinical trial with 556 young women given 100 mg thiamin for sixty to ninety days (Gokhale et al. 1996), UK EVM, finding an absence of adverse effects at any level of intake, set 100 mg as the GL for supplemental thiamin, and 103 mg for total thiamin.

CRN ULS for Vitamin B₁ (Thiamin)

CRN identifies a ULS of 100 mg of supplemental thiamin hydrochloride per day, based on clinical trial data (Gokhale 1996). The marketing of thiamin products at much higher levels, in addition to the clinical trial data of Meador and colleagues (Meador et al. 1993), strongly suggests that much higher levels of thiamin are safe.

Comparison of Safety Values for Vitamin B₁ (Thiamin)

CRN ULS (OSL method)	100 mg
US FNB UL	Reviewed but not established (no toxicological basis)
EC SCF UL	Reviewed but not established (no toxicological basis)
EC supplement maximum	Not established (as of May 2004)
UK EVM GL, supplement	100 mg (103 mg total)

References

DHEW: Department of Health, Education, and Welfare. Vitamin and mineral drug products for over-the-counter human use. Federal Register 1979; 44:16126-16201.

Expert Group on Vitamins and Minerals. Safe upper levels for vitamins and minerals, Food Standards Agency, United Kingdom, 2003.

Food and Nutrition Board. Dietary reference intakes for thiamin, riboflavin, niacin, vitamin B₆, folate, vitamin B₁₂, pantothenic acid, biotin, and choline. Washington, DC: National Academy Press, 1998.

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Gokhale LB. Curative treatment of primary (spasmodic) dysmenorrhea. *Indian J Med Res* 1996;
103:227-231.

Hayes KC, Hegsted DM. Toxicity of the vitamins. In: Food and Nutrition Board, National
Research Council, eds. *Toxicants occurring naturally in foods*. Washington, DC: National
Academy Press, 1973; 235-253.

Meador K, Loring D, Nichols M, Zamrini E, Rivner M, Posas H, Thompson E, Moore E.
Preliminary finding of a high dose thiamin in dementia of Alzheimer's type. *J Geriatric
Psychiatry and Neurology*, 1993; 6:222-229.

Miller DR, Hayes KC. Vitamin excess and toxicity. In: Hathcock JN, ed. *Nutritional toxicology*,
vol. 1. New York: Academic Press, 1982; 81-133.

Scientific Committee on Food. Scientific Committee on Food on the Tolerable Upper Intake
Level of Vitamin B₁. European Commission, SCF/CS/NUT/UPPLEV/46 Final, Brussels, 2001.

SCOGS: Select Committee on GRAS Substances, Life Sciences Research Office (LSRO).
Evaluation of the health aspects of thiamin hydrochloride and thiamin mononitrate as food
ingredients. Washington, DC, Federation of American Societies for Experimental Biology
(FASEB), 1978.

Tanphaichitr V. Thiamin. In: Shils ME, Olson HA, Shike M, Ross CA, eds. *Modern nutrition in
health and disease*, 9th ed. Philadelphia: Williams & Wilkins, 1999; 381-389.

Wrenn KD, Murphy F, Lovis CM. A toxicity study of parenteral thiamine hydrochloride. *Ann
Emerg Med* 1989; 18:867-870.