Pantothenic acid

Introduction

Pantothenic acid belongs to the group of B-vitamins. The vitamin is water-soluble and has an important role in intermediary metabolism as part of coenzyme A (van den Berg 1997, Depeint et al 2006). Pantothenic acid is widely distributed in nature, as its name implies (from the Greek *pantos* meaning everywhere).

Dietary sources and intake

Pantothenic acid is found in many foods. The content of pantothenic acid in the average Danish diet is estimated to be approximately 5 mg per 10 MJ. The majority (~ 75 %) of this amount comes from milk and cheese, cereal products including bread, meats and vegetables (van den Berg 1997,Danish Institute for Food and Veterinary Research 198, New ref). Rich sources are offal, dried legumes and whole grain products.

Physiology and metabolism

As part of coenzyme A and acyl-carrier protein, pantothenic acid plays a central role as a carrier of acyl groups in both catabolism and anabolism. The availability of pantothenic acid from foods to humans is 40-60 % (van den Berg 1997). Deficiency of pantothenic acid is rare because of the widespread nature of the vitamin. Deficiency has only been observed in individuals on a diet free of pantothenic acid or given an antagonist to pantothenic acid (IoM 1998).

Deficiency-induced greying of hair in mice can be reversed by administration of pantothenic acid, but the once popular idea that pantothenic acid might restore hair colour in humans proved fruitless (Plesofsky-Vig 1996, Kobayashi et al 2011).

Requirement and recommended intake

There is insufficient information for estimating the requirement of pantothenic acid, therefore no recommended intakes are included in NNR 2012. In the U.S. recommendations an adequate intake (AI) for adults was set to 5 mg/day (IoM 1998). This reference intake is mainly based upon estimated usual intakes of pantothenic acid in the U.S. population and there is no evidence to suggest that this level of intake is inadequate.

Upper intake levels and toxicity

The toxicity of pantothenic acid is very low, but due to lack of systematic oral dose-response intake studies no UL can be derived. Evidence available from clinical studies using high doses of pantothenic acid indicates that intakes considerably in excess of current levels of intake from all sources do not represent a health risk for the general population (SCF 2002).

References

van den Berg. Bioavailability of pantothenic acid. Eur J Nutr 1997;51(Suppl.1):S62-S63.

Danish Institute for Food and Veterinary Research. Unpublished results from the survey: Dietary Habits in Denmark 1985.

Depeint F, Bruce WR, Shangari N, Mehta R, O'Brien PJ. Mitochondrial function and toxicity: role of the B vitamin family on mitochondrial energy metabolism. Chem Biol Interact. 2006;163(1-2):94-112. http://www.ncbi.nlm.nih.gov/pubmed/16765926

IoM: Food and Nutrition Board, Institute of Medicine. Pantothenic acid. In: Dietary Reference Intakes for Thiamin, Riboflavin, Niacin, Vitamin B_6, Folate, Vitamin B_{12}, Pantothenic Acid, Biotin, and Choline. Washington D.C.: National Academy Press, 1998.

Kobayashi D, Kusama M, Onda M, Nakahata N (2011). The effect of pantothenic acid deficiency on keratinocyte proliferation and the synthesis of keratinocyte growth factor and collagen in fibroblasts. J Pharmacol Sci. 2011;115(2):230-4. Epub 2011

Plesofsky-Vig N. Pantothenic Acid. In: Present knowledge in nutrition. Ziegler EE, Filer, Jr LJ, Ed. Washington, DC: ILSI press 1996.

SCF. Opinion of the Scientific Committee on Food on the Tolerable Upper Intake Level of Pantothenic Acid. 2002. (http://europa.eu.int/comm/food/fs/sc/scf/out80_en.html).