

Biotin

Function

Clinical deficiency of biotin is rare. Functional deficiency of biotin has occurred through genetic defects in the enzymes that depend on it and, more rarely, through long-term consumption of large quantities of raw egg white, which contains the biotin-binding protein avidin. Impaired biotin function has serious consequences because of the resulting damage to the enzyme systems associated with respiration. These enzymatic reactions involve the transfer of a carboxyl group in biochemical reactions that are important to the metabolism of fatty acids, carbohydrates, and amino acids.

Safety Evidence

No toxic effects of oral biotin have been reported in humans. Infants have been given injections of up to 10 mg for six months (Miller and Hayes 1982); and oral intakes of up to 10 mg (SCOGS 1978) have not produced adverse effects, demonstrating that biotin must have an extremely low order of toxicity. Acute doses of 200 mg or intravenous doses of 20 mg have not produced adverse effects (Mock 1996).

Only marginal adverse effects are produced in animals as a result of biotin doses in the hundreds of milligrams per kilogram of body weight (Food and Nutrition Board 1998; Scientific Committee on Food 2001; Expert Group on Vitamins and Minerals 2003). In view of the absence of adverse effects in humans at extremely high doses, these effects are not relevant to the safety of supplemental biotin.

Published Official Reviews of Biotin Safety

The FNB concluded that the data on adverse effects of biotin were insufficient for a risk assessment, and that a UL value could not be derived (Food and Nutrition Board 1998).

The EC SCF concurred that there were no data to support a risk assessment and therefore did not set a UL value (Scientific Committee on Food 2001).

Similarly, UK EVM concluded that the data from studies on humans and animals were not sufficient for the establishment of an SUL (Expert Group on Vitamins and Minerals 2003). In the absence of established toxicity at any observed intake level, UK EVM identified a clinical trial (Maebashi et al. 1993) that involved oral administration of 9 mg per day of supplemental biotin, without adverse effect. Given the low number of individuals studied, UK EVM applied a UF of 10 to

conclude that biotin supplements of 0.9 mg per day should be considered safe. Considering the likely intake from food, UK EVM set a GL for consumption from all sources at 0.97 mg per day.

CRN ULS (OSL Method) for Biotin

CRN agrees with FNB, EC SCF, and UK EVM that a properly defined UL cannot be set because of the absence of known adverse effects at any observed level of intake. An OSL may be identified as the highest level of intake for which there are sufficient data to support a conclusion of safety. In the U.S., biotin supplements of 5 mg and 7.5 mg are quite common. The FDA has never given public notice of receipt of any reports of adverse effects associated with biotin. The absence of adverse effect at 9 mg of biotin per day (Maebashi et al. 1993) suggests that biotin supplements with lower amounts are likely to be safe.

The UF selected by UK EVM seems arbitrary, especially considering the absence of adverse effects in the clinical trial at 9 mg or at any other intake level ever reported for humans.

Based on (1) the absence of adverse effect at 9 mg of supplemental biotin (recognizing that the study size was small) and (2) the absence of any adverse effect reports for biotin, even though 2.5 mg and lower products are quite common in the U.S., CRN identifies 2.5 mg as its OSL and sets its ULS at that level.

Comparison of Safety Values for Biotin

CRN ULS (OSL method)	2,500 µg (2.5 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	900 µg

References

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