

Vitamin B₂ (Riboflavin)

Introduction

Riboflavin, like thiamin and some other B vitamins, is essential for normal development, growth, reproduction, lactation, physical performance, and well-being. It is involved in a wide array of essential biochemical oxidation-reduction reactions, especially those that yield energy and metabolize carbohydrates, fats, and proteins. Riboflavin is widely distributed in small amounts in many foods, and milk is one important dietary source. Similar to many members of the water-soluble B-complex family of vitamins, riboflavin is easily lost from grains or vegetables during milling, heating, canning, blanching, and storage. Riboflavin is especially sensitive to light. It is readily absorbed in small amounts from the intestine and readily excreted through the kidneys (McCormick 1999).

Safety Considerations

Riboflavin consumed orally has no reported toxicity (Miller and Hayes 1982; Institute of Medicine [IOM] 1998; Expert Group on Vitamins and Minerals [EVM] 2003). Reports of adverse effects all relate to animal studies or cell culture research involving either drugs with phototoxicity, intense exposure of lens tissue to ultraviolet light, or both in combination with high levels of riboflavin (Floersheim 1994; Spector et al. 1995). There are no reports of adverse reactions that can be attributed to riboflavin consumed orally from foods or dietary supplements.

Official Reviews

Institute of Medicine (IOM 1998). The IOM found no evidence of adverse effects associated with excess intake of riboflavin from food or supplements, that is, no toxicity data on which to base a LOAEL or a NOAEL. After extensive clinical and scientific investigation with elevated doses, the IOM found no basis for a UL value.

European Commission’s Scientific Committee on Food (EC SCF 2000). The SCF found no evidence of toxicity of oral vitamin B₂ and did not set a UL.

Expert Group on Vitamins and Minerals (EVM 2003). Based on clinical trial data generated after the IOM review (Schoenen et al. 1998), the UK’s EVM tentatively concluded that 400 mg per day produced only minor and infrequent side effects of uncertain significance. Because of the small number of subjects studied at that level of intake under controlled conditions, the EVM assigned the default toxicological uncertainty factor of 10 and set a supplemental guidance level at 40 mg, with a total intake guidance level at 43 mg because intakes of riboflavin from conventional foods are 3.3 mg or less.

CRN Recommendations

Using the data of Schoenen and colleagues (1998), CRN identifies 400 mg per day of vitamin B₂ as a level that does not produce a significant pattern of adverse effects. The minor and inconsistent adverse effects reported with 400 mg supplemental intake suggest that the EVM uncertainty factor of 10 is unnecessarily restrictive. Hence, CRN identifies a NOAEL from the 400 mg LOAEL and considers an uncertainty factor of 2 to be sufficient. The widespread market presence of 200 mg riboflavin supplements without reported adverse effects is consistent with safety at this level.

Quantitative Summary for Vitamin B₂ (Riboflavin)

CRN UL, supplemental intake	200 mg/day
IOM, total intake	Not determined
EC SCF, total intake	Not determined
EC supplement maximum	Not determined
EVM, guidance level	40 mg/day supplemental intake; 43 mg/day total intake

References

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