

Riboflavin: The Dose Makes the Poison

Riboflavin, or vitamin B-2, is an essential dietary component required in small amounts for many functions, including regenerating the vital antioxidant glutathione. Dietary riboflavin that is not being utilized in riboflavin-dependent enzymes exists as free riboflavin. When we consume riboflavin in excess of this requirement, there is a dramatic increase in blood, tissue, and urine levels of free riboflavin.

Normally the body contains low levels of free riboflavin, but it's easy to get abnormally high levels of riboflavin, simply because many of the supplements available in today's marketplace contain an excess amount of riboflavin. *This is a particular concern because riboflavin has the ability to react with light, resulting in adverse cellular effects.* The combination of riboflavin and light produces both toxic peroxides,¹ and a unique riboflavin-tryptophan photo adduct that is known to damage the liver and cells.²

This propensity for riboflavin to generate both damaging free radicals and toxic photo adducts of amino acids has been especially troubling in the cases of patients and infants who are fed intravenously. In these cases, riboflavin catalyzed reactions formed from room light, irradiating the bags of liquid nutrition, have often caused liver dysfunction.³

In fact, the naturally occurring riboflavin found in our skin and eyes has been implicated to play a pivotal role in many of the damaging effects of UV light exposure.⁴ This includes damage to our skin's connective tissue,⁵ the induction of DNA lesions known to promote the development of skin cancer and aging,⁶ and the impairment of mitochondria functioning resulting in cell death.⁷ High doses of riboflavin have also been shown to induce damage to retina cells in the eyes of research animals.⁸

Surprisingly, while the combination of riboflavin and light has been studied because of the adverse effects on cells grown in culture and exposed to light – and riboflavin and light have been used

as a model for inducing things as diverse as liver dysfunction, cataracts and mutations – yet the nutrition industry has failed to heed the warning that damage may be caused by high doses of riboflavin supplements.

This is partly due to confusion because a diet deficient in riboflavin is a risk factor for things like cataracts, while at the same time, the combination of riboflavin and light is often used by scientists to *cause* cataracts in animal research. As always, the dose makes the poison, and this means that *if you take nutritional supplements you should make sure you consume an adequate amount of riboflavin daily, rather than an excess of riboflavin.*

The human requirement for riboflavin is less than 2 milligrams a day, but many common vitamin supplements contain 10s or 100s of milligrams. There is little (if any) scientific justification for taking supplements of riboflavin greatly in excess of the known dietary requirement. However, there is a lot of scientific evidence and speculation that the combination of abnormally high blood, eye and skin levels of riboflavin, combined with a lifetime of sun exposure, may have serious negative consequences, and actually cause the damage we are trying to prevent. The combination of sunlight and abnormally high tissue levels of riboflavin from excess supplementation is a toxic combination that should be avoided.

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