VITAMIN B₁

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VITAMIN B₂

• Vitamin B₂, which is also known as Riboflavin, is an easily absorbed colored micronutrient with a key role in maintaining health in humans and other animals.

• It is the central component of the cofactors FAD (flavin adenin dinucleotide) and FMN (flavin mononucleotide), and is therefore required by all flavoproteins.
• As such, vitamin B₂ is required for a wide variety of cellular processes.

• It plays a key role in energy metabolism, and for the metabolism of fats, ketone bodies, carbohydrates, and proteins.

• The reduced form, which occurs in metabolism along with the oxidized form, is colorless.
The name "riboflavin" comes from:

1. "Ribose" (the sugar whose reduced form, ribitol)
2. "Flavin", the ring-moiety which imparts the yellow color to the oxidized molecule (from Latin flavus, "yellow")
It's best known visually as:

1. The vitamin which imparts the orange color to solid B-vitamin preparations

2. In addition to the yellow color to vitamin supplement solutions

3. And the unusual fluorescent-yellow color to the urine of persons who supplement with high-dose B-complex preparations.
The Chemical Structure:
**In Food Sources:**

- Yeast extract is considered to be exceptionally rich in vitamin B2, and liver and kidney are also rich sources.

- Wheat bran, eggs, meat, milk, and cheese are important sources in diets containing these foods.
- Cereals contain relatively low concentrations of flavins, but are important sources in those parts of the world where cereals constitute the staple diet.

- The milling of cereals results in considerable loss (up to 60%) of vitamin B2, so white flour is enriched in some countries such as USA by addition of the vitamin.
• Free B2 is naturally present in foods along with protein-bound FMN and FAD.

• Bovine milk contains mainly free vitamin B2, with a minor contribution from FMN and FAD.

• In whole milk, 14% of the flavins are bound non-covalently to specific proteins.
• Egg white and egg yolk contain specialized B2-binding proteins, which are required for storage of free B2 in the egg for use by the developing embryo.

• It is difficult to incorporate vitamin B2 into many liquid products because it has poor solubility in water.
• Hence the requirement for **riboflavin-5'-phosphate** ‘a more expensive but more soluble form of riboflavin.

• **Stability:**
  
• Vitamin B2 is generally stable during the heat processing and normal cooking of foods if light is excluded.
The alkaline conditions in which B2 is unstable are rarely encountered in foodstuffs.

B2 degradation in milk can occur slowly in dark during storage in the refrigerator.
Uses:

- Bβ is yellow or yellow-orange in color.

- In addition to being used as a food coloring, it is also used to fortify some foods.

- It is used in baby foods, breakfast cereals, pastas, sauces, processed cheese, fruit drinks, vitamin-enriched milk products, and some energy drinks.
Biochemical Function:

- Vitamin B\textsubscript{2} is the precursor of:
  1. (FMN)
  2. (FAD) Which function as coenzymes.

- Flavins can act as oxidizing agents.
- Reduction of isoalloxazine ring \( \rightarrow \) \( \text{FMNH}_2 \) and \( \text{FADH}_2 \).
Deficiency:

- \( B_2 \) is continuously excreted in the urine of healthy individuals, making deficiency relatively common when dietary intake is insufficient.

- However, \( B_2 \) deficiency is always accompanied by deficiency of other vitamins.
A deficiency of vitamin B2 can be:

1. Primary, poor vitamin sources in one's daily diet.

2. Secondary, may result from:
   A. Conditions that affect absorption in the intestine.
   B. The body not being able to use the vitamin.
   C. Or an increase in the excretion of the vitamin from the body.
Signs and symptoms of vitamin B2 deficiency (ariboflavinosis) include:

- Cracked and red lips.
- Inflammation of the lining of mouth and tongue.
- Mouth ulcers.
- Cracks at the corners of the mouth (angular cheilitis).
- A sore throat.
• Dry and scaling skin.
• Fluid in the mucous membranes.
• Iron-deficiency anemia.
• The eyes may also become bloodshot, itchy, watery and sensitive to bright light.
**Toxicity:**

- Vitamin B2 is not toxic when taken orally.

- Toxic doses can be administered by injection; any excess at nutritionally relevant doses is excreted in the urine.
• No evidence for B2 toxicity produced by excessive intakes.

• Even when 400 mg of vitamin B2 per day was given orally to subjects in one study for three months.
• **Summary:**

• B₂ is also known as riboflavin.

• It plays a key role in maintaining health in human and other animals.

• It’s important in energy metabolism as well as the metabolism of **fats, ketone bodies, carbohydrates, and proteins**.

• It’s yellow or yellow-orange color so it’s used in food coloring.
• **Milk, cheese, leaf vegetables, liver, kidneys, legumes, yeast, mushrooms, and almonds** are good sources of vitamin B2.

• A deficiency of vitamin B2 can be:

  • primary - poor vitamin sources in one's daily diet
  • secondary, which may be a result of conditions that affect absorption in the intestine, the body not being able to use the vitamin, or an increase in the excretion of the vitamin from the body.
Common symptoms of vitamin B2 deficiency (ariboflavinosis) include cracked and red lips, inflammation of the lining of mouth and tongue, mouth ulcers, and a sore throat.
Thank You