

# Biotin Gummy

## Strawberry Delight Flavor



### INGREDIENTS

Doctor's Best Biotin Gummies are a potent source of biotin, a water-soluble B vitamin. Like some other vitamins, biotin is vital to biological processes, occurring in all our cells. Unlike most vitamins, however, biotin is a coenzyme—it is actually part of the molecular structure of certain of our enzymes, and without it these enzymes cannot function.<sup>1-4</sup> Biotin is essential for fetal development, for growth, and for health in adulthood.<sup>1-9,26</sup>

The body also needs biotin to make energy and to efficiently utilize proteins, carbohydrates, and fats.<sup>1-4</sup> Genetic research has established that biotin is profoundly important for the stability of our DNA and healthy regulation of our gene functions.<sup>1,5,6</sup> Clinical studies have found that biotin supplementation can improve the hair, skin, and nails.<sup>1,2,9-15</sup> Since the body cannot make biotin so we must obtain it from diet or supplements.<sup>1,2,8</sup>

Dietary biotin is known to be required for the health of the brain, eyes, ears, lungs, voluntary muscles, bone, and immune system.<sup>1-9,16-18</sup> Pregnancy and lactation can deplete biotin,<sup>7,8</sup> as can malnutrition,<sup>11</sup> smoking,<sup>19</sup> excessive alcohol intake,<sup>20</sup> and certain medications.<sup>18-20</sup> The body has protein transporters specialized to absorb biotin, to deliver it to the brain across the blood-brain barrier, and to ensure its uptake from the bloodstream into our cells.<sup>9,20</sup>

### BENEFITS

- Promotes healthy hair, skin and nails\*
- Supports energy generation & other essential enzyme functions\*
- Fundamental to gene regulation & DNA integrity\*
- Helps maintain health & well-being across the lifespan\*
- May offer benefits for neuroprotection\*

### EXTENDED BENEFITS & SCIENTIFIC EVIDENCE

#### Promotes Healthy Hair, Skin and Nails\*

Considerable evidence links biotin status to the health of the hair, skin, and nails.<sup>1,2,9-15,27</sup> One mutation is known that changes the structure of hair and makes it virtually impossible to comb.<sup>12,13</sup> This is often accompanied by scaling of the scalp skin. Biotin supplementation was found to make such

problem hair much easier to comb, while increasing hair growth rate and eliminating scalp scaling.<sup>12,13</sup>

Babies with inherited mutations of biotin enzymes, or simply with low blood biotin levels, can have totally bald scalps. Supplementation with biotin can restore hair growth in such bald babies, without adverse effects,<sup>1,12</sup> and some researchers recommend that biotin supplementation be tried for any child with unexplained hair loss or skin changes.<sup>12</sup>

Skin integrity is vulnerable to lack of biotin, whether due to dietary insufficiency, poor absorption, or mutations in biotin enzymes.<sup>2,9-15,21</sup> Biotin enzymes are involved in the metabolism of fatty acids, required for skin health, and this helps explain the link between biotin deficiency and skin changes.<sup>9</sup> One indicator of biotin's importance for skin is that skin cells have transport proteins that are very efficient at importing biotin into the cell interior.<sup>15</sup>

Clinical studies indicate biotin supplementation can also improve your nails.<sup>9,13,14,27</sup> In a trial conducted with women,<sup>14</sup> biotin (2.5 mg daily for 6-15 months) improved nail thickness by 25%, and also improved splitting of the nails. Microscopic examination revealed that the cell layer on the top of the nail also improved from an irregular to the more regular, normal orientation.

#### Supports Energy Generation & Other Essential Enzyme Functions\*

At least seven human enzymes require biotin in order to function. Five have biotin integrated within their structure as a coenzyme, and these all belong to the carboxylase category.<sup>3,4</sup> Measuring the activities of these carboxylase enzymes gives a more accurate picture of the body's biotin status than measuring blood biotin levels.<sup>3,22</sup> The activity of each carboxylase enzyme can be conveniently assessed by measuring the level of its specific end product—a particular organic acid—in the urine.<sup>22</sup>

### Supplement Facts

Serving Size 2 Gummies  
Servings Per Container 30

	Amount Per Serving	% Daily Value
Calories	15	
Total Carbohydrate	4 g	1%**
Total Sugars	3 g	†
Includes 3g Added Sugars		6%**
Biotin	5000 mcg	16670%
Sodium	5 mg	<1%

\*\*Percent Daily Values are based on a 2,000 calorie diet.  
†Daily Value not established.

**Other Ingredients:** Glucose syrup, sugar, water, pectin, natural flavor, elderberry concentrate (for color), citric acid, sodium citrate, coconut oil, carnauba wax.

**Suggested Adult Use:** Chew two (2) gummies daily with or without food, or as recommended by a nutritionally-informed physician. Chew thoroughly before swallowing.

**KEEP OUT OF REACH OF CHILDREN**

Store in a cool dry place.

\* These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure or prevent any disease.

Of the five known biotin carboxylases,<sup>3</sup> three are located in the mitochondria, the microscopic energy generators within our cells.<sup>4,23</sup> Carboxylases that reside in the mitochondria help make heme, a protein that contains iron and is essential for the mitochondria's energy generation functions. Consequently, biotin deficiency can impair mitochondrial heme protein function, which in turn can create a free radical challenge for the cell.<sup>4</sup>

The sixth biotin enzyme is biotinidase, which functions to release biotin from its linkages to proteins or other biomolecules thereby making it available for utilization as the carboxylase coenzyme.<sup>1,16,17</sup> Biotinidase also can remove biotin from used carboxylase molecules, for reuse in newly made carboxylase molecules. Mutations in biotinidase can markedly lower biotin absorption from the foods and contribute to depletion of the body's biotin stores.<sup>1,17</sup>

At least 165 biotinidase mutations are known to exist, and some countries routinely monitor newborns for the presence of such mutations.<sup>24</sup> Supplementation with biotin (5-20 mg per day for 3-6 months) can correct some of the adverse effects associated with these mutations.<sup>8,17,20,24</sup> Biotinidase is also involved in the use of biotin to help stabilize DNA and regulate gene activity.<sup>1,5,6</sup>

The seventh biotin enzyme is holocarboxylase synthetase (HS), which functions to attach biotin into all five biotin carboxylase enzymes.<sup>1</sup> HS also works together with biotinidase to insert biotin into the gene structure.<sup>1,6</sup> Mutations in HS are associated with an array of genetic and metabolic abnormalities, some of which respond favorably to biotin supplementation.<sup>1</sup>

The seven biotin enzymes are so closely linked functionally, that a mutation that impairs any of them can potentially result in impairments of either biotin absorption from the intestinal tract, its incorporation into the carboxylases, its insertion into genetic material, or its recycling from used biotin enzymes, and contribute to a functional biotin deficiency.<sup>1,3,4,6,16,17</sup>

### Fundamental to Gene Regulation and DNA Integrity\*

Besides its importance for energy generation and a broad variety of metabolic activities, biotin is crucial for DNA stability and overall healthy gene activity.<sup>1,5,6,25,26</sup> This vitamin is involved in regulating at least 2000 genes,<sup>9,25</sup> including genes for cell signaling, maintenance of chromosome structure, synthesis of biotin-dependent enzymes, and regulation of protein synthesis.<sup>1,25</sup>

DNA is the genetic blueprint for our life processes, and its coding information is managed via its complex structural associations with a variety of proteins, mainly of the histone type. Histones help control how and when the DNA genetic coding will be read out or "translated".<sup>23</sup> The HS and biotinidase work together to attach or "tag" biotin onto selected histones.<sup>5,6,25</sup> The biotin tags modify histone function to help ensure DNA translation and other gene activity are appropriate for the particular cell.

### Helps Maintain Health & Wellbeing Across the Lifespan\*

The importance of biotin for health begins at conception. The developing brain and other organs of the fetus have a high requirement for biotin.<sup>4,8,9</sup> Yet biotin deficiency is common among pregnant women in the United States.<sup>1,7,26</sup> Lactation also increases the requirement for dietary biotin intake.<sup>7,8</sup> Therefore pregnant or lactating women are well advised to maintain healthy biotin status.

Since the requirement for biotin begins before a woman would likely know she is pregnant,<sup>7</sup> and since biotin is very safe to consume, all women of reproductive age would be better prepared for pregnancy by having adequate biotin in their diet. The benefits of consuming adequate biotin extend to the entire population, including individuals who smoke, consume alcohol, or simply desire added "nutritional insurance" for good health. This B vitamin is increasingly being recognized for its diverse involvements in human energetics, genetic stability, and metabolic versatility.<sup>26</sup>

## SCIENTIFIC REFERENCES

1. Zemleni J et al. 2012. Biotin. Adv Nutr. Mar 1;3(2):213-4.
2. Nyhan WL. 1987. Inborn errors of biotin metabolism. Arch Dermatol. Dec;123:1696-1698a.
3. Tong L. 2013. Structure and function of biotin-dependent carboxylases. Cell Mol Life Sci. Mar;70(5):863-91.
4. Atamna H et al. 2007. Biotin deficiency inhibits heme synthesis and impairs mitochondria in human lung fibroblasts. J Nutr. Jan;137(1):25-30.
5. Kothapalli N et al. 2005. Biological functions of biotinylated histones. J Nutr Biochem. Jul;16(7):446-8.
6. Zemleni J et al. 2012. Biotin requirements for DNA damage prevention. Mutat Res. May 1;733(1-2):58-60.
7. Mock DM. 2009. Marginal biotin deficiency is common in normal human pregnancy and is highly teratogenic in mice. J Nutr. Jan;139(1):154-7
8. Agadi S et al. 2013. Vitamin-responsive epileptic encephalopathies in children. Epilepsy Res Treat. 2013:510529.
9. Anonymous. 2007. Biotin. Altern Med Rev. Mar;12(1):73-8.
10. Daniells S et al. 2010. Hair loss in long-term or home parenteral nutrition: are micronutrient deficiencies to blame? Curr Opin Clin Nutr Metab Care. Nov;13(6):690-7.
11. Velazquez A et al. 1995. Biotin supplementation affects lymphocyte carboxylases and plasma biotin in severe protein-energy malnutrition. Am J Clin Nutr. Feb;61(2):385-91.
12. Shelley WB et al. 1985. Uncombable hair syndrome: observations on response to biotin and occurrence in siblings with ectodermal dysplasia. J Am Acad Dermatol. Jul;13(1):97-102.
13. Boccaletti V et al. 2007. Familial Uncombable Hair Syndrome: Ultrastructural Hair Study and Response to Biotin. Pediatr Dermatol. May-Jun;24(3):E14-6.
14. Colombo VE et al. 1990. Treatment of brittle fingernails and onychoschizia with biotin: scanning electron microscopy. J Am Acad Dermatol. Dec;23(6 Pt 1):1127-32.
15. Grafe F et al. 2003. Transport of biotin in human keratinocytes. J Invest Dermatol. Mar;120(3):428-33.
16. Rajendiran A et al. 2011. Biotinidase deficiency--clinching the diagnosis rapidly can make all the difference! BMJ Case Rep. Sep 28.
17. Karimzadeh P et al. 2013. Biotinidase deficiency: a reversible neurometabolic disorder (an Iranian pediatric case series). Iran J Child Neurol. Fall;7(4):47-52.
18. Stratton SL et al. 2012. Marginal biotin deficiency can be induced experimentally in humans using a cost-effective outpatient design. J Nutr. Jan;142(1):22-6
19. Sealey WM et al. 2004. Smoking accelerates biotin catabolism in women. Am J Clin Nutr. 2004 Oct;80(4):932-5.
20. Said HM. 2011. Intestinal absorption of water-soluble vitamins in health and disease. Biochem J. Aug 1;437(3):357-72.
21. Burri BJ et al. 1981. Mutant holocarboxylase synthetase: evidence for the enzyme defect in early infantile biotin-responsive multiple carboxylase deficiency. J Clin Invest. Dec;68(6):1491-5.
22. Bogusiewicz A et al. 2012. Measurement of acylcarnitine substrate to product ratios specific to biotin-dependent carboxylases offers a combination of indicators of biotin status in humans. J Nutr. Sep;142(9):1621-5.
23. Alberts B et al. *Molecular Biology of the Cell*. 2008; New York: Garland Science/Taylor and Francis (Fifth Edition).
24. Procter M et al. 2013. The Biotinidase Gene Variants Registry: A Paradigm Public Database. G3 (Bethesda). Apr 9;3(4):727-731.
25. Zemleni J et al. 2009. Biotin. Biofactors. Jan-Feb;35(1):36-46.
26. Mock DM. 2017. Biotin: From Nutrition to Therapeutics. J Nutr. Aug;147(8):1487-1492.
27. Lipner SR et al. 2018. Biotin for the treatment of nail disease: what is the evidence? J Dermatolog Treat. Jun;29(4):411-414.



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