INTERNATIONAL HEALTH RESEARCH

DOSSIER · SUBSTANCE

Biotin (Vitamin B7)

Biotin is a water-soluble B vitamin; human studies found lower total cholesterol in type 2 diabetes and mixed findings for hair, skin, nails and multiple sclerosis.

413	161	30	30	29
STUDIES IN TOTAL	IN HUMANS	OF WHICH CONTROLLED	IN ANIMALS	IN THE LAB

Figures from the IHR study database · Last updated 2026-10-16

How to Read This Dossier

ESTABLISHED
measured in humans, with a comparison group

PLAUSIBLE
supported by mechanism, animal studies or observation

HYPOTHESIS
a likely connection that still needs to be tested

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Biotin (Vitamin B7) at a Glance

In type 2 diabetes, total cholesterol fell with biotin in a meta-analysis; the reduction in fasting blood glucose and triglycerides was not statistically confirmed, insulin remained unchanged [2].

In hair loss, a systematic review found no difference in hair growth between biotin and placebo in the most informative, placebo-controlled study [4].

In progressive multiple sclerosis, disability regressed in some patients with high-dose biotin in a randomized study, and in no one with placebo [7]. The follow-up study SPI2 did not confirm this benefit [25].

Another randomized controlled study showed no difference in visual acuity, nerve fiber layer thickness and quality of life in MS-related chronic vision loss [9].

We evaluated 123 human studies on Biotin (Vitamin B7), including 12 randomised controlled trials and 6 meta-analyses or systematic reviews; the controlled studies include 1,170 participants in total. As of 11 October 2026.

1. What Is Biotin (Vitamin B7)? Occurrence, Origin and Forms

Biotin is a water-soluble vitamin of the B group. In the body it acts as a coenzyme of several carboxylases involved in fat, carbohydrate and protein metabolism. As a supplement it is traditionally associated with hair, skin and nails, and medically it is given in confirmed biotin deficiency and in inborn disorders of biotin metabolism.

Biotin occurs in many foods, among them egg yolk, liver, nuts, oats, soy and yeast, and is additionally produced by gut bacteria. In body cells it is present bound to protein.

In foods biotin is bound to protein and is released in the gut by the enzyme biotinidase. In supplements it is present in free form; human studies examine free biotin taken by mouth, high-dose biotin and biotin as a component of combination products, and in metabolic medicine also biotin as an infusion.

Forms and Preparations Studied

- Biotin from foods, bound to protein
- Free biotin as a dietary supplement (tablets, capsules, drops)
- High-dose biotin as used in studies of neurological disease
- Biotin in combination products with other vitamins and minerals
- Biotin for injection or infusion in inborn metabolic disorders

Not covered on this page:

- Other B vitamins such as thiamine, riboflavin, pantothenic acid, folate and cobalamin are substances in their own right, even when they occur in the same products.
- Combination products for hair, skin and nails that contain zinc, selenium or amino acids alongside biotin are not studies of biotin alone.
- Interference of laboratory tests by biotin, for instance in immunoassays, is an analytical safety topic and not an area of application.

2. What Does Biotin (Vitamin B7) Do? Results by Area

AREA	RESULT IN CONTROLLED STUDIES	STRENGTH OF EVIDENCE	STUDIES	PARTICIPANTS
Biotin deficiency	mostly improved	moderate	0 meta-analyses · 3 controlled · 24 other	128
Multiple sclerosis	mostly no difference	low	2 meta-analyses · 2 controlled · 20 other	247
Hair loss	mixed	unclear	1 meta-analyses · 2 controlled · 9 other	165
Skin and skin inflammation	mostly no difference	unclear	0 meta-analyses · 2 controlled · 5 other	165
Glucose and lipid metabolism	mixed	unclear	1 meta-analyses · 1 controlled · 5 other	40
Brittle nails	mixed	unclear	0 meta-analyses · 1 controlled · 2 other	105
Other investigations	mostly no difference	unclear	0 meta-analyses · 2 controlled · 51 other	146

How to read the table: counted are human studies whose results concern the area. “High” means at least one meta-analysis and two controlled studies showing improvement, or at least three controlled studies of which three quarters show improvement, with at least 300 participants in total. “Moderate” means at least two controlled studies showing improvement, as a majority, or one meta-analysis alongside controlled studies. “Low” means one controlled study showing improvement. Where an area has no controlled study, the strength of evidence is at most “low” (result “reviews only” or “observational data

only"). Everything else is "unclear". A study counts as showing improvement when at least half of its outcomes in this area improved. Reviews of combination products do not count as meta-analyses; results that only describe side effects or shares of users do not count as an effect. The same study is counted only once.

3. What the Studies Show in Detail

Biotin (Vitamin B7) and Biotin Deficiency: Human Studies

In pregnant women with increased excretion of 3-hydroxyisovaleric acid, a sign of mild biotin deficiency, this decreased with biotin in a randomized trial, while it increased slightly with placebo [15]. In children with severe protein-energy malnutrition, the activity of biotin-dependent enzymes in lymphocytes increased with biotin, most strongly in those with initially low levels [20]. The evidence is considered moderate, as both studies are small and involve different populations and outcome measures.

STUDY	DESIGN · PARTICIPANTS	PREPARATION · DOSE · DURATION · COMPARISON
[10] Hanson et al. 2026	randomised controlled · 80 participants	Prenatal multivitamin with 150 µg (intervention) or 30 µg (control) biotin; 150 µg vs. 30 µg biotin daily; 24 weeks;
[15] Mock et al. 2002	randomised controlled · 26 participants	Biotin supplement or placebo; 300 µg (1.2 µmol) biotin per day; 14 days; vs. Placebo-controlled, randomized
[20] Velázquez et al. 1995	controlled · 22 participants	Biotin supplement; 10 mg/d; vs. Placebo, double-blind
[22] Jezela-Stanek et al. 2022	cross-sectional study · 1,071,463 participants	Biotinidase activity in dried blood spot and serum, BTD gene sequencing
[26] Upadia et al. 2025	cohort study · 478 participants	Newborn screening for inborn errors of metabolism, including biotinidase deficiency; January 2005 to December
[27] Sharma et al. 2024	cross-sectional study · 407 participants	Biotinidase enzyme analysis and BTD gene sequencing; vs. enzyme activity <10% vs. >10% of mean normal
[28] Yaralı et al. 2024	cohort study · 357 participants	Biotin; vs. no control group
[29] Çıkı et al. 2024	cross-sectional study · 302 participants	Biotin (endogenous, in biotinidase deficiency); vs. genotype-phenotype correlation, no intervention comparison

Further studies in this area: [30 35 41 45 49 50 52 61 62 65 77 79 83 84 86 91 99 103 107]

Biotin (Vitamin B7) and Multiple Sclerosis: Human Studies

In multiple sclerosis, high-dose biotin (MD1003) has been tested against placebo in several randomized trials [7925]. In a randomized trial in progressive MS, disability improved in some patients on high-dose biotin, and in none on placebo [7]. EDSS progression was also lower [7]. The follow-up study SPI2 did not confirm this benefit [25]. Another randomized controlled trial showed no difference in visual acuity, retinal nerve fiber layer thickness, and quality of life in MS-related chronic vision loss [9]. A systematic review with meta-analysis found no confirmed difference from placebo in disability and EDSS, but more often a faster walking time [1]. The certainty of evidence is low: the first study showed benefit in some patients, but the follow-up study and the meta-analysis did not confirm this for disability. It remains open whether a subgroup benefits, for example in walking ability.

STUDY	DESIGN · PARTICIPANTS	PREPARATION · DOSE · DURATION · COMPARISON
[1] Espiritu et al. 2021	meta-analysis · 889 participants	High-dose biotin (MD1003), oral, as adjunctive treatment; at least 300 mg/day; 12 to 15 months; vs. Placebo
[5] Marx et al. 2020	systematic review	Biotin as nutraceutical; vs. Control
[7] Tourbah et al. 2016	randomised controlled · 154 participants	MD1003 (high-dose biotin); 100 mg biotin thrice daily; 12 months double-blind, then 12 months open-label for all; vs.
[9] Tourbah et al. 2018	randomised controlled · 93 participants	MD1003 (high-dose pharmaceutical-grade biotin); 300 mg/day orally; 6 months double-blind, then 6 months open-la

STUDY	DESIGN · PARTICIPANTS	PREPARATION · DOSE · DURATION · COMPARISON
[25] Joseph et al. 2026	study · 506 participants	High-dose biotin vs. placebo (SPI2 trial), arms pooled; Follow-up over 27 months; vs. Pooled treatment arms, no effic
[31] Pape et al. 2020	cross-sectional study · 186 participants	vitamins and dietary supplements, including biotin; biotin 10 and 300 mg/day in healthy volunteers; vs. biotin intake v
[32] Couloume et al. 2020	cohort study · 178 participants	High-dose biotin; 12 months; vs. No control group, comparison to baseline
[37] Collongues et al. 2021	cohort study · 48 participants	High-dose pharmaceutical-grade biotin (MD1003); 1 year; vs. No control group, before/after observation

Further studies in this area: [38] [46] [80] [81] [94] [95] [99] [100] [104] [110] [111] [112] [114] [115] [116] [117]

Biotin (Vitamin B7) and Hair Loss: Human Studies

A systematic review found three studies on biotin in hair loss; the most informative, placebo-controlled one showed no difference in hair growth [4]. With biotin from a plant extract, with or without silica, hair loss decreased in a placebo-controlled study compared with baseline [8]. A hair product for application with Redensyl, saw palmetto and biotin performed better together with platelet-rich plasma than Procapil with platelet-rich plasma [12]. Injections with biotin and dexpanthenol from two manufacturers reduced hair loss in both groups; there was no group without biotin [13]. In acne patients taking isotretinoin, the proportion of growing hairs increased with additional biotin compared with baseline [18]. It remains open whether biotin helps in hair loss mainly in a biotin deficiency.

STUDY	DESIGN · PARTICIPANTS	PREPARATION · DOSE · DURATION · COMPARISON
[4] Yelich et al. 2024	systematic review	Oral biotin as a hair supplement; vs. Placebo or control groups in the included studies
[8] Patel et al. 2025	randomised controlled · 105 participants	Botanical extracts with biotin from Sesbania grandiflora, some with silica from Bambusa arundinacea; 1.25 mg biotin or
[18] Aksac et al. 2021	controlled · 60 participants	Biotin 10 mg/day added to isotretinoin; 10 mg/day; 4 months; vs. isotretinoin alone (group A) vs. isotretinoin plus biotin
[21] Schulpis et al. 2001	case series	Biotin supplementation; 10 mg/day; 45 days of valproic acid treatment; vs. Healthy controls; three valproic acid dose gr
[33] Şen et al. 2021	cohort study · 156 participants	Biotin 1000 mcg/day; 1000 mcg/day; 3 months (biotin deficiency) or mean 2.5 months (self-initiated); vs. patients with
[34] Kakunje et al. 2025	cross-sectional study · 150 participants	Valproate treatment; measurement of serum biotinidase and IL-2; 2-year study period; vs. valproate group vs. control g
[43] Starace et al. 2021	case series · 25 participants	biotin alone or with topical minoxidil; vs. no control group, retrospective case series
[44] González et al. 2025	study · 22 participants	Serum WS Biotin, water-soluble form of D-biotin; 3 months daily application; vs. no control group (single-arm, pretest-p

Further studies in this area: [87] [96] [102] [109]

Biotin (Vitamin B7), Skin and Skin Inflammation: Human Studies

In acne patients taking isotretinoin, skin moisture decreased significantly without biotin, but not with additional biotin; a direct group comparison was not reported [18]. With biotin from a plant extract, with or without silica, skin elasticity increased from baseline in a placebo-controlled study [8]. Both studies are small, one was not randomized, and neither reports a direct comparison with the control group. It remains open whether the effects also occur in individuals with adequate biotin status without concomitant medications.

STUDY	DESIGN · PARTICIPANTS	PREPARATION · DOSE · DURATION · COMPARISON
[8] Patel et al. 2025	randomised controlled · 105 participants	Botanical extracts with biotin from Sesbania grandiflora, some with silica from Bambusa arundinacea; 1.25 mg biotir
[18] Aksac et al. 2021	controlled · 60 participants	Biotin 10 mg/day added to isotretinoin; 10 mg/day; 4 months; vs. isotretinoin alone (group A) vs. isotretinoin plus bic
[21] Schulpis et al. 2001	case series	Biotin supplementation; 10 mg/day; 45 days of valproic acid treatment; vs. Healthy controls; three valproic acid dos
[52] Ting et al. 2025	case series · 5 participants	Biotin supplementation; 10-30 mg daily; vs. no control group
[59] Pi et al. 2025	case series · 2 participants	Oral multivitamin regimen with biotin, lipoic acid, and pantothenic acid; vs. No control group; before-and-after cour
[86] Yılmaz et al. 2024	cross-sectional study	Biotinidase enzyme activity and BTD gene analysis; vs. genotype-phenotype correlations, no treatment groups
[108] Januszewski et al. 2023	review	Biotin among 13 other nutritional supplements

Biotin (Vitamin B7), Glucose and Lipid Metabolism: Human Studies

In adults with type 2 diabetes, total cholesterol fell with biotin in a meta-analysis; the reduction in fasting blood glucose and triglycerides was not statistically confirmed, insulin remained unchanged [2]. For mixtures of biotin and chromium picolinate, two randomized controlled studies reported improvements in blood glucose and lipid values in type 2 diabetes, but these findings apply to the mixture and not to biotin alone [614]. In the meta-analysis, only the reduction in total cholesterol is confirmed; whether biotin alone lowers blood glucose must be clarified by larger studies.

STUDY	DESIGN · PARTICIPANTS	PREPARATION · DOSE · DURATION · COMPARISON	RESULT
[2] Zhang et al. 2022	meta-analysis · 445 participants	Biotin supplementation; 28 to 90 days; vs. Control groups of included RCTs	Fasting blood gluc
[3] Chai et al. 2025	systematic review	Water-soluble vitamins, including biotin	Glycemic control a
[19] Marshall et al. 1980	controlled · 40 participants	Biotin supplementation; 0.9 mg/day; 71 days; vs. Placebo	Total plasma lipids:
[24] Belda et al. 2022	study · 1,545 participants	Biotin plus fructo-oligosaccharides (prebiotics); vs. high-fat diet-fed mice without supplementation	weight gain and gly
[66] Walimbe et al. 2025	case report · 1 participants	Targeted replacement with biotin, lipoic acid and pantothenic acid	Metabolic control:
[92] Güder et al. 2023	cross-sectional study	biotin (level measurement, no supplementation); vs. no control group, correlations	biotin levels and ch
[98] Mehta et al. 2026	review	Biotin and/or chromium supplements; vs. Single versus combined supplementation, controls (qualitative)	Fasting blood gluc

Biotin (Vitamin B7) and Brittle Nails: Human Studies

With biotin from a plant extract, with or without silica, nail roughness decreased from baseline in a placebo-controlled study with 105 participants [8]. A review names biotin alongside collagen peptides, keratin, MSM, and orthosilicic acid among substances that may improve the appearance, strength, and brittleness of nails [105]. The certainty of evidence is unclear because only one controlled study is available, which does not report a comparison with placebo, and it remains open whether the participants had a biotin deficiency.

STUDY	DESIGN · PARTICIPANTS	PREPARATION · DOSE · DURATION · COMPARISON
[8] Patel et al. 2025	randomised controlled · 105 participants	Botanical extracts with biotin from Sesbania grandiflora, some with silica from Bambusa arundinacea; 1.25 mg biotin
[97] Fernández-Campos et al. 2020	study	Regenail® nail lacquer with biotin, MSM, dimethylsilanediol salicylate; vs. Betalfatrus® reference product
[105] Zaraa et al. 2025	review	Biotin (dietary supplement)

Biotin (Vitamin B7): Further Outcomes in Studies

In children with asthma, biotin in addition to standard therapy reduced the inflammatory markers TNF-α and 8-OHdG more than placebo; lung function improved only with L-carnitine [11]. The other works in this area are predominantly observational studies or investigate biotin in combination products; controlled studies on clinical endpoints are still pending here.

STUDY	DESIGN · PARTICIPANTS	PREPARATION · DOSE · DURATION · COMPARISON
[1] Espiritu et al. 2021	meta-analysis · 889 participants	High-dose biotin (MD1003), oral, as adjunctive treatment; at least 300 mg/day; 12 to 15 months; vs. Placebo
[10] Hanson et al. 2026	randomised controlled · 80 participants	Prenatal multivitamin with 150 µg (intervention) or 30 µg (control) biotin; 150 µg vs. 30 µg biotin daily; 24 weeks; vs. Lc
[11] Khedr et al. 2026	randomised controlled · 66 participants	Biotin 5 mg capsules twice daily plus standard therapy; 5 mg twice daily; 3 months; vs. Placebo plus standard therapy
[23] Kong et al. 2025	cohort study · 144,439 participants	Dietary biotin intake (24-h Oxford WebQ); median 14.06 years follow-up; vs. Q1 (lowest intake) vs. Q2-Q4
[24] Belda et al. 2022	study · 1,545 participants	Biotin plus fructo-oligosaccharides (prebiotics); vs. high-fat diet-fed mice without supplementation
[26] Upadia et al. 2025	cohort study · 478 participants	Newborn screening for inborn errors of metabolism, including biotinidase deficiency; January 2005 to December 202
[36] Jaafar et al. 2025	cross-sectional study · 50 participants	Biotin (serum and follicular fluid levels, no supplementation); vs. Normal, poor, and hyper-responders
[39] Saudubray et al. 1984	case series · 41 participants	Vitamin mixture with biotin, thiamine, B12, riboflavin; biotin 10 mg; vs. comparison with similar reported cases

Further studies in this area: [40] [42] [47] [48] [51] [52] [53] [54] [55] [56] [57] [58] [59] [60] [63] [64] [66] [67] [68] [69] [70] [71] [72] [73] [74] [75] [76] [77] [78] [82] [85] [86] [88] [89] [90] [91] [92] [93] [99] [100] [101] [106] [107] [113] [118]

4. How Is Biotin (Vitamin B7) Dosed? Preparation, Dose and Duration in Studies

The studies mostly used oral biotin: as a dietary supplement, high-dose as a drug (MD1003) in multiple sclerosis or in combination products with other vitamins, minerals or plant extracts. Biotin was injected together with dexpanthenol in hair loss [13], applied in a hair product with Redensyl and saw palmetto [12]. The doses and dosage forms are listed in the table.

PREPARATION OR FORM	DOSE	DURATION	STUDY
Chromium picolinate plus biotin (CPB)	600 µg chromium and 2 mg biotin once daily	90 days	[6]
MD1003 (high-dose biotin)	100 mg biotin thrice daily	12 months double-blind, then 12 months open-label for all	[7]
Botanical extracts with biotin from Sesbania grandiflora, some with silica from Bambusa arundinacea	1.25 mg biotin orally; biotin-silica group additionally 21.75 mg silica	90 days	[8]
MD1003 (high-dose pharmaceutical-grade biotin)	300 mg/day orally	6 months double-blind, then 6 months open-label	[9]
Prenatal multivitamin with 150 µg (intervention) or 30 µg (control) biotin	150 µg vs. 30 µg biotin daily	24 weeks	[10]

PREPARATION OR FORM	DOSE	DURATION	STUDY
Biotin 5 mg capsules twice daily plus standard therapy	5 mg twice daily	3 months	11
Topical redensyl, saw palmetto, and biotin plus PRP	—	four sessions at three-week intervals	12
Weekly injections of biotin 5 mg/1 ml plus dexpanthenol 250 mg/2 ml	Biotin 5 mg plus dexpanthenol 250 mg weekly	6 weeks treatment, follow-up at 1 and 8 weeks	13
Chromium picolinate and biotin (CPB) or placebo	—	4 weeks	14
Biotin supplement or placebo	300 µg (1.2 µmol) biotin per day	14 days	15
SPP1 specialized food product with biotin and other vitamins	2 portions of SPP1 per day	14 days	16
AG1, comprehensive nutritional supplement with vitamins, minerals, probiotics, phytochemicals	Single serving 13 g mixed in water	Single dose, 1-week washout	17
Biotin 10 mg/day added to isotretinoin	10 mg/day	4 months	18
Biotin supplementation	0.9 mg/day	71 days	19
Biotin supplement	10 mg/d	—	20

5. Is Biotin (Vitamin B7) Safe? Side Effects in Studies

Adverse events with high-dose biotin in multiple sclerosis occurred no more frequently than with placebo [179]; in children with asthma, biotin proved to be safe [11]. However, high-dose biotin distorted laboratory tests in some of those treated, and in no one with placebo [1].

STUDY	REPORTED SIDE EFFECTS
[1] Espiritu et al. 2021	Any and serious AEs not different; laboratory test interference in 4.7% on biotin
[6] Albarracin et al. 2007	well tolerated, no adverse effects, similar to placebo
[7] Tourbah et al. 2016	Safety profile similar to placebo
[8] Patel et al. 2025	No adverse events reported
[9] Tourbah et al. 2018	Safety profile similar to placebo
[11] Khedr et al. 2026	Biotin was safe
[13] Samadi et al. 2022	Adverse drug reactions recorded; treatment described as safe
[14] Geohas et al. 2007	No significant adverse events in either group
[16] 2021	Product well tolerated
[17] Sapp et al. 2026	Both well tolerated, no serious adverse events
[18] Aksac et al. 2021	biotin prevented mucocutaneous adverse effects of isotretinoin
[21] Schulpis et al. 2001	Skin lesions (seborrheic rash, alopecia) improved with biotin

6. What Remains Open: Limits of the Evidence

- Most controlled studies are small and short; large long-term studies are still pending.
- Whether the findings for hair, skin and nails are tied to a biotin deficiency is an open question.
- Many findings come from combination products and apply to the mixture, not to biotin alone.
- In multiple sclerosis, the results are inconsistent and only some of the endpoints were investigated.

- For most uses, controlled studies with clinical endpoints are still pending.

7. Bottom Line: What Is Established About Biotin (Vitamin B7)

Biotin is a water-soluble B vitamin that, as a coenzyme of several carboxylases, is involved in fat, carbohydrate and protein metabolism. In type 2 diabetes, biotin lowered total cholesterol in a meta-analysis; the effect on blood glucose is not yet confirmed. For hair, skin and nails, measured values improved in small studies mainly compared with baseline; the most informative placebo-controlled hair study found no difference. Many positive results come from combination products and therefore do not apply to biotin alone. In progressive multiple sclerosis, high-dose biotin showed benefit in an initial study, and the follow-up study did not confirm it. In signs of biotin deficiency, such as in pregnancy, biotin improved biotin-dependent metabolic values. Biotin was well tolerated; in high doses it can distort laboratory tests.

Frequently Asked Questions

How well has Biotin (Vitamin B7) been studied in humans?

We evaluated 123 human studies on Biotin (Vitamin B7), including 12 randomised controlled trials and 6 meta-analyses or systematic reviews; the controlled studies include 1,170 participants in total. As of 11 October 2026.

Does Biotin (Vitamin B7) help with biotin deficiency? What the studies show

We evaluated 3 controlled studies and 24 further studies; the controlled studies include 128 participants in total. Result of the controlled studies: mostly improved. Strength of evidence under our published rules: moderate. Sources: [10152022]

Does Biotin (Vitamin B7) help with multiple sclerosis? What the studies show

We evaluated 2 meta-analyses or systematic reviews, 2 controlled studies and 20 further studies; the controlled studies include 247 participants in total. Result of the controlled studies: mostly no difference. Strength of evidence under our published rules: low. Sources: [1579]

Does Biotin (Vitamin B7) help with hair loss? What the studies show

We evaluated one meta-analysis or systematic review, 2 controlled studies and 9 further studies; the controlled studies include 165 participants in total. Result of the controlled studies: mixed. Strength of evidence under our published rules: unclear. Sources: [481821]

Does Biotin (Vitamin B7) help with skin and skin inflammation? What the studies show

We evaluated 2 controlled studies and 5 further studies; the controlled studies include 165 participants in total. Result of the controlled studies: mostly no difference. Strength of evidence under our published rules: unclear. Sources: [8182152]

Does Biotin (Vitamin B7) help with glucose and lipid metabolism? What the studies show

We evaluated one meta-analysis or systematic review, one controlled study and 5 further studies; the controlled studies include 40 participants in total. Result of the controlled studies: mixed. Strength of evidence under our published rules: unclear. Sources: [231924]

Does Biotin (Vitamin B7) help with brittle nails? What the studies show

We evaluated one controlled study and 2 further studies; the controlled studies include 105 participants in total. Result of the controlled studies: mixed. Strength of evidence under our published rules: unclear. Sources: [897105]

What is biotin and what is it needed for in the body?

Biotin is a water-soluble vitamin from the group of B vitamins. In the body it acts as a coenzyme of several carboxylases that are involved in fat, carbohydrate and protein metabolism. Medically it is given in confirmed biotin deficiency and in congenital disorders of biotin metabolism.

Do human studies show an effect of biotin on hair loss?

A systematic review found three studies on biotin in hair loss; the most informative, placebo-controlled one showed no difference in hair growth [4]. For biotin from a plant extract and for combination products with biotin, improvements were reported, but only compared with baseline or another hair product [81213].

How does biotin affect blood glucose and lipid metabolism?

In adults with type 2 diabetes, total cholesterol fell with biotin in a meta-analysis; the reduction in fasting blood glucose and triglycerides was not statistically confirmed, insulin remained unchanged [2]. For mixtures of biotin and chromium picolinate, two randomized controlled studies reported improvements in blood glucose and lipid values, but these findings apply to the mixture and not to biotin alone [614].

What role does biotin play in multiple sclerosis?

In multiple sclerosis, high-dose biotin (MD1003) was tested against placebo in several randomized studies [7925]. In a randomized study in progressive MS, disability regressed in some patients with high-dose biotin, and in no one with placebo [7]. The follow-up study SPI2 did not confirm this benefit [25]. Another randomized controlled study showed no difference in visual acuity, nerve fiber layer thickness and quality of life in MS-related chronic vision loss [9]. A systematic review with meta-analysis found no confirmed difference from placebo in disability and EDSS, but more often a faster walking time [1].

Is biotin safe and what side effects are known?

Adverse events with high-dose biotin in multiple sclerosis occurred no more frequently than with placebo [179]; in children with asthma, biotin proved to be safe [11]. However, high-dose biotin distorted laboratory tests in some of those treated, and in no one with placebo [1].

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