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TABLE 1

Effects of nutrient deficiency and supplement use on hair loss. [Copyright: ©2017 Guo et al.]

Nutrient	Effect of Deficiency on Hair Loss	Studies of Supplementation
Iron	<ul style="list-style-type: none">• Chronic diffuse telogen hair loss with iron deficiency anemia [20].• In the absence of anemia, studies are not clear whether there is a significant link between ID and hair loss [16,20,24].	<ul style="list-style-type: none">• Insufficient evidence to recommend iron supplementation to all hair loss patients with iron deficiency in the absence of anemia [20]. Approach on a case-by-case basis.• Excess supplementation can cause hemochromatosis [25].
Zinc	<ul style="list-style-type: none">• Statistically lower serum zinc concentrations in a study of 312 patients with AA, MPHL, FPHL, or TE compared to 30 healthy controls [38].	<ul style="list-style-type: none">• A case series demonstrated reversal of hair loss following oral supplementation in five patients with TE and zinc deficiency [37].• Limited information on effects of zinc supplementation improving hair growth in the absence of deficiency.• One case report with a patient with dry brittle hair and alopecia, without clear zinc deficiency, who experienced improvement in alopecia following oral zinc therapy [40].• Excess supplementation can cause acute toxic effects including epigastric pain, nausea, vomiting diarrhea, and headache and chronic toxic effects including reduced copper status, interaction with iron, reduced immune function, and decreased concentrations of HDL cholesterol [18].
Niacin (Vitamin B3)	<ul style="list-style-type: none">• Diffuse hair loss with pellagra due to severe deficiency [2].• No known studies regarding serum niacin levels in patients with hair loss.	<ul style="list-style-type: none">• Limited information on effects of niacin supplementation improving hair growth in absence of deficiency.

Nutrient	Effect of Deficiency on Hair Loss	Studies of Supplementation
Fatty acids	<ul style="list-style-type: none"> Loss of scalp and eyebrow hair [3–4]. 	<ul style="list-style-type: none"> Limited information on effects of fatty acid supplementation improving hair growth in absence of deficiency.
Selenium	<ul style="list-style-type: none"> In animal studies, rats deficient in selenium display sparse hair growth [46], while knockout mice lacking specific selenoproteins exhibit progressive hair loss after birth, ultimately leading to almost total alopecia [47]. One case report of selenium deficiency in a young child reported clinical manifestations of dry skin and sparse, light-colored hair, improving after supplementation [49]. 	<ul style="list-style-type: none"> Limited information on effects of selenium supplementation improving hair growth in absence of deficiency. Toxicity from excess supplementation is well documented and can cause generalized hair loss [9–11].
Vitamin D	<ul style="list-style-type: none"> Serum vitamin D2 levels in a study of eight females with either TE or FPHL were shown to be significantly lower than in 40 age-matched female controls, with decreased levels correlating to increased disease severity [54]. 	<ul style="list-style-type: none"> Limited information on effects of vitamin D supplementation improving hair growth in absence of deficiency.
Vitamin A	<ul style="list-style-type: none"> Deficiency has no known link to hair loss. 	<ul style="list-style-type: none"> Limited information on effects of vitamin A supplementation improving hair growth in absence of deficiency. Toxicity from excess supplementation has a strong known link to hair loss, as well as other effects on skin, vision, and bone [4,8].
Vitamin E	<ul style="list-style-type: none"> Deficiency has no known link to hair loss. 	<ul style="list-style-type: none"> Limited information on effects of vitamin E supplementation improving hair growth in absence of deficiency. Supplementation in one study of twenty-one volunteers suffering from hair loss has showed significant increase in hair number compared to placebo [57]. Toxicity from excess supplementation can result in risk of bleeding problems, decreased thyroid hormones, and decreased activity of vitamin K. Additionally, there is some evidence for adverse effect on hair growth with excess supplementation [8].

Nutrient	Effect of Deficiency on Hair Loss	Studies of Supplementation
Folic Acid	<ul style="list-style-type: none"> No significant difference in serum folate levels in a study of 91 patients with diffuse hair loss and 74 healthy controls [58]. 	<ul style="list-style-type: none"> Limited information on effects of folic acid supplementation improving hair growth in absence of deficiency.
Biotin	<ul style="list-style-type: none"> Deficiency can result in alopecia, eczematous skin rash, conjunctivitis, and candidiasis [60]. 	<ul style="list-style-type: none"> Limited information on effects of biotin supplementation improving hair growth in absence of deficiency.
Amino Acids and Proteins	<ul style="list-style-type: none"> Protein malnutrition can result in hair loss [64]. 	<ul style="list-style-type: none"> L-lysine supplementation in addition to iron supplementation has been shown to significantly increase mean serum ferritin concentration in some women with chronic TE who failed to respond to iron supplementation alone [8]. Limited information on effects other amino acids and proteins improving hair growth in absence of deficiency.

Key of abbreviations: Alopecia areata – AA; Androgenic alopecia – AGA; Female pattern hair loss – FPHL; High density lipoprotein – HDL; Iron deficiency – ID; Male pattern hair loss – MPHL; Telogen effluvium - TE.