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Update on Biotin Therapy in Dermatology: Time for a Change

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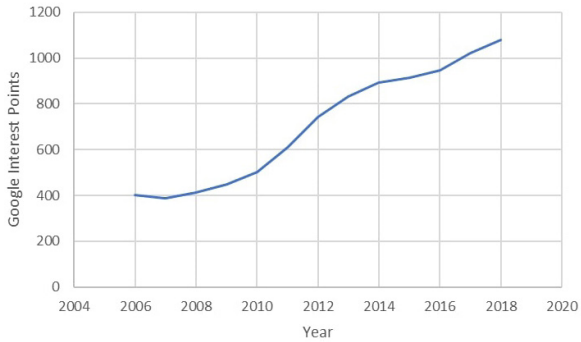
INTRODUCTION

Biotin (vitamin B7 or H) is found in milk, nuts, egg yolks, cereals, supplements, synthesized by intestinal bacteria, and is required for gluconeogenesis, fatty acid synthesis and amino acid catabolism.[1-3] Biotin deficiency results in neuromuscular dysfunction, alopecia, and dermatitis in animals and humans.[4,5,6] Biotin deficiency is rare, but may occur with inborn errors of metabolism (holocarboxylase synthetase and biotinidase deficiencies), parenteral nutrition, malnutrition, antiepileptic therapy, and consumption of large quantities of egg whites, due to avidin binding to biotin and blocking its absorption.[7] Established daily allowances for biotin are lacking,[8] but 30 micrograms/day for adults is recommended,[9] which is easily obtained from diet alone.[10]

Several studies have utilized biotin to treat dermatologic conditions, but they are small and without adequate controls.[11-17] Biotin, 2.5 mg daily, had a beneficial effect for brittle nails in firmness, thickness, and fragility.[18-21] Biotin may be helpful for select hair disorders, but only in patients with inherited or acquired biotin deficiencies.[22,23] Furthermore, in an analysis of 16 biotin products on amazon.com, only 27.2%, 15.03%, and 2.8% of consumers reported benefit for hair, nails, and skin, respectively.[24] Biotin has been suggested to alleviate xerosis with isotretinoin treatment for acne, and to modify the lipid profile in seborrheic dermatitis, but has not been formally studied.[21]

Despite its limited benefit, worldwide interest in biotin for treatment of skin, hair and nails has been rising and physician prescribing is prevalent.[25-28] Between 2006 and 2018, there was a 167% increase in google searches for "biotin" (Figure 1).

FIGURE 1. Plot of Google Trends search term "biotin" by year (2006 to 2018). Google Trends Interest Points are defined by how frequently a given search term is entered into Google's search engine relative to the site's total search volume over a given period of time.



In survey-based studies, 66% of 300 United States (US) dermatologists recommended supplements,[27] and 60% of Saudi Arabian dermatologists treated hair loss with supplements, including biotin.[28]

On November 28, 2017, the Food and Drug Administration (FDA) issued a warning that biotin may interfere with laboratory tests, including troponins, thyroid-stimulating and parathyroid hormones.[29] These immunoassays rely on biotin-streptavidin technology,[30,31] with biotin in the blood causing falsely elevated or reduced levels.[32,33,34-36] This FDA warning was prompted by a report of a myocardial infarction and death due to falsely low troponin levels. The FDA had recommended that physicians ask patients about supplement usage,[29] and discontinue biotin for 8 hours for patients taking 10 mg/day,[37] 3 days for 100 – 300 mg/day,[38,39] 7 days for children taking 2 and 15 mg/kg/daily,[35,40] and informing the laboratory if a diagnostic test was performed while taking biotin.[29]

What was the impact of this 2017 FDA warning on patient self-prescribing and physician recommendation of biotin? Not much. Google searches from December 1, 2017 to November 30, 2019 increased by 64% and 50%, worldwide and in the US, respectively, compared to the period January 6, 2006 to November 30, 2017.[41] Furthermore, in a survey-based study of dermatology 447 outpatients in June 2018, 34% reported past or current biotin supplementation. Of the patients still taking biotin, 40% were taking it following the 2017 biotin warning, and only 7% knew about the FDA warning. While 55% had self-prescribed, 29% reported the recommendation from a primary care physician or dermatologist.[42] In a survey-based study of 113 dermatologists, 51% were still prescribing biotin 2 years after the FDA warning.[43] While 119 biotin articles were published in the 2 years following the 2017 FDA warning, only 21% cited biotin risks, and only 5% mentioned the FDA warning. Using Altmetric, which measures media attention on scientific research, these biotin articles were not published in high impact journals, and generally received low "media attention scores," which makes it unlikely that biotin risks and the FDA warning were communicated to physicians and the public.[44]

On November 5, 2019, the FDA updated their 2017 safety communication that biotin supplementation can interfere with laboratory tests, and reported that they continue to receive adverse event reports due to falsely low troponins.[45] While some lab developers have successfully mitigated the biotin interference in their assays, there are 17 troponin and

many other non-troponin assays that are still subject to this interference.[45]

What can we do to protect our patients from missed diagnoses and subsequent consequences form biotin supplementation? Since the 2017 FDA warning clearly had no effect on patient behavior, it is equally unlikely that the 2019 update will be influential. One approach is to fine diagnostic companies heavily or prohibit use of immunoassays that use biotin-streptavidin technology. Another approach is to use more resources (CME activities, articles in high impact journals, live or online lectures) educating physicians about the lack of evidence for biotin as an effective therapy for medical and dermatologic conditions and laboratory interference. We have a duty to employ current and updated evidence based medicine in treating our patients to give them the most effective and safe therapies.

DISCLOSURES

The author has no relevant conflicts.

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