Response to: "Rethinking biotin therapy for hair, nail, and skin disorders"

To the Editor: We applaud Dr Lipner for her relevant critique and commentary in her recent article, "Rethinking biotin therapy for hair, nail, and skin disorders," regarding the popularized use and promotion of biotin for improvement in hair and nails by media and physicians alike despite a lack of evidence to support routine use.[1] We also recognize the trends of increasing consumer purchasing of biotin and physician recommendation of its use as alarming considering the warnings from the US Food and Drug Administration, as up to 20% of Americans consume some form of biotin, which may not be disclosed to physicians.[1-3] Although we agree that biotin supplementation should be recommended with caution or avoided altogether when limited evidence suggests benefit for hair, in select dermatologic conditions biotin may be beneficial and further evidence would be immensely valuable.[4] In our response to the author, we attempt to amplify the influence of her article by highlighting the fact that although there are hair conditions reported in the literature that may respond favorably with biotin, the majority of publications are case reports and there remains a definite lack of controlled, randomized studies to support routine use of biotin. Furthermore, the nonspecific language of several of the case reports renders them difficult to interpret and more information is needed. It is also our intent to emphasize that, to our knowledge, in multiple databases no published studies exist to suggest that biotin should be used for healthy, typical hair growth and distribution. We further aim to underscore the fact that future studies regarding biotin use both in healthy hair and with hair pathology are necessary.

As part of a comprehensive literature review in May 2018, we compiled and presented evidence for use of biotin in hair disease.[4] Articles published after 1979 were obtained via the PubMed database (Table I).[4] Of the 30 articles, 28 were case reports or case series with patients ranging in age from 2 months to 54 years. The overwhelming majority involved infants and children. Many diagnoses were nonspecific, listed as hair loss or alopecia. Follow-up ranged from weeks to 2 years and improvement in hair conditions (alopecia, telogen effluvium, uncombable hair syndrome, etc) was reported in 30 cases. However, it is difficult to determine whether conditions would have resolved with time regardless of supplementation. Biotin dosing in the trials ranged from 2.5 to 20 mg/d.

In select hair diseases biotin may be useful. Additional large-scale, double-blinded, randomized clinical trials are necessary to define optimal patient demographics, dosing schedules, and side effect monitoring. Biotin has not been shown to be beneficial for normal, healthy hair or in individuals with no biotin deficiency. In addition, a distorted view of biotin as a wonder drug for hair growth prevails in modern culture, notwithstanding the very real hazards of interfering in clinical testing and diagnosis, as cautioned by Dr Lipner.[1] Therefore, our conclusion supports that of Dr Lipner: there is little to no reason to believe that biotin supplementation should be recommended for individuals with healthy hair and its use should be limited to select, evidence-based clinical situations after careful consideration and discussion with patients of the risks and benefits of its use.

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REFERENCES

1. Lipner SR. Rethinking biotin therapy for hair, nail, and skin disorders. *J Am Acad Dermatol*. 2018;78(6):1236-1238.
2. Samarasinghe S, Meah F, Singh V, et al. Biotin interference with routine clinical immunoassays: understand the causes and mitigate the risks. *Endocr Pract*. 2017;23:989-998.
3. Institute of Medicine (US) Standing Committee on the Scientific Evaluation of Dietary Reference Intakes and Its Panel on Folate, Other B Vitamins, and Choline. *Dietary Reference Intakes for Thiamin, Riboflavin, Niacin, Vitamin B_6, Folate, Vitamin B_{12},*

Table I. Literature review on efficacy of biotin in hair disease and alopecia

Source	Time period	Population	Clinical indication	Dose	Results
Case report					
Thoene J, Baker H, Yoshino M, et al. *N Engl J Med*. 1981;14:817-820.	1 y	2-y-old female, multiple carboxylase deficiency	Alopecia universalis	10 mg/d	Complete regrowth
Charles BM, Hosking G, Green A, et al. *Lancet*. 1979;2:118-120.	18 d	10-mo-old male, possible defect in absorption of biotin	Dermatitis and alopecia	5 mg bid	Hair regrowth
Sweetman L, Surh L, Baker H, et al. *Pediatrics*. 1981;68:553-558.	1.5 y of observation	11-y-old male, dietary deficiency of biotin and multiple carboxylase deficiency	Alopecia totalis	1 mg/d	Noticeable regrowth of hair within 1 mo
Coulter DL, Beals TF, Allen RJ. *Develop Med Child Neurol*. 1982;24:634-644.	n/a	11-mo-old female, multiple carboxylase deficiency	Hair loss	10 mg/d	Complete regrowth of hair
Coulter DL, Beals TF, Allen RJ. *Develop Med Child Neurol*. 1982;24:634-644.	n/a	14-mo-old male, biotin absorption deficiency	Trichorrhexis nodosa	10 mg bid	Regrowth and increased hair strength
McClain CJ, Baker H, Onstad GR. *JAMA*. 1982;247: 3116-3117.	3 mo	36-y-old male with Crohn's disease receiving total parenteral nutrition, possible biotin deficiency	Alopecia with loss of hair color	60 μg/d	Regrowth of hair
Innis SM, Allardyce DB. *Am J Clin Nutr*. 1983;37: 185-187.	6 mo	2 adults receiving parenteral nutrition, possible biotin deficiency	Hair loss	60 - 100 μg/d	Halted hair loss at 1 wk; regrowth of healthy hair at 2 mo
Khalidi N, Wesley JR, Thoene JG, et al. *JPEN J Parenter Enteral Nutr* .1984;8: 311-314.	7 wk	54-y-old female receiving total parenteral nutrition, biotin deficiency	Complete hair loss	10 mg/d for 3 wk, then 5 mg/d IV for 4 wk	New hair growth observed
Mock DM, Baswell DL, Baker H, et al. *J Pediatr*. 1985;106: 762-769.	n/a	3 pediatric patients receiving total parenteral nutrition, 1 with serum-confirmed biotin deficiency	Alopecia	100 μg/d	Improved dramatically
Shelley WB, Shelley ED. *J Am Acad Dermatol*. 1985;13:97-102.	4 mo	18-mo-old	Uncombable hair syndrome	0.3 mg tid	Decreased hair loss, fragility, and pluckability
Campana G, Valentini G, Legnaioli MI, et al. *Ophthalmic Paediatr Genet*. 1987;8:125-129.	1 y	7-y-old male, multiple carboxylase deficiency	Severe alopecia	10 mg/d	Complete regrowth of hair; noticeably thickened hair

Continued

Table I. Cont'd

Source	Time period	Population	Clinical indication	Dose	Results
Colamaria V, Burlina AB, Gaburro D, et al. Epilepsia. 1989;30:573-578.	n/a	Infant, low serum biotinidase activity	Sparse hair on scalp	5 mg bid	Dramatic symptom improvement, unclear if this included changes in sparse hair
McVoy JRS, Levy HL, Lawler M, et al. *J Pediatr*. 1990;116:78-83.	2 mo	6-mo-old male	Occipital hair loss	10 mg/d	Hair growth markedly thicker
Higuchi R, Noda E, Koyama Y, et al. *Acta Paediatr*. 1996;85:872-874.	2 mo	11-mo-old male, low serum biotin	Alopecia of scalp/ eyebrows	1 mg/d	Complete hair regrowth on scalp and eyebrows
Ananth N, Praveen Kumar GS. *Indian J Clin Biochem*. 2003;18:23-26.	6 mo	3-mo-old male, biotinidase deficiency	Alopecia	10 mg/d	Complete resolution of hair loss
Hou J. *Chang Gung Med J*. 2004; 27:129-133.	2 y	2-y-old female, multiple carboxylase deficiency	Sparse hair, eyelashes, and eyebrows	10 mg/d	Symptoms normalized, unclear if includes sparse hair, eyelashes, and eyebrows
Fujimoto W, Inaoki M, Fukui T, et al. *J Dermatol*. 2005;32:256-261.	1 mo	5-mo-old male, low serum biotin	Diffuse alopecia on back of head	1 mg/d	Regrowth of scalp hair
Boccaletti V, Zendri E, Giordano G, et al. *Pediatr Dermatol*. 2007;24:E14-16.	2 y	2-y-old male	Uncombable hair syndrome	5 mg/d	Normal combability; thicker hair
Dahiphale R, Jain S, Agrawal M. *Indian Pediatr*. 2008;45:77-779.	6 mo	3-mo-old male, low biotinidase activity	Alopecia	10 mg/d	Marked improvement after only days, hair regrowth
Komur M, Okuyaz C, Ezgu F, et al. *Eur J Paediatr Neurol*. 2011;15:551-553.	6 mo	3-y-old female, biotinidase deficiency	Hair loss	10 mg bid	Complete hair regrowth
Munnich A, Saudubray JM, Cotisson A, et al. *Eur J Pediatr*. 1981;137: 203-206.	12 mo	2 pediatric patients, low plasma biotin	Total alopecia	10 mg/d	Improved
Rajendiran A, Sampath S. *BMJ Case Rep*. 2011; doi:10.1136/bcr.07.2011.4494.	8 mo	2-mo-old male, biotinidase deficiency	Alopecia of scalp/ eyebrows, lack of hair pigmentation	10 mg bid	Complete regrowth of normally pigmented hair on scalp and eyebrows
Mukhopadhyay D, Das MK, Dhar S, et al. *Indian J Dermatol*. 2014;59:502-504.	6 wk	3-y-old male, low serum biotinidase level/multiple carboxylase deficiency	Diffuse alopecia	30 mg/d	Full head of noticeably thickened hair

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Table I. Cont'd

Source	Time period	Population	Clinical indication	Dose	Results
Grootens KP, Hartong EGTM. *J Clin Psychiatry* 2017;78:e838.	3 mo	Middle-aged female receiving valproic acid	Telogen effluvium	10 mg/d	Normalized
Benke PJ, Duchowny M, McKnight D. *Pediatr Neurol*. 2018;79:61-64.	n/a	10-y-old female with autism	Very poor hair and nail growth	25 mg/d	Hair and nails began to grow
Case series/review					
Forbes GM, Forbes A. *Nutrition*. 1997;13:941-944.	n/a	Patients receiving parenteral nutrition	Hair loss	IV n/a	Symptom resolution
Karimzadeh P, Ahmadabadi F, Jafari N, et al. *Iran J Child Neurol*. 2013;7:47-52.	3-6 mo	8 patients (1.5-52 mo), biotinidase deficiency	Alopecia; hair hypopigmentation	5-20 mg/d	Complete resolution of symptoms
Gannavarapu S, Prasad C, DiRaimo J, et al. *Mol Genet Metab* 2015;116: 146-151.	n/a	5-y-old female, partial biotinidase deficiency	Alopecia	10 mg/d	Symptom resolution
Desai S, Ganesan K, Hegde A. *Pediatr Radiol*. 2008;38: 848-856.	4 mo	4 patients with biotinidase deficiency	Sparse hair on scalp	n/a	Possible improvement
Trial					
Schulpis KH, Karikas GA, Tjamouranis J, et al. *Epilepsia*. 2001;42: 1359-1362.	n/a	Children (9 patients with biotinidase deficiency) receiving valproic acid	Hair loss	10 mg/d	Unclear number with improvement
Castro-Gago M, Perez-Gay L, Gomez-Lado C, et al. *J Child Neurol* 2011;26: 1522-1524.	3 mo	3 children receiving valproic acid	Alopecia due to valproic acid	10 mg/d	Resolution of symptoms with biotin

Biotin is the only therapy mentioned in all of the studies except in the following: Benke et al (2018), which mentions acetazolamide; Innis and Allardyce (1983) and Forbes and Forbes (1997), which mention a multivitamin added to parenteral nutrition; and Schulpis et al (2001), Castro-Gago et al (2011), and Grootens (2017), which mention patients receiving biotin in response to valproic acid therapy.
bid, Twice a day; *IV*, intravenously; *tid*, 3 times a day.

Pantothenic Acid, Biotin, and Choline. Washington DC: National Academies Press (US); 1998

4. Walth C, Wessman LL, Wipf A, Bertin AC, Hordinsky MK, Farah RS (2018). Literature-based evaluation of biotin use for alopecia. Poster presented at: 2018 American Hair Research Summit. May 14-16, 2018; Orlando, FL.

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