

Zinc and inflammatory bowel disease

Dear Sir:

We read with interest the letter of Mills and Fell (1). They reported insignificant mean differences in plasma zinc in patients with inflammatory bowel disease (IBD) and controls, and commented on our previous reports of zinc deficiency in IBD (2, 3). In our studies, reduced plasma zinc was a common but not *universal* finding in patients with IBD. However, hypozincemia was seen with sufficient frequency in our studies and those of others (4-6) that failure to encounter a statistically significant lowering in plasma zinc in a similarly ill population of patients with IBD would, indeed, be unexpected. Table 1 shows a summary of data from adult IBD patients studied at the University of Chicago from 1973 to 1976. A comparison of our patients and those reported by Drs. Mills and Fell based on severity and longevity might help to explain some of the discrepancy.

We agree with Mills and Fell about the uncertainty of interpreting zinc levels. The complexities and nuances of interpreting plasma zinc concentrations have been discussed recently in an updated review of the clinical assessment of zinc nutriture (7). In patients with acute disease, therefore, whole-body zinc stores may only be one variable influencing circulating levels. A pronounced correlation between zinc and its primary serum binding-protein, albumin, was demonstrated in our original publications (2, 4), and

confirmation can be found in 10 additional reports (7). Thus, hypoalbuminemia can result in reduced plasma concentrations of zinc. Moreover, internal redistribution of zinc, mediated by leukocytic endogenous mediator substances, is an important determinant of zinc levels in IBD. In patients hospitalized with active Crohn's disease, but not in individuals with quiescent disease, we were able to demonstrate high levels of leukocytic endogenous mediator and a significant correlation with the severity of the episode (5). Thus, not only as a result of impaired zinc nutriture due to intestinal malabsorption, exudative loss, and hyperzincuria (1), but also by virtue of hypoalbuminemia and activation of leukocyte endogenous mediator, plasma zinc concentrations in patients with IBD would be expected to be low.

As to the nutritional status with respect to zinc, itself, in these diseases, in addition to plasma zinc levels, we reported lowered hair zinc content and impaired taste acuity as ancillary indices of zinc deficiency in patients with active Crohn's disease (4). Also, individual cases of patients with growth retardation and hypogonadism responding to zinc administration (8) and a zinc-responsive acrodermatitis enteropathica-like rash (6) in patients with Crohn's disease have also been reported. In patients with severe zinc losses requiring intravenous repletion, zinc depletion was reported in association with negative nitrogen balance (9).

Thus, a growing experience differs from

TABLE 1
Plasma zinc levels in patients with inflammatory bowel diseases

	Healthy controls	Crohn's disease	Ulcerative colitis
n	29*	41†	16‡
Percentage with plasma zinc < 60 µg/dl	7%	41%	44%
Mean plasma zinc	73.5 ± 2.0 µg/dl [§]	61.1 ± 1.5 µg/dl	62.3 ± 3.0 µg/dl
P value as compared to controls [†]		p < 0.01	p < 0.05

* 20 individuals from Reference 4; nine individuals from Reference 5.

† 20 patients from Reference 4; 21 patients from Reference 5.

‡ Previously unpublished data.

§ Mean ± SEM.

† Student's *t* test.

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the reassuring impression left by the letter of Mills and Fell with respect to zinc status in IBD. We believe that the following outline would be the most prudent approach to this problem at the current state of our knowledge: 1) to expect to find a substantial number of patients with active inflammatory bowel disease to have decreased circulating zinc concentrations; 2) to realize that this does not necessarily signify an impairment of zinc nutriture as low plasma albumin binding-capacity and/or mediated redistribution could account for some or all of the depression; 3) while a few centers seek other confirmatory laboratory indices of zinc deficiency such as hair zinc, salivary zinc, metaloenzyme activities, in addition to clinical signs of human zinc deficiency, zinc therapy should be reserved for those at special risk with severe disease and large diarrheal losses; and 4) zinc should be regularly added, along with other trace metal nutrients, when intravenous nutritional support is utilized, in view of the documented risk of such patients (9, 10). The important question of whether or not zinc supplementation in zinc-depleted patients with IBD will improve healing of the inflammatory lesions or reverse growth retardation, however, have yet to be subjected to adequately-designed, controlled therapeutic trials.

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Endogenous ascorbic acid synthesis and recommended dietary allowances for vitamin C

Dear Sir:

Rucker et al. (1) criticized in the May 1980 issue of *The American Journal of Clinical Nutrition* the calculations of ascorbic acid synthesis based on in vitro estimates. Their corrections of data on ascorbate synthesis by

crude liver microsomes using L-gulonolactone as substrate (2) lead to values similar to those obtained by the in vivo technique of isotope dilution of 1-¹⁴C-ascorbic acid (Table 1). However, efforts at extrapolating these data to the human organism, whether linearly or with corrections for differences in meta-