ing with amounts normally synthesized by other animals.

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INCAP Publication I-1229

Milk tolerance, gastric emptying, and breath hydrogen excretion

Dear Sir:

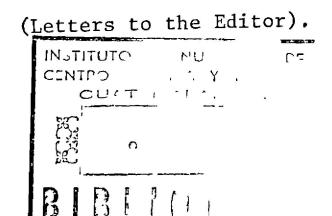
The observations of Ellestad-Sayed et al. (1) on milk intolerance and lactose absorption in Manitoban Indians raise interesting questions about the role of the rate of gastric emptying in affecting the validity of the H₂ breath-analysis test. In discarding the possibility that differences in gastric emptying explained their differences in H₂ production 2 h after the administration of diluted evaporated milk or reconstituted skimmed milk powder of equivalent lactose content (1), the authors cite our observations in preschool children given equivalent amounts of lactose in milk or as an aqueous solution (2). It is appropriate to extend the discussion of this phenomenon. I would maintain that two major differences qualify a comparison of the two studies' fundings. First, our Guatemalan subjects were preschoolers with a mean age of 2 yr whereas the Manitoban subjects averaged 10 yr. Second, we used a drastic contrast in our experimental design, comparing a nonmeal (aqueous solution) with a meal (whole milk) situation. As aqueous solutions are conventionally used to provide the dose of carbohydrate for lactose tolerance tests, we believed that our design focused on the question of why some individuals, particularly children, who experienced symptoms during a formal test might be able to tolerate fluid milk in the diet.

An age dependence of this phenomenon is apparent insofar as milk and aqueous solutions of lactose produced equivalent amounts of H₂ in lactose-malabsorbing adults (3). This

is in accordance with other observations in adult subjects that the H₂ breath test is relatively free of gastric emptying dynamics (4, 5). The issue is less clear in the school-aged population, precisely the group addressed in the study by Ellestad-Sayed et al. (1). The authors argue that if the amounts of protein and fat were responsible for differences between the H₂ production after ingesting evaporated milk versus skimmed milk, then the addition of a peanut butter sandwich to the meal would have reduced H₂ production still further. This tendency was seen with both of the milk preparations, but in neither case did its magnitude reach statistical significance. We must consider the possibility that among lactose-containing meals of distinct composition the differences in gastric emptying rates are less drastic than between a lactose-containing meal and an aqueous lactose solution as an explanation for this observation.

The procedures used by Ellestad-Sayed et al. (1), however, permit a comparison of initial, fasting rates of H₂ production with postprandial rates only at 2 h. Although this time point seemed to correspond to the point of maximal gas production in response to a milk meal in preliminary studies (1), the failure to assay breath H₂ excretion at other intervals does not allow us to exclude the possibility that a less abrupt and more prolonged course of the H₂ response was occurring with the evaporated milk meal due to slower gastric emptying and that a single 2-h postprandial sampling interval failed to reflect this phenomenon. We have recommended that multiple postdose sampling intervals can improve

Am. J. Clin. Nutr., 34(7): 1451-1452, 1981.



the sensitivity of the H₂ breath test in detecting malabsorption. Inclusion of other time points in the study by Ellestad-Sayed et al. (1) would have definitively allayed any suspicion that the differential H₂ response to the milk preparations tested was based on differential gastrointestinal transit of the fluid meals.

The practical question of milk utilization in school-feeding programs which prompted the studies in Manitoba reflects a world-wide concern about policies of milk distribution (6). The finding that 250 ml of milk is generally tolerated by most members of all populations targeted for milk distribution (6) has once again been reinforced by the report of Ellestad-Sayed et al. (1). We believe that part of the explanation for this tolerance of milk in a dietary context is the more gradual intestinal delivery of lactose consumed along with the fat and protein that constitute a customary meal.

Noel W. Solomons, M.D.

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Reply to letter by Solomons

Dear Sir:

Dr. Solomons has called attention to the need for further work in the development and application of the breath hydrogen test. Hopefully, a standardized test will soon evolve and it will be logistically possible not only for clinical studies but also for population studies in remote areas. There are, as yet, no clear answers about the interrelationships among breath hydrogen production, age, rate of gastric emptying, and the effect of milk processing, and perhaps other unidentified factors as well.

It has been demonstrated, however, that not only North American Indian children (1), but other populations as well can tolerate the lactose contained in 250 ml of milk. This is of public health significance in a population similar to the northern Manitoba Indians, whose intake of vitamin D and calcium is marginal (2, 3). Whether this tolerance is due to the gradual intestinal delivery of lactose

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per se, or the biochemical action of intestinal flora, or the creation of other conditions that promote lactose hydrolysis remains to be demonstrated.

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