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RESPONSE OF LACTOSE-INTOLERANT CHILDREN
TO DIFFERENT LACTOSE LEVELS

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16. Abstracts Lactose intolerance in children is commonly identified by a tolerance test utilizing 2 g lactose/kg body wt (1, 2). Questions have been raised as to the appropriateness of this level (3). It has been suggested that levels of 0.6 to 1.3 g lactose/kg, which is the equivalent of 1 glass of whole milk or reconstituted skim milk, would yield significantly different results in the children studied. It was the purpose of ^{attempted} this study to determine: 1) whether children who are identified as lactose intolerant with a test dose of 2.0 g lactose/kg have similar results with 1.0 g lactose/kg and 0.5 g lactose/kg; and 2) the presence or absence of symptoms at the varying levels of challenge. Eight Peruvian Mestizo siblings from 4 to 11 years of age were studied. All were in good health at the time. The oldest had been rehabilitated from marasmus 10 years ago; the two youngest, twin girls, were raised from birth to 27 months of age in a protected environment with regular milk consumption and then returned to their homes. Fifteen months ago, the twins were found to absorb lactose normally, and the test results of the other six siblings showed flat curves when plotted; these children were symptomatic after 2.0 g lactose/kg (4). An unrelated, healthy 7-month-old infant was used as a control on the methodology.					
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Response of lactose-intolerant children to different lactose levels^{1,2}

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Lactose intolerance in children is commonly identified by a tolerance test utilizing 2 g lactose/kg body wt (1, 2). Questions have been raised as to the appropriateness of this level (3). It has been suggested that levels of 0.6 to 1.3 g lactose/kg, which is the equivalent of 1 glass of whole milk or reconstituted skim milk, would yield significantly different results in the children studied.

It was the purpose of this study to determine: 1) whether children who are identified as lactose intolerant with a test dose of 2.0 g lactose/kg have similar results with 1.0 g lactose/kg and 0.5 g lactose/kg; and 2) the presence or absence of symptoms at the varying levels of challenge.

Materials and methods

Subjects

Eight Peruvian Mestizo siblings from 4 to 11 years of age were studied. All were in good health at the time. The oldest had been rehabilitated from marasmus 10 years ago; the two youngest, twin girls, were raised from birth to 27 months of age in a protected environment with regular milk consumption and then returned to their homes. Fifteen months ago, the twins were found to absorb lactose normally, and the test results of the other six siblings showed flat curves when plotted; these children were symptomatic after 2.0 g lactose/kg (4). An unrelated, healthy 7-month-old infant was used as a control on the methodology.

Lactose tolerance tests

Doses of 0.5, 1.0, and 2.0 g lactose/kg body wt as a 20% suspension in water were given orally on successive study days after overnight fasts. A 0.2-ml microcapillary blood sample was obtained at 0, 15, 30, and 60 min. True glucose was determined by

the ortho-toluidine method (Dow Diagnostest, Dow Chemical Company, Midland, Michigan) (5). A blood sugar rise of less than 26 mg/100 ml was considered a "flat" lactose tolerance curve (6).

Symptoms, such as abdominal discomfort, cramps, flatulence, bloating, loose stools, and diarrhea, which occurred during the test, were noted and recorded by trained observers. Symptoms occurring during the 24 hr following the test were noted and recorded by the parents. A blood sugar rise below 26 mg/100 ml coupled with symptoms was used to define an intolerant subject (7).

Results

Results were abnormal in all eight siblings. Flat tolerance curves, i.e., a blood sugar rise below 26 mg/100 ml, were observed at 0.5, 1.0, and 2.0 g lactose/kg. The lactose-tolerant infant had a normal blood sugar rise on 0.5, 1.0, and 2.0 g lactose/kg.

Symptoms of lactose intolerance were noted with all three levels. At 0.5 g lactose/kg, five of the eight children (63%) had one

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TABLE 1
Results at different lactose levels

Subject ^a	Previous nutritional history ^b	History of milk consumption ^c	Height, cm	Weight, kg	Lactose load					
					0.5 g/kg		1.0 g/kg		2.0 g/kg	
					mg/100 ml ^d	Symp-toms ^e	mg/100 ml	Symp-toms	mg/100 ml	Symptoms
1 (11.8)	a	Breast fed, 7 days; consumer	133.2	30.7	7.0	1	11.0	5	13.0	1,3,5
2 (10.3)	c	Breast fed, 1 month; nonconsumer	128.3	30.0	5.0	3,5	6.0	5	14.0	1,3,5
3 (9.2)	c	Breast fed, 2 months; nonconsumer	120.0	23.9	1.0	0	12.0	3,5	9.0	1,3,5
4 (8.0)	c	Breast fed, 8 days; nonconsumer	114.2	23.4	4.0	0	4.0	0	1.0	1
5 (6.8)	c	Breast fed, 3 months; consumer	112.3	20.6	3.0	3	12.0	0	2.0	3
6 (5.7)	c	Breast fed, 3 months; consumer	105.0	21.3	7.0	1	5.0	1	4.0	3,5
7 (4.6)	b	Breast fed, 7 days; consumer	98.0	16.9	4.0	0	5.0	0	1.0	1,3
8 (4.6)	b	Breast fed, 7 days; consumer	98.0	16.9	15.0	1	5.0	1	6.0	1,3
9 (0.7)	Normal	Breast fed, 8 days; consumer	59.3	6.2	28.0	0	33.0	0	37.0	0

^a Figures in parentheses refer to the subject's age in years. ^b a = rehabilitated from marasmus; b = raised in protected environment from birth to 27 months of age; c = other siblings at home. ^c Current consumption defined as 1 glass (8 oz) or more per day. ^d Maximum blood sugar rise. ^e Symptoms: 0 = none; 1 = diarrhea; 2 = gas; 3 = loose stools; 4 = bloating; and 5 = abdominal discomfort.

or more symptoms; at 1.0 g lactose/kg, the same number exhibited symptoms; at 2.0 g lactose/kg, all eight children had symptoms. The time of onset was earlier and the intensity of symptoms greater on the higher lactose challenge. There were no symptoms observed in the control infant at any lactose level (Table 1).

Discussion

These results suggest that there is little difference in the ability to tolerate a lactose load when smaller amounts are ingested. The blood sugar curve was consistently flat. Symptoms of intolerance were present with the lowest level of lactose, 0.5 g lactose/kg, but were more forceful and appeared earlier on 2.0 g lactose/kg. The normal infant had

an appropriate blood sugar rise at all levels of intake and was free of symptoms.

As there is a gradient of symptoms with lactose ingestion, which may be further modified by additional foods consumed along with milk, it is possible that many children with lactose intolerance do not develop overt symptomatology with milk ingestion. We have previously reported (1) that 77% of the non-milk drinkers in a school lunch program were found to have lactose malabsorption, but 36% of the milk drinkers of the same race were also classified as lactose malabsorbers. It may be that this last group is not receiving the full benefit of all the nutrients in the milk they consume.

Although the smaller lactose levels identified individuals with low lactase activity as readily as larger levels, it is not clear from

this study whether they would identify individuals with high levels of activity just as accurately.

It is of particular interest to note that the youngest members of this family lost their tolerance for lactose between 3 and 4 years of age, the very age at which most of a larger group seem to do so (4).²

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