Lactose Intolerance: An Unnecessary Risk for Low Bone Density

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The potential for lactose intolerance causes 25–50 million Americans to avoid milk. Milk avoidance is a significant risk factor for low bone density. Individuals who avoid milk, due to intolerance or learned aversion, consume significantly less calcium and have poorer bone health and probable higher risk of osteoporosis. Lactose intolerance is easily managed by: (1) regular consumption of milk that adapts the colon bacteria and facilitates digestion of lactose, (2) consumption of yogurts and cheeses and other dairy foods low in lactose, (3) consumption of dairy foods with meals to slow transit and maximize digestion, and (4) use of lactose digestive aids.

Lactose intolerance can cause moderate and acute symptoms of excessive flatulence, stomach discomfort and diarrhea. The occurrence of symptoms depends on:

1 The dose of lactose consumed. Typically, one cup of milk (containing 12 g of lactose) served with a meal is well tolerated by maldigesters, even those claiming severe intolerance. If milk is consumed with breakfast and dinner, it remains well tolerated. Dairy sources vary considerably in lactose content. Lactose is water soluble and thus found in the whey portion when curds and whey are separated. Thus, hard cheeses have minimal lactose and soft cheeses are intermediate in lactose content. Yogurts are well tolerated due to microbial β-galactosidase that is active in vivo during digestion, supplementing the body's own lactase activity. The primary source of lactose in the diet is fluid milk.
2 The rate at which the lactose passes into the large intestine. This is a function of stomach emptying and meal feeding. Lactose tolerance is significantly improved when lactose is fed with a meal. The effect is more difficult to demonstrate with individual foods such as whole milk compared to fat-free milk.
3 The residual lactase activity in the small intestine presumably varies among individuals and likely influences tolerance.

However, this variance is not well understood or evaluated relative to tolerance.

4 The ability of the large intestine bacteria to compensate for maldigestion. This ability depends on how well the microflora are adapted to metabolize lactose. Regular consumption of lactose in both double-blinded and free-living studies suggests that diet history and adaptation are major factors in determining tolerance. The primary clinical issue of concern related to lactose maldigestion and intolerance is reduced calcium intake, leading to low bone density and thus increasing the risk for osteoporosis. Various groups have shown that:
   - Lactose intolerance or maldigestion per se are not associated with decreased bone mineral density, but the smaller amounts of calcium taken in by those people often leads to a reduced bone mineral density [1, 2].
   - Di Stefano et al. [2] reported that lactose intolerance indirectly prevents an adequate bone mass from being achieved and may predispose to osteoporosis.
   - Segal et al. [3] found in their group of 66 people that lactose intolerance may lead to increased bone turnover and decreased bone mass.
   - Kudlacek et al. [4] reported that some people with lactose intolerance had a large number of vertebral fractures, although they did not find that the overall group with lactose intolerance ($n = 115$) was at risk for accelerated bone loss.
   - Finkenstedt et al. [5] showed that 13 of 33 women with idiopathic osteoporosis had lactose maldigestion vs. only 4 of 33 matched controls without osteoporosis ($p < 0.01$), and the daily intake of calcium from milk was less than half in the women with osteoporosis ($p < 0.05$).
   - McCabe et al. [6] showed that increased calcium with supplements protected both men and women from bone loss in a longitudinal study.
   - Barger-Lux and Heaney [7] reported on a national symposium on the role of calcium intake in preventing bone fragility and discussed a large number of studies that demonstrated the well-recognized relationship of calcium intake and bone loss.
   - Matlik et al. [8] reported that girls 10–13 years old who considered themselves to be lactose intolerant consumed 212 mg less of total food calcium per day and already showed lower bone densities due to milk and dairy food avoidance at this young age.

- Stallings et al. [9] reported that lactose-free diets result in lower calcium absorption, perhaps adding to the problem of inadequate calcium consumption among the lactose-intolerant population.

The incidence of symptoms resulting from intolerance to milk and dairy products in various populations has been well documented [10–13]. The FDA's Consumer Health Information website [14] states that NIH 'estimates that 30 to 50 million Americans are lactose intolerant'. The NIH's website contains a substantial amount of information on this condition [15].

Dairy foods account for 73% of the calcium available in the US food supply [16] and 51% of the total calcium intake [17]. Calcium intakes of most Americans are far below recommendations [18–20]. Fleming and Heimbach [21] provide specific data of the amount of calcium intake in the US by sex, age, ethnic group, region, and food group. Further, it is difficult to get adequate calcium in the diet without dairy foods [21–23]. It is hypothesized that adequate calcium not only helps reduce the risk of osteoporosis and hypertension [24], but also possibly reduces the risk for several cancers [7, 24].

An estimated 25% of Americans and 75% of the World's population are maldigesters of lactose. Like all other mammals, these maldigesters lose 90+% of their infantile levels of lactase during early childhood development. Thus, they have limited ability to digest lactose into its component sugars (galactose and glucose) in the small intestine. The NIH estimate of 30–50 million milk avoiders is supported by a survey by Elbon et al. [25] demonstrating that 17% of Whites and 35% of Blacks indicated a perceived milk intolerance. The National Dairy Council African American Lactose Intolerance Study [26] reported that 24% of respondents considered themselves lactose intolerant, and 49% reported some physical discomfort at some time following dairy food consumption, of which 27% said they experience discomfort all the time. Evidence strongly suggests that all maldigesters have a similar potential for intolerance [27]. If the conservative estimate of 24% of the entire African-American population is used for extrapolation (i.e. 35% of African-American maldigesters are estimated to be intolerant since only 75% of African-Americans are maldigesters) to the general US population, at least 25 million (1/3 of 75 million) Americans are avoiding dairy foods due to lactose intolerance. If the 17% figure from Elbon et al. [25] is used, 50 million Americans are avoiding dairy foods.

As the dairy industry continues to develop worldwide, and dairy foods become a dominant global source of calcium in the diet, the potential for symptoms of lactose intolerance among maldigesters will continue to grow. Education and new product development can address this issue.

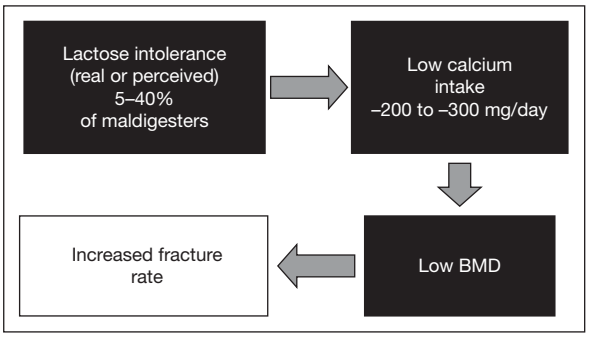

Fig. 1. Consequences of reduced milk and dairy consumption.

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