Understanding lactose intolerance and the dietary management thereof

Labuschagne IL, BScDietetics, Principal Dietitian; **Lombard MJ**, PhD, NICUS Manager, Registered Dietitian
Division of Human Nutrition, Department of Interdisciplinary Health Sciences
Faculty of Health Sciences, Stellenbosch University
Correspondence to: Martani Lombard, e-mail: martani@sun.ac.za
Keywords: lactose intolerance, lactose malabsorption, dairy

Abstract

Diets that exclude dairy may decrease gastrointestinal symptoms in symptomatic individuals who have lactose malabsorption or lactose intolerance. However, most lactose-intolerant adults can consume some lactose without experiencing major symptoms, thereby reducing the need for strict elimination of dairy products from the diet.

Ⓟ **Peer reviewed. (Submitted: 2012-03-01. Accepted: 2012-07-09.) © SAAFP** **S Afr Fam Pract 2012;54(6):496-498**

Introduction

It is important to distinguish between lactose intolerance and a milk allergy. Usually, milk allergy is an abnormal immune response to milk proteins. Milk and milk products contain high concentrations of the disaccharide lactose (galactose and glucose). Intestinal absorption of lactose requires that the disaccharide is hydrolysed by the enzyme lactase to its component monosaccharides, both of which are rapidly transported across the small bowel mucosa.[1]

Lactose malabsorption is a common type of carbohydrate malabsorption and is caused by low lactase levels. "Lactose malabsorption" refers to the physiological concomitant of lactase deficiency, where the body does not have sufficient lactase capacity to digest the amount of ingested lactose.[1,2] When lactose malabsorption causes symptoms, the result is called "lactose intolerance". Lactose intolerance primarily refers to a syndrome that has one or more symptoms following the consumption of food substances that contain lactose. Individuals may be lactose intolerant to varying degrees, depending on the severity of their symptoms.

Primary lactase deficiency is genetic. It only affects adults and is caused by the absence of a lactase persistence allele. Secondary, acquired or transient lactase deficiency is caused by injury to the small intestine, usually in infancy, from acute gastroenteritis, diarrhoea, chemotherapy, intestinal parasites or other environmental causes. Congenital lactase deficiency is a very rare, autosomal recessive genetic disorder that prevents lactase expression from birth.[1-4]

The frequency of decreased lactase activity ranges from 5% in northern Europe, through 71% in Sicily, to more than 90% in some African and Asian countries.[5] Previously, lactase deficiency was reported to be common among black South Africans (78%).[6]

Diagnosing lactose intolerance

Diagnosing lactose intolerance in primary health care is not straightforward, since symptoms that are consistent with lactose intolerance (abdominal pain, bloating, flatulence and diarrhoea) are common, and may have many other causes such as irritable bowel syndrome, dyspepsia, inflammatory bowel disease, coeliac disease and even malignancies.[7] The symptoms of lactose intolerance result from bacterial fermentation of undigested lactose in the colon. Lactose intolerance can be diagnosed by having individuals ingest a standard dose of lactose after fasting and finding elevated levels of breath hydrogen which is produced by bacterial fermentation of undigested lactose in the colon.[4]

A recent systematic review by Jellema et al[7] found that the diagnostic performance of reported symptoms that are associated with lactose intolerance (diarrhoea, abdominal pain, bloating and flatulence) was highly variable. More firm associations were found for ethnicity. Lactose malabsorption is more likely when a patient is of non-Caucasian ethnic origin. Self-reported milk intolerance and occurrence of symptoms during a lactose hydrogen breath test (LHBT) were not only found in people with lactose intolerance, but also in people who were lactose tolerant. Overall, symptoms were more often associated with lactose malabsorption than absorption.[7]

The LHBT is currently considered to be the diagnostic method of choice, but it actually identifies lactose malabsorption, rather than lactose intolerance. Formerly, the usual test dose was 50 g. However, a 25 g dose is standard

in clinical practice and has recently been confirmed as the recommended dosage. Other tests to help diagnose lactose intolerance include an enteroscopy, a lactose tolerance test, faecal-reducing sugars and stool pH.[8,9]

High-quality studies on the diagnosis of lactose malabsorption and intolerance in primary care are clearly needed.[8]

Lactose intolerance and health

Self-reported lactose intolerance may be problematic, since limiting lactose intake on the basis of self-reported milk intolerance without having been tested for lactose malabsorption may be unnecessary, if not detrimental to health.[4,7] There is considerable confusion about the terms "lactose intolerance" and "milk allergy". Reported reactions to foods are often believed to be manifestations of a food allergy. However, immunoglobulin E-mediated food allergy only affects 1-4% of adults. Therefore, milk avoidance with subsequent restriction of calcium intake below the recommended level of 1 g per day for men and women, and 1.3 g per day for adolescents, is cause for serious concern. Individuals may demonstrate reduced peak bone mass, increased incidence of osteopenia and greater risk of osteoporosis and bone fractures.[1,4]

Wilt et al[1] systematically reviewed evidence to determine the prevalence of lactose intolerance, bone health after diets that exclude dairy and a tolerable dose of lactose in subjects with diagnosed lactose intolerance and management. They reported that the lactose intolerance magnitude was very low in children and remained low in adulthood in individuals of Northern European descent. Lactose intolerance rates may be 50% higher in late childhood and adulthood for African American, Hispanic, Asian and Native American populations. Importantly, small doses of lactose were well tolerated in most populations. Low-level evidence from 55 observational studies indicated that low milk consumers may have increased fracture risk. Strength and significance varied depending on exposure definitions. Furthermore, low-level evidence from randomised controlled trials of children and adult women with a low lactose intake have indicated that dairy interventions may improve bone mineral content in select populations.[1]

Avoiding or limiting lactose-containing products

Diets that exclude dairy may decrease gastrointestinal symptoms in symptomatic individuals who have lactose malabsorption or lactose intolerance,[4] yet most lactose-intolerant adults can consume some lactose without experiencing major symptoms.[1,9,10] This reduces the need for strict elimination of dairy from the diet, especially as it is an excellent source of calcium, phosphorous, magnesium, vitamin A, riboflavin and protein.[9] Since each individual's tolerance to lactose varies, the dietary control of lactose intolerance depends on people learning through trial and error how much lactose they can manage.[4,9]

Current dietary recommendations suggest consuming three cups (50 g of lactose) of fat-free or low-fat milk, or equivalent milk products, per day. Ingesting smaller portions over the course of the day may minimise potential problems with larger acute lactose loads. Most individuals with lactose intolerance can tolerate up to 12-15 g of lactose,[1,4,8-11] although symptoms became more prominent at doses above 12 g, and substantial after 24 g of lactose. Fifty grams of lactose induced symptoms in the vast majority of subjects. The systematic review by Wilt et al[1] reported that a daily divided dose of 24 g was generally tolerated. It also reported insufficient evidence that use of lactose-reduced solution or milk, with a lactose content of 0-2 g compared to a lactose dose of greater than 12 g, reduced symptoms of lactose intolerance. Treatment with lactose-reduced milk products may result in clinically important improvements in selected gastrointestinal symptoms in selected individuals who are diagnosed with lactose intolerance or malabsorption, but there are very little high-quality data on the effect of incremental lactose loads. Evidence was insufficient for probiotics, colonic adaptation or varying lactose doses or other agents. Studied yoghurt and probiotic types were variable. Results either showed no difference in symptom scores or small differences in symptoms that were of low clinical relevance.[1]

Calcium intake from low-lactose dairy products, non-dairy products and nutritional supplements is an important management strategy in individuals with lactose intolerance, but little data are available on the effect of such interventions on individual outcomes, including bone mineral content and fractures.[4]

Lactose is present in two large food categories, namely conventional dairy products and as a food additive in dairy and non-dairy products.[10] Table I provides a guide to the typical lactose levels that are found in various foods.

Table I: Guide to the typical lactose levels that are found in various foods[9,12]

Product	Lactose per 100 g or 100 ml	Lactose per serving
Milk: whole, low fat, skim	4-5 g	11-13 g/250 ml
Yogurt (plain)	4-5 g	9 g/200 ml
Ice cream	2.6-3.1 g	~5 g/50 g
Cheddar cheese	Trace	0.02 g/30 g
Cottage cheese	Trace	0.1 g/30 g
Butter	0.4 g/100 g	0.02 g/5 g

Lactose may also be present when labels mention the inclusion of lactoserum, whey, milk solids or modified milk ingredients. Lactose is found in foods such as processed meats, gravy stock powder, margarines, sliced breads, breakfast cereals, potato chips, processed foods, medications, pre-prepared meals, meal replacements (powders and bars), protein supplements (powders and bars) and even milk stout-style beers. Some barbecue sauces and liquid cheeses that are used in fast-food restaurants may also contain lactose.[13] Lactose-containing medication, vitamin supplements and certain sweeteners or additives may pose a problem for severely intolerant individuals.[9]

Conclusion

Health professionals need to alleviate patients' fears about lactose intolerance, discuss the importance of calcium-rich foods and recommend dietary sources to improve tolerance. There is evidence that most individuals with presumed lactose intolerance or malabsorption can tolerate 12-15 g of lactose (approximately one cup of milk). Tolerance seems to be improved if small amounts of lactose-containing foods are consumed with meals. Better tolerated dairy products include more solid and semi-solid forms such as cheeses and yoghurt, or cultured dairy products in small portions. Getting enough calcium and vitamin D is a concern for people with lactose intolerance when the intake of milk and milk products is limited. Fortified food or supplements should be recommended as an alternative source.

Conflict of interest

The authors declare that they have no financial or personal relationships which may have inappropriately influenced them in writing this paper.

References

1. Wilt TJ, Shaukat A, Shamliyan T, et al. Lactose intolerance and health. Rockville, Maryland: Agency for Healthcare Research and Quality; 2010.
2. Heyman MB, Committee on Nutrition. Lactose intolerance in infants, children, and adolescents. Pediatrics. 2006;118(3):1279-1286.
3. Enattah NS, Sahi T, Savilahti E, et al. Identification of a variant associated with adult-type hypolactasia. Nat Genet. 2002;30(2):233-237.
4. Suchy FJ, Brannon PM, Carpenter TO, et al. NIH consensus development conference statement: lactose intolerance and health. NIH Consens State Sci Statements. 2010;27(2):1-27, 22-24.
5. Bulhões AC, Goldani HAS, Oliveira FS, et al. Correlation between lactose absorption and the C/T-13910 and G/A-22018 mutations of the lactase-phlorizin hydrolase (LCT) gene in adult-type hypolactasia. Brazilian Journal of Medical and Biological Research. 2007;40(11):1441-1446.
6. Segal I. Lactase deficiency in the South African black population. Am J Clin Nutr. 1983;38(6):901-905.
7. Jellema P, Schellevis FG, Van der Windt DAWM, et al. Lactose malabsorption and intolerance: a systematic review on the diagnostic value of gastrointestinal symptoms and self-reported milk intolerance. QJM. 2010;103(8):555-572.
8. Lactose intolerance. PubMed Health [homepage on the Internet]. c2012. Availabe from: http://www.ncbi.nlm.nlm.nih.gov/pubmedhealth/PMH0001321
9. Stear GIJ, Horsburgh K, Steinman HA. Lactose intolerance: a review. Current Allergy & Clinical Immunology. 2005;18:3.
10. Lactose intolerance. National Digestive Diseases Information Clearinghouse [homepage on the Internet]. c2012. Available from: http://digestive.niddk.nih.gov/ddiseases/pubs/lactoseintolerance/
11. Shaukat A, Levitt MD, Taylor BC, et al. Systematic review: effective management strategies for lactose intolerance. Ann Intern Med. 2010;152(12):797-803.
12. Diet for lactose intolerance. Gastronet [homepage on the Internet]. c2012. Available from: http://www.gastro.net.au/diets/lactose.html
13. Lactose intolerance. Wikipedia [homepage on the Internet]. c2012. Available from: http://en.wikipedia.org/wiki/Lactose_intolerance