

### Lactose Intolerance

Lactose intolerance occurs in about 25% of people in Europe; 50-80% of people of Hispanic origin, people from south India, black people, and Ashkenazi Jews; and almost 100% of people in Asia and American Indians <sup>1</sup>. Lactose is a disaccharide sugar that is found exclusively in mammalian milk and is digested by the enzyme lactase in the mucosal brush border of the intestine. Reduced intestinal lactase results in malabsorption of lactose. The unabsorbed lactose is metabolised by colonic bacteria to produce gas and short chain fatty acids, causing the clinical syndrome of abdominal cramps, bloating, diarrhoea, and flatulence. Lactose malabsorption does not always cause lactose intolerance; symptoms depend on the amount and rate of lactose reaching the colon, and the amount and type of colonic flora.

Lactase deficiency may be classified as primary, secondary, congenital, and developmental. The classification is important as it relates to diagnosis, prognosis, and treatment. In all mammals, lactase concentrations are at their highest shortly after birth and decline rapidly after the usual age of weaning. In people with primary lactase deficiency, such a physiological decline in lactase concentrations occurs at the age of weaning. This condition is a recessive inherited trait; the underlying genetic change is different in the European and African populations.<sup>2,3</sup> Secondary lactase deficiency results from injury to the small bowel mucosal brush border secondary to viral or non-viral intestinal infection. It is more common in children, particularly those in developing countries, where such infections are common. Congenital lactase deficiency is an extremely rare disorder that manifests at birth, soon after milk is introduced. Affected infants have minimal or absent lactase in an otherwise normal intestinal mucosa. Developmental lactase deficiency occurs in premature infants (<34 weeks' gestation), and rapidly improves as the intestinal mucosa matures.

Lactose intolerance should be suspected in people with abdominal symptoms after ingestion of milk and milk products. The symptoms can be disabling enough to interfere with daily life. Improvement in symptoms after eliminating such foods and worsening when they are reintroduced confirms the diagnosis. Diarrhoea is more pronounced in children with secondary lactase deficiency than in those with the primary form and may lead to dehydration and growth failure; perianal excoriations due to acidic stools are common.

Several tests are available for the diagnosis of lactose malabsorption. The lactose tolerance test (reproduction of symptoms and rise in serum glucose by <1.11 mmol/l, 60-120 minutes after ingestion of 50 g lactose) has a sensitivity of around 75%. The lactose hydrogen breath test (increase in hydrogen concentration in exhaled air to >20 parts per million after 20 g of lactose) is more sensitive.<sup>4</sup> A breath test using carbon-13 labeled lactose and estimation of lactase in intestinal biopsy are also available. However, the diagnosis can be made easily on the basis of clinical history by general practitioners as well as specialists, and diagnostic tests are rarely needed in clinical practice. Differences in underlying genetic changes in different geographical regions may preclude the development of a single DNA based diagnostic test.

Treatment depends on the underlying type of deficiency. In primary lactase deficiency the development of symptoms depends on how much lactose needs to be ingested before the available lactase is saturated. Thus, most people with primary lactase deficiency can ingest up to 240 ml of milk (12 g of lactose) without developing symptoms.<sup>5</sup> It may help to divide daily milk intake into several small portions and to take it with other foods. Yoghurt, curds, and cheeses are better tolerated, because lactose is partially hydrolysed by bacteria during their preparation and gastric emptying is slower as these products have a thicker consistency. Lactase enzyme preparations-ingested directly or added to milk-and soya milk have been used.<sup>6</sup> These are too costly for people in poorer countries, however, and are possibly unnecessary. Instead, people with lactose intolerance should be encouraged to gradually increase their intake of milk-this causes changes in the intestine that permit higher milk intake.<sup>7</sup> Milk is the main source of calcium in predominantly vegetarian communities, so ingestion of milk is important to avoid the increased risk of osteopenia, osteoporosis, and long bone fractures.<sup>8</sup> Milk-cereal mixtures delay the entry of lactose into the intestine, permitting better absorption. Since these are cheap and easily prepared at home, their use should be promoted.

In secondary lactase deficiency, treatment is directed at the underlying cause. Short periods of lactose intolerance are common after episodes of infective diarrhea and may prolong the diarrheal illness. This can lead to unnecessary antimicrobial treatment and unwarranted avoidance of milk—a meta-analysis has shown that most children with acute diarrhea can safely continue to receive breast or undiluted animal milk.<sup>9</sup> This is particularly important in developing countries, where milk is a convenient, readily available, and well accepted food of exceptional nutritional value. A randomized trial in malnourished children in India found that giving milk rather than yoghurt during acute diarrhea was associated with higher milk intake and better weight gain and did not increase diarrhoea.<sup>10</sup> Further randomized controlled trials have shown that milk-cereal mixtures given at frequent intervals (nearly 2 g/kg/day of lactose or 40 ml/kg/day of milk) were well tolerated by most children with persistent diarrhoea.<sup>11 12</sup>

Lactose intolerance is a common condition that can be diagnosed on clinical history and treated with simple dietary measures. Most patients do not need referral to a specialist or diagnostic laboratory tests. Non-responders will benefit from reducing lactose intake below their current threshold of tolerance, followed by long term steps directed at improving adaptation of the intestine.

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