

Lactose Intolerance

National Digestive Diseases Information Clearinghouse



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What is lactose intolerance?

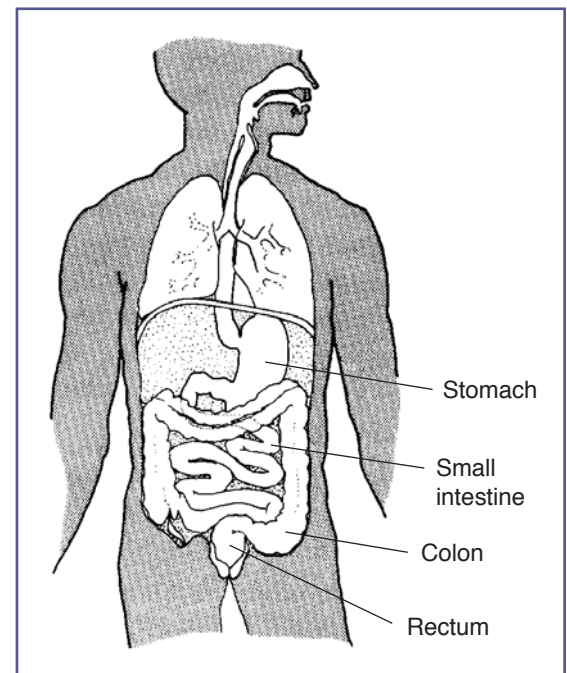
Lactose intolerance is the inability to digest significant amounts of lactose, the predominant sugar of milk. This inability results from a shortage of the enzyme lactase, which is normally produced by the cells that line the small intestine. Lactase breaks down milk sugar into simpler forms that can then be absorbed into the bloodstream. When there is not enough lactase to digest the amount of lactose consumed, the results, although not usually dangerous, may be very distressing. While not all persons deficient in lactase have symptoms, those who do are considered to be lactose intolerant.

Common symptoms include nausea, cramps, bloating, gas, and diarrhea, which begin about 30 minutes to 2 hours after eating or drinking foods containing lactose. The severity of symptoms varies depending on the amount of lactose each individual can tolerate.

Some causes of lactose intolerance are well known. For instance, certain digestive diseases and injuries to the small intestine can reduce the amount of enzymes produced. In rare cases, children are born without the ability to produce lactase. For most people, though, lactase deficiency is a condition that develops naturally over time. After about the age of 2 years, the body begins to produce less lactase. However, many people may not experience symptoms until they are much older.

Between 30 and 50 million Americans are lactose intolerant. Certain ethnic and racial populations are more widely affected than others. As many as 75 percent of all African Americans and American Indians and 90 percent of Asian Americans are lactose intolerant. The condition is least common among persons of northern European descent.

Researchers have identified a genetic variation associated with lactose intolerance; this discovery may be useful in developing a diagnostic test to identify people with this condition.



The digestive tract



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How is lactose intolerance diagnosed?

The most common tests used to measure the absorption of lactose in the digestive system are the lactose tolerance test, the hydrogen breath test, and the stool acidity test. These tests are performed on an out-patient basis at a hospital, clinic, or doctor's office.

The lactose tolerance test begins with the individual fasting (not eating) before the test and then drinking a liquid that contains lactose. Several blood samples are taken over a 2-hour period to measure the person's blood glucose (blood sugar) level, which indicates how well the body is able to digest lactose.

Normally, when lactose reaches the digestive system, the lactase enzyme breaks it down into glucose and galactose. The liver then changes the galactose into glucose, which enters the bloodstream and raises the person's blood glucose level. If lactose is incompletely broken down, the blood glucose level does not rise and a diagnosis of lactose intolerance is confirmed.

The hydrogen breath test measures the amount of hydrogen in a person's breath. Normally, very little hydrogen is detectable. However, undigested lactose in the colon is fermented by bacteria, and various gases, including hydrogen, are produced. The hydrogen is absorbed from the intestines, carried through the bloodstream to the lungs, and exhaled. In the test, the patient drinks a lactose-loaded beverage, and the breath is analyzed at regular intervals. Raised levels of hydrogen in the breath indicate improper digestion of lactose. Certain foods, medications, and cigarettes can affect the accuracy of the test and should be avoided before taking it. This test is available for children and adults.

The lactose tolerance and hydrogen breath tests are not given to infants and very young children who are suspected of having lactose intolerance. A large lactose load may be dangerous for the very young because they are more prone to the dehydration that can result from diarrhea caused by the lactose. If a baby or young child is experiencing symptoms of lactose intolerance, many pediatricians simply recommend changing from cow's milk to soy formula and waiting for symptoms to abate.

If necessary, a stool acidity test, which measures the amount of acid in the stool, may be given to infants and young children. Undigested lactose fermented by bacteria in the colon creates lactic acid and other short-chain fatty acids that can be detected in a stool sample. In addition, glucose may be present in the sample as a result of unabsorbed lactose in the colon.

How is lactose intolerance treated?

Fortunately, lactose intolerance is relatively easy to treat. No treatment can improve the body's ability to produce lactase, but symptoms can be controlled through diet.

Young children with lactase deficiency should not eat any foods containing lactose. Most older children and adults need not avoid lactose completely, but people differ in the amounts and types of foods they can handle. For example, one person may have symptoms after drinking a small glass of milk, while another can drink one glass but not two. Others may be able to manage ice cream and aged cheeses, such as cheddar and Swiss, but not other dairy products. Dietary control of lactose intolerance depends on people learning through trial and error how much lactose they can handle.

For those who react to very small amounts of lactose or have trouble limiting their intake of foods that contain it, lactase enzymes are available without a prescription to help people digest foods that contain lactose. The tablets are taken with the first bite of dairy food. Lactase enzyme is also available as a liquid. Adding a few drops of the enzyme will convert the lactose in milk or cream, making it more digestible for people with lactose intolerance.

Lactose-reduced milk and other products are available at most supermarkets. The milk contains all of the nutrients found in regular milk and remains fresh for about the same length of time, or longer if it is super-pasteurized.

How is nutrition balanced?

Milk and other dairy products are a major source of nutrients in the American diet. The most important of these nutrients is calcium. Calcium is essential for the growth and repair of bones throughout life. In the middle and later years, a shortage of calcium may lead to thin, fragile bones that break easily, a condition called osteoporosis. A concern, then, for both children and adults with lactose intolerance, is getting enough calcium in a diet that includes little or no milk.

In 1997, the Institute of Medicine released a report recommending new requirements for daily calcium intake. How much calcium a person needs to maintain good health varies by age group. Recommendations from the report are shown in the following table.

Age group	Amount of calcium to consume daily, in milligrams (mg)
0–6 months	210 mg
7–12 months	270 mg
1–3 years	500 mg
4–8 years	800 mg
9–18 years	1,300 mg
19–50 years	1,000 mg
51–70+ years	1,200 mg

Also, pregnant and nursing women under 19 need 1,300 mg daily, while pregnant and nursing women over 19 need 1,000 mg.

In planning meals, making sure that each day's diet includes enough calcium is important, even if the diet does not contain dairy products. Many nondairy foods are high in calcium. Green vegetables, such as broccoli and kale, and fish with soft, edible bones, such as salmon and sardines, are excellent sources of calcium. To help in planning a high-calcium and low-lactose diet, the table on the next page lists some common foods that are good sources of dietary calcium and shows how much lactose they contain.

Recent research shows that yogurt with active cultures may be a good source of calcium for many people with lactose intolerance, even though it is fairly high in lactose. Evidence shows that the bacterial cultures used to make yogurt produce some of the lactase enzyme required for proper digestion.

Calcium and Lactose in Common Foods

Vegetables	Calcium Content	Lactose Content
Calcium-fortified orange juice, 1 cup	308–344 mg	0
Sardines, with edible bones, 3 oz.	270 mg	0
Salmon, canned, with edible bones, 3 oz.	205 mg	0
Soymilk, fortified, 1 cup	200 mg	0
Broccoli (raw), 1 cup	90 mg	0
Orange, 1 medium	50 mg	0
Pinto beans, 1/2 cup	40 mg	0
Tuna, canned, 3 oz.	10 mg	0
Lettuce greens, 1/2 cup	10 mg	0
Dairy Products		
Yogurt, plain, low-fat, 1 cup	415 mg	5 g
Milk, reduced fat, 1 cup	295 mg	11 g
Swiss cheese, 1 oz.	270 mg	1 g
Ice cream, 1/2 cup	85 mg	6 g
Cottage cheese, 1/2 cup	75 mg	2–3 g

Adapted from *Manual of Clinical Dietetics*. 6th ed. American Dietetic Association, 2000; and Soy Dairy Alternatives. Available at: www.soyfoods.org. Accessed March 5, 2002.

Clearly, many foods can provide the calcium and other nutrients the body needs, even when intake of milk and dairy products is limited. However, factors other than calcium and lactose content should be kept in mind when planning a diet. Some vegetables that are high in calcium (Swiss chard, spinach, and rhubarb, for instance) are not listed in the chart because the body cannot use the calcium they contain. They also contain substances called oxalates, which stop calcium absorption. Calcium is absorbed and used only when there is enough vitamin D in the body. A balanced diet should provide an adequate supply of vitamin D. Sources of vitamin D include

eggs and liver. However, sunlight helps the body naturally absorb or synthesize vitamin D, and with enough exposure to the sun, food sources may not be necessary.

Some people with lactose intolerance may think they are not getting enough calcium and vitamin D in their diet. Consultation with a doctor or dietitian may be helpful in deciding whether any dietary supplements are needed. Taking vitamins or minerals of the wrong kind or in the wrong amounts can be harmful. A dietitian can help in planning meals that will provide the most nutrients with the least chance of causing discomfort.

What is hidden lactose?

Although milk and foods made from milk are the only natural sources, lactose is often added to prepared foods. People with very low tolerance for lactose should know about the many food products that may contain even small amounts of lactose, such as

- bread and other baked goods
- processed breakfast cereals
- instant potatoes, soups, and breakfast drinks
- margarine
- lunch meats (other than kosher)
- salad dressings
- candies and other snacks
- mixes for pancakes, biscuits, and cookies
- powdered meal-replacement supplements

Some products labeled nondairy, such as powdered coffee creamer and whipped toppings, may also include ingredients that are derived from milk and therefore contain lactose.

Smart shoppers learn to read food labels with care, looking not only for milk and lactose among the contents, but also for such words as whey, curds, milk by-products, dry milk solids, and nonfat dry milk powder. If any of these are listed on a label, the product contains lactose.

In addition, lactose is used as the base for more than 20 percent of prescription drugs and about 6 percent of over-the-counter medicines. Many types of birth control pills, for example, contain lactose, as do

some tablets for stomach acid and gas. However, these products typically affect only people with severe lactose intolerance.

Summary

Even though lactose intolerance is widespread, it need not pose a serious threat to good health. People who have trouble digesting lactose can learn which dairy products and other foods they can eat without discomfort and which ones they should avoid. Many will be able to enjoy milk, ice cream, and other such products if they take them in small amounts or eat other food at the same time. Others can use lactase liquid or tablets to help digest the lactose. Even older women at risk for osteoporosis and growing children who must avoid milk and foods made with milk can meet most of their special dietary needs by eating greens, fish, and other calcium-rich foods that are free of lactose. A carefully chosen diet, with calcium supplements if the doctor or dietitian recommends them, is the key to reducing symptoms and protecting future health.

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Publications produced by the clearinghouse are carefully reviewed by both NIDDK scientists and outside experts.

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