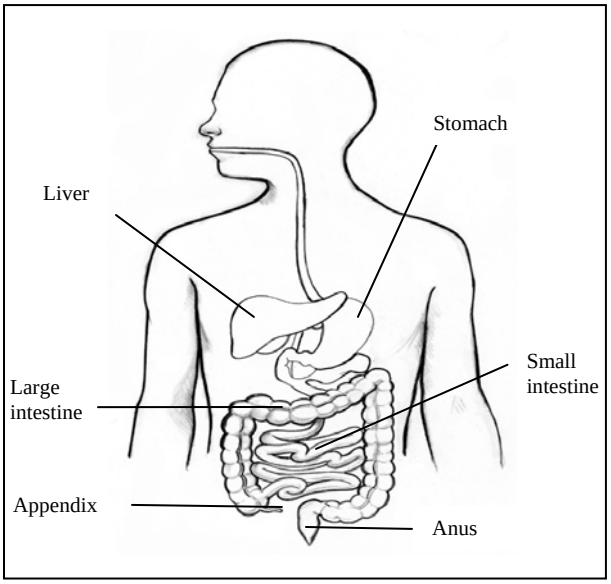
Lactose Intolerance

What is lactose intolerance?

Lactose intolerance is the inability or insufficient ability to digest lactose, a sugar found in milk and milk products. Lactose intolerance is caused by a deficiency of the enzyme lactase, which is produced by the cells lining the small intestine. Lactase breaks down lactose into two simpler forms of sugar called glucose and galactose, which are then absorbed into the bloodstream.

Not all people with lactase deficiency have digestive symptoms, but those who do may have lactose intolerance. Most people with lactose intolerance can tolerate some amount of lactose in their diet.

People sometimes confuse lactose intolerance with cow milk allergy. Milk allergy is a reaction by the body's immune system to one or more milk proteins and can be life threatening when just a small amount of milk or milk product is consumed. Milk allergy most commonly appears in the first year of life, while lactose intolerance occurs more often in adulthood.



The Digestive System

What causes lactose intolerance?

The cause of lactose intolerance is best explained by describing how a person develops lactase deficiency.

Primary lactase deficiency develops over time and begins after about age 2 when the body begins to produce less lactase. Most children who have lactase deficiency do not experience symptoms of lactose intolerance until late adolescence or adulthood. Researchers have identified a possible genetic link to primary lactase deficiency. Some people inherit a gene from their parents that makes it likely they will develop primary lactase deficiency. This discovery may be useful in developing future genetic tests to identify people at risk for lactose intolerance.

Secondary lactase deficiency results from injury to the small intestine that occurs with severe diarrheal illness, celiac disease, Crohn's disease, or chemotherapy. This type of lactase deficiency can occur at any age but is more common in infancy.

Who is at risk for lactose intolerance?

Lactose intolerance is a common condition that is more likely to occur in adulthood, with a higher incidence in older adults. Some ethnic and racial populations are more affected than others, including African Americans, Hispanic Americans, American Indians, and Asian Americans. The condition is least common among Americans of northern European descent.

Infants born prematurely are more likely to have lactase deficiency because an infant's lactase levels do not increase until the third trimester of pregnancy.

What are the symptoms of lactose intolerance?

People with lactose intolerance may feel uncomfortable 30 minutes to 2 hours after consuming milk and milk products. Symptoms range from mild to severe, based on the amount of lactose consumed and the amount a person can tolerate.

Common symptoms include

- abdominal pain
- abdominal bloating
- gas
- diarrhea
- nausea

How is lactose intolerance diagnosed?

Lactose intolerance can be hard to diagnose based on symptoms alone. People may think they suffer from lactose intolerance because they have digestive symptoms; however, other conditions such as irritable bowel syndrome can cause similar symptoms.

After taking a medical history and performing a physical examination, the doctor may first recommend eliminating all milk and milk products from the person's diet for a short time to see if the symptoms resolve. Tests may be necessary to provide more information.

Two tests are commonly used to measure the digestion of lactose.

Hydrogen Breath Test. The person drinks a lactose-loaded beverage and then the breath is analyzed at regular intervals to measure the amount of hydrogen. Normally, very little hydrogen is detectable in the breath, but undigested lactose produces high levels of hydrogen. Smoking and some foods and medications may affect the accuracy of the results. People should check with their doctor about foods and medications that may interfere with test results.

Stool Acidity Test. The stool acidity test is used for infants and young children to measure the amount of acid in the stool. Undigested lactose creates lactic acid and other fatty acids that can be detected in a stool sample. Glucose may also be present in the stool as a result of undigested lactose.

Because lactose intolerance is uncommon in infants and children younger than 2, a health professional should take special care in determining the cause of a child's digestive symptoms.

How is lactose intolerance managed?

Although the body's ability to produce lactase cannot be changed, the symptoms of lactose intolerance can be managed with dietary changes. Most people with lactose intolerance can tolerate some amount of lactose in their diet. Gradually introducing small amounts of milk or milk products may help some people adapt to them with fewer symptoms. Often, people can better tolerate milk or milk products by taking them with meals.

The amount of change needed in the diet depends on how much lactose a person can consume without symptoms. For example, one person may have severe symptoms after drinking a small glass of milk, while another can drink a large glass without symptoms. Others can easily consume yogurt and hard cheeses such as cheddar and Swiss but not milk or other milk products.

The *Dietary Guidelines for Americans 2005* recommend that people with lactose intolerance choose milk products with lower levels of lactose than regular milk, such as yogurt and hard cheese.

Lactose-free and lactose-reduced milk and milk products, available at most supermarkets, are identical to regular milk except that the lactase enzyme has been added. Lactose-free milk remains fresh for about the same length of time or longer than regular milk if it is ultra-pasteurized. Lactose-free milk may have a slightly sweeter taste than regular milk. Soy milk and other products may be recommended by a health professional.

People who still experience symptoms after dietary changes can take over-the-counter lactase enzyme drops or tablets. Taking the tablets or a few drops of the liquid enzyme when consuming milk or milk products may make these foods more tolerable for people with lactose intolerance.

Parents and caregivers of a child with lactose intolerance should follow the nutrition plan recommended by the child's doctor or dietitian.

Lactose Intolerance and Calcium Intake

Milk and milk products are a major source of calcium and other nutrients. Calcium is essential for the growth and repair of bones at all ages. A shortage of calcium intake in children and adults may lead to fragile bones that can easily fracture later in life, a condition called osteoporosis.

The amount of calcium a person needs to maintain good health varies by age. Recommendations are shown in Table 1.

Table 1. Recommended calcium intake by age group

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

Source: Adapted from *Dietary Reference Intakes,* 2004, Institute of Medicine, National Academy of Sciences.

Women who are pregnant or breastfeeding need between 1,000 and 1,300 mg of calcium daily.

Getting enough calcium is important for people with lactose intolerance when the intake of milk and milk products is limited. Many foods can provide calcium and other nutrients the body needs. Non-milk products that are high in calcium include fish with soft bones such as salmon and sardines and dark green vegetables such as spinach.

Table 2 lists foods that are good sources of dietary calcium.

Table 2. Calcium content in common foods

Non-milk Products	Calcium Content
Rhubarb, frozen, cooked, 1 cup	348 mg
Sardines, with bone, 3 oz.	325 mg
Spinach, frozen, cooked, 1 cup	291 mg
Salmon, canned, with bone 3 oz.	181 mg
Soy milk, unfortified, 1 cup	61 mg
Orange, 1 medium	52 mg
Broccoli, raw, 1 cup	41 mg
Pinto beans, cooked ½ cup	40 mg
Lettuce greens, 1 cup	20 mg
Tuna, white, canned 3 oz.	12 mg
Milk and Milk Products	
Yogurt, with active and live cultures, plain, low-fat, vitamin D-fortified, 1 cup	415 mg
Milk, reduced fate, vitamin D-fortified, 1 cup	285 mg
Swiss cheese, 1 oz.	224 mg
Cottage cheese, ½ cup	87 mg
Ice cream, ½ cup	84 mg

Source: Adapted from U.S. Department of Agriculture, Agricultural Research Service. 2008. USDA National Nutrient Database for Standard Reference, Release 21.

Yogurt made with active and live bacterial cultures is a good source of calcium for many people with lactose intolerance. When this type of yogurt enters the intestine, the bacterial cultures convert lactose to lactic acid, so the yogurt may be well-tolerated due to a lower lactose content than yogurt without live cultures. Frozen yogurt does not contain bacterial cultures, so it may not be well-tolerated.

Calcium is absorbed and used in the body only when enough vitamin D is present. Some people with lactose intolerance may not be getting enough vitamin D. Vitamin D comes from food sources such as eggs, liver, and vitamin D-fortified milk and yogurt. Regular exposure to sunlight also helps the body naturally absorb vitamin D.

Talking with a doctor or registered dietitian may be helpful in planning a balanced diet that provides an adequate amount of nutrients—including calcium and vitamin D—and minimizes discomfort. A health professional can determine whether calcium and other dietary supplements are needed.

What other products contain lactose?

Milk and milk products are often added to processed foods—foods that have been altered to prolong their shelf life. People with lactose intolerance should be aware of the many food products that may contain even small amounts of lactose, such as

- bread and other baked goods
- waffles, pancakes, biscuits, cookies, and mixes to make them
- processed breakfast foods such as doughnuts, frozen waffles and pancakes, toaster pastries, and sweet rolls
- processed breakfast cereals
- instant potatoes, soups, and breakfast drinks
- potato chips, corn chips, and other processed snacks
- processed meats, such as bacon, sausage, hot dogs, and lunch meats
- margarine
- salad dressings
- liquid and powdered milk-based meal replacements
- protein powders and bars
- candies
- non-dairy liquid and powdered coffee creamers
- non-dairy whipped toppings

Checking the ingredients on food labels is helpful in finding possible sources of lactose in food products. If any of the following words are listed on a food label, the product contains lactose:

- milk
- lactose
- whey
- curds
- milk by-products
- dry milk solids
- non-fat dry milk powder

Lactose is also used in some prescription medicines, including birth control pills, and over-the-counter medicines like products to treat stomach acid and gas. These medicines most often cause symptoms in people with severe lactose intolerance.

Points to Remember

- Lactose intolerance is the inability or insufficient ability to digest lactose, a sugar found in milk and milk products.
- Lactose intolerance is caused by a deficiency of the enzyme lactase, which is produced by the cells lining the small intestine.
- Not all people with lactase deficiency have digestive symptoms, but those who do may have lactose intolerance.
- Most people with lactose intolerance can tolerate some amount of lactose in their diet.
- People with lactose intolerance may feel uncomfortable after consuming milk and milk products. Symptoms can include abdominal pain, abdominal bloating, gas, diarrhea, and nausea.
- The symptoms of lactose intolerance can be managed with dietary changes.
- Getting enough calcium and vitamin D is a concern for people with lactose intolerance when the intake of milk and milk products is limited. Many foods can provide the calcium and other nutrients the body needs.
- Talking with a doctor or registered dietitian may be helpful in planning a balanced diet that provides an adequate amount of nutrients—including calcium and vitamin D—and minimizes discomfort. A health professional can determine whether calcium and other dietary supplements are needed.
- Milk and milk products are often added to processed foods. Checking the ingredients on food labels is helpful in finding possible sources of lactose in food products.

Hope through Research

The National Institute of Diabetes and Digestive and Kidney Diseases' (NIDDK's) Division of Digestive Diseases and Nutrition conducts and supports basic and clinical research into digestive disorders.

Participants in clinical trials can play a more active role in their own health care, gain access to new research treatments before they are widely available, and help others by contributing to medical research. For information about current studies, visit *www.ClinicalTrials.gov.*

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This publication is available at www.digestive.niddk.nih.gov.

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