

# Lactose Intolerance

*National Digestive Diseases Information Clearinghouse*



National Institute of  
Diabetes and Digestive  
and Kidney Diseases

## What is lactose?

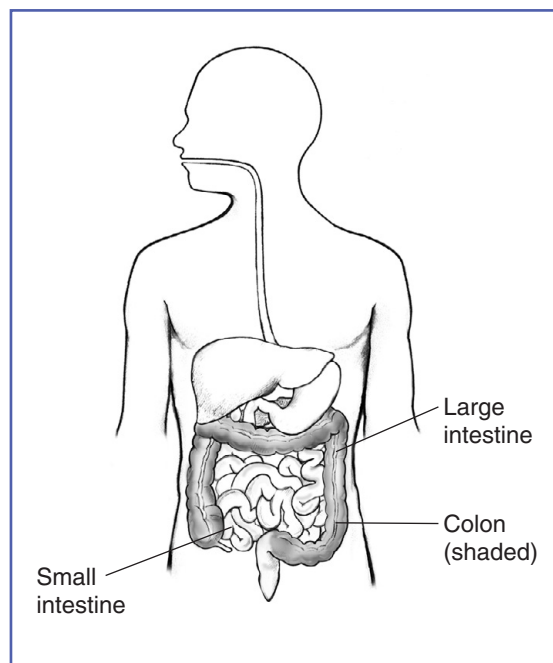
Lactose is a sugar found in milk and milk products. The small intestine—the organ where most food digestion and nutrient absorption take place—produces an enzyme called lactase. Lactase breaks down lactose into two simpler forms of sugar: glucose and galactose. The body then absorbs these simpler sugars into the bloodstream.

## What is lactose intolerance?

Lactose intolerance is a condition in which people have digestive symptoms—such as bloating, diarrhea, and gas—after eating or drinking milk or milk products.

Lactase deficiency and lactose malabsorption may lead to lactose intolerance:

- **Lactase deficiency.** In people who have a lactase deficiency, the small intestine produces low levels of lactase and cannot digest much lactose.
- **Lactose malabsorption.** Lactase deficiency may cause lactose malabsorption. In lactose malabsorption, undigested lactose passes to the colon. The colon, part of the large intestine, absorbs water



The digestive tract

from stool and changes it from a liquid to a solid form. In the colon, bacteria break down undigested lactose and create fluid and gas. Not all people with lactase deficiency and lactose malabsorption have digestive symptoms.

People have lactose intolerance when lactase deficiency and lactose malabsorption cause digestive symptoms. Most people with lactose intolerance can eat or drink some amount of lactose without having digestive symptoms. Individuals vary in the amount of lactose they can tolerate.

People sometimes confuse lactose intolerance with a milk allergy. While lactose intolerance is a digestive system

disorder, a milk allergy is a reaction by the body's immune system to one or more milk proteins. An allergic reaction to milk can be life threatening even if the person eats or drinks only a small amount of milk or milk product. A milk allergy most commonly occurs in the first year of life, while lactose intolerance occurs more often during adolescence or adulthood.<sup>1,2</sup>

## Four Types of Lactase Deficiency

Four types of lactase deficiency may lead to lactose intolerance:

- **Primary lactase deficiency**, also called lactase nonpersistence, is the most common type of lactase deficiency. In people with this condition, lactase production declines over time. This decline often begins at about age 2; however, the decline may begin later. Children who have lactase deficiency may not experience symptoms of lactose intolerance until late adolescence or adulthood. Researchers have discovered that some people inherit genes from their parents that may cause a primary lactase deficiency.
- **Secondary lactase deficiency** results from injury to the small intestine. Infection, diseases, or other problems may injure the small intestine. Treating the underlying cause usually improves the lactose tolerance.
- **Developmental lactase deficiency** may occur in infants born prematurely. This condition usually lasts for only a short time after they are born.
- **Congenital lactase deficiency** is an extremely rare disorder in which the small intestine produces little or no lactase enzyme from birth. Genes inherited from parents cause this disorder.

<sup>1</sup>Boyce JA, Assa'ad A, Burks AW, et al. Guidelines for the diagnosis and management of food allergy in the United States: report of the NIAID-sponsored expert panel. *Journal of Allergy and Clinical Immunology*. 2010;126(6 suppl.):S1–S58.

<sup>2</sup>Suchy FJ, Brannon PM, Carpenter TO, et al. National Institutes of Health Consensus Development Conference: lactose intolerance and health. *Annals of Internal Medicine*. 2010;152(12):792–796.

## Who is more likely to have lactose intolerance?

In the United States, some ethnic and racial populations are more likely to have lactose intolerance than others, including African Americans, Hispanics/Latinos, American Indians, and Asian Americans. The condition is least common among Americans of European descent.<sup>2</sup>

## What are the symptoms of lactose intolerance?

Common symptoms of lactose intolerance include

- abdominal bloating, a feeling of fullness or swelling in the abdomen
- abdominal pain
- diarrhea
- gas
- nausea

Symptoms occur 30 minutes to 2 hours after consuming milk or milk products. Symptoms range from mild to severe based on the amount of lactose the person ate or drank and the amount a person can tolerate.

## How does lactose intolerance affect health?

In addition to causing unpleasant symptoms, lactose intolerance may affect people's health if it keeps them from consuming enough essential nutrients, such as calcium and vitamin D. People with lactose intolerance may not get enough calcium if they do not eat calcium-rich foods or do not take a dietary supplement that contains calcium. Milk and milk products are major sources of calcium and other nutrients in the diet. Calcium is essential at all ages

for the growth and maintenance of bones. A shortage of calcium intake in children and adults may lead to bones that are less dense and can easily fracture later in life, a condition called osteoporosis.

## How is lactose intolerance diagnosed?

A health care provider makes a diagnosis of lactose intolerance based on

- medical, family, and diet history, including a review of symptoms
- a physical exam
- medical tests

**Medical, family, and diet history.** A health care provider will take a medical, family, and diet history to help diagnose lactose intolerance. During this discussion, the health care provider will review a patient's symptoms. However, basing a diagnosis on symptoms alone may be misleading because digestive symptoms can occur for many reasons other than lactose intolerance. For example, other conditions such as irritable bowel syndrome, celiac disease, inflammatory bowel disease, or small bowel bacterial overgrowth can cause digestive symptoms.

**Physical exam.** A physical exam may help diagnose lactose intolerance or rule out other conditions that cause digestive symptoms. During a physical exam, a health care provider usually

- checks for abdominal bloating
- uses a stethoscope to listen to sounds within the abdomen
- taps on the abdomen to check for tenderness or pain

A health care provider may recommend eliminating all milk and milk products from a person's diet for a short time to see if the symptoms resolve. Symptoms that go away when a person eliminates lactose from his or her diet may confirm the diagnosis of lactose intolerance.

**Medical tests.** A health care provider may order special tests to provide more information. Health care providers commonly use two tests to measure how well a person digests lactose:

- **Hydrogen breath test.** This test measures the amount of hydrogen in a person's breath. Normally, only a small amount of hydrogen is detectable in the breath when a person eats or drinks and digests lactose. However, undigested lactose produces high levels of hydrogen. For this test, the patient drinks a beverage that contains a known amount of lactose. A health care provider asks the patient to breathe into a balloon-type container that measures breath hydrogen level. In most cases, a health care provider performs this test at a hospital, on an outpatient basis. Smoking and some foods and medications may affect the accuracy of the results. A health care provider will tell the patient what foods or medications to avoid before the test.
- **Stool acidity test.** Undigested lactose creates lactic acid and other fatty acids that a stool acidity test can detect in a stool sample. Health care providers sometimes use this test to check acidity in the stools of infants and young children. A child may also have glucose in his or her stool as a result of undigested lactose. The health care

provider will give the child's parent or caretaker a container for collecting the stool specimen. The parent or caretaker returns the sample to the health care provider, who sends it to a lab for analysis.

## How much lactose can a person with lactose intolerance have?

Most people with lactose intolerance can tolerate some amount of lactose in their diet and do not need to avoid milk or milk products completely. Avoiding milk and milk products altogether may cause people to take in less calcium and vitamin D than they need. See the "Calcium and Vitamin D" section.

Individuals vary in the amount of lactose they can tolerate. A variety of factors—including how much lactase the small intestine produces—can affect how much lactose an individual can tolerate. For example, one person may have severe symptoms after drinking a small amount of milk, while another person can drink a large amount without having symptoms. Other people can easily eat yogurt and hard cheeses such as cheddar and Swiss, while they are not able to eat or drink other milk products without having digestive symptoms.

Research suggests that adults and adolescents with lactose malabsorption could eat or drink at least 12 grams of lactose in one sitting without symptoms or with only minor symptoms. This amount is the amount of lactose in 1 cup of milk. People with lactose malabsorption may be able to eat or drink more lactose if they eat it or drink it with meals or in small amounts throughout the day.<sup>2</sup>

## How is lactose intolerance managed?

Many people can manage the symptoms of lactose intolerance by changing their diet. Some people may only need to limit the amount of lactose they eat or drink. Others may need to avoid lactose altogether. Using lactase products can help some people manage their symptoms.

For people with secondary lactase deficiency, treating the underlying cause improves lactose tolerance. In infants with developmental lactase deficiency, the ability to digest lactose improves as the infants mature. People with primary and congenital lactase deficiency cannot change their body's ability to produce lactase.

### Eating, Diet, and Nutrition

People may find it helpful to talk with a health care provider or a registered dietitian about a dietary plan. A dietary plan can help people manage the symptoms of lactose intolerance and make sure they get enough nutrients. Parents, caretakers, childcare providers, and others who serve food to children with lactose intolerance should follow the dietary plan recommended by the child's health care provider or registered dietitian.

**Milk and milk products.** 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 having them with meals, such as having milk with cereal or having cheese with crackers.

People with lactose intolerance are generally more likely to tolerate hard cheeses, such as cheddar or Swiss, than a glass of milk. A 1.5-ounce serving of low-fat hard cheese has less than 1 gram of lactose, while a 1-cup serving of low-fat milk has about 11 to 13 grams of lactose.<sup>2</sup>

However, people with lactose intolerance are also more likely to tolerate yogurt than milk, even though yogurt and milk have similar amounts of lactose.<sup>2</sup>

**Lactose-free and lactose-reduced milk and milk products.** Lactose-free and lactose-reduced milk and milk products are available at most supermarkets and are identical nutritionally to regular milk and milk products. Manufacturers treat lactose-free milk with the lactase enzyme. This enzyme breaks down the lactose in the milk. Lactose-free milk remains fresh for about the same length of time or, if it is ultra-pasteurized, longer than regular milk. Lactose-free milk may have a slightly sweeter taste than regular milk.

**Lactase products.** People can use lactase tablets and drops when they eat or drink milk products. The lactase enzyme digests the lactose in the food and therefore reduces the chances of developing digestive symptoms. People should check with a health care provider before using these products because some groups, such as young children and pregnant and breastfeeding women, may not be able to use them.

## Calcium and Vitamin D

Ensuring that children and adults with lactose intolerance get enough calcium is important, especially if their intake of milk and milk products is limited. The amount of calcium a person needs to maintain good health varies by age. Table 1 illustrates recommendations for calcium intake.

**Table 1. Recommended Dietary Allowance of calcium by age group**

Age Group	Recommended Dietary Allowance (mg/day)
1–3 years	700 mg
4–8 years	1,000 mg
9–18 years	1,300 mg
19–50 years	1,000 mg
51–70 years, males	1,000 mg
51–70 years, females	1,200 mg
70+ years	1,200 mg
14–18 years, pregnant/breastfeeding	1,300 mg
19–50 years, pregnant/breastfeeding	1,000 mg

Source: Adapted from *Dietary Reference Intakes for Calcium and Vitamin D*, Institute of Medicine, National Academy of Sciences, November 2010.

A U.S. Recommended Dietary Allowance for calcium has not been determined for infants. However, researchers suggest 200 mg of calcium per day for infants age 0 to 6 months and 260 mg for infants age 6 to 12 months.<sup>3</sup>

Many foods can provide calcium and other nutrients the body needs. Nonmilk products high in calcium include fish with soft bones, such as canned salmon and sardines, and dark green vegetables, such as spinach. Manufacturers may also add calcium to fortified breakfast cereals, fruit juices, and soy beverage—also called soy milk. Many fortified foods are also excellent sources of vitamin D and other essential nutrients, in addition to calcium.

<sup>3</sup>Institute of Medicine, National Academy of Sciences. *Dietary Reference Intakes for Calcium and Vitamin D*. 2010. Report.

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

**Table 2. Calcium content in common foods**

Nonmilk Products	Calcium Content
sardines, with bone, 3.75 oz.	351 mg
rhubarb, frozen, cooked, 1 cup	348 mg
soy milk, original and vanilla, with added calcium and vitamins A and D	299 mg
spinach, frozen, cooked, 1 cup	291 mg
salmon, canned, with bone, 3 oz.	181 mg
pinto beans, cooked, 1 cup	79 mg
broccoli, cooked, 1 cup	62 mg
soy milk, original and vanilla, unfortified, 1 cup	61 mg
orange, 1 medium	52 mg
lettuce, green leaf, 1 cup	13 mg
tuna, white, canned, 3 oz.	12 mg
Milk and Milk Products	
yogurt, plain, skim milk, 8 oz.	452 mg
milk, reduced fat, with added vitamins A and D, 1 cup	293 mg
Swiss cheese, 1 oz.	224 mg
cottage cheese, low fat, 1 cup	206 mg
ice cream, vanilla, 1/2 cup	84 mg

*Source:* Adapted from U.S. Department of Agriculture, Agricultural Research Service. 2013. USDA national nutrient database for standard reference, release 26.

Vitamin D helps the body absorb and use calcium. Some people with lactose intolerance may not get enough vitamin D. Foods such as salmon, tuna, eggs, and liver naturally contain vitamin D. Most milk sold in the United States is fortified with vitamin D, and vitamin D is added to some nonmilk beverages, yogurts, and breakfast cereals. People's bodies also make vitamin D when the skin is exposed to sunlight.

People may find it helpful to talk with a health care provider or a registered dietitian to determine if their diet provides adequate nutrients—including calcium and vitamin D. To help ensure coordinated and safe care, people should discuss their use of complementary and alternative medical practices, including their use of dietary supplements, with their health care provider. Read more at [www.ods.od.nih.gov](http://www.ods.od.nih.gov) and [www.nccam.nih.gov](http://www.nccam.nih.gov).

## What products contain lactose?

Lactose is present in many food products and in some medications.

### Food Products

Lactose is in all milk and milk products. Manufacturers also often add milk and milk products to boxed, canned, frozen, packaged, and prepared foods. People who have digestive symptoms after consuming a small quantity of lactose 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 the 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
- nondairy liquid and powdered coffee creamers
- nondairy whipped toppings

People can check the ingredients on food labels to find possible sources of lactose in food products. If a food label includes any of the following words, the product contains lactose:

- milk
- lactose
- whey
- curds
- milk by-products
- dry milk solids
- nonfat dry milk powder

### Medications

Some medications also contain lactose, including prescription medications such as birth control pills and over-the-counter medications such as products to treat stomach acid and gas. These medications most often cause symptoms in people with severe lactose intolerance. People with lactose intolerance who take medications that contain lactose should speak with their health care provider about other options.



## Points to Remember

- Lactose is a sugar found in milk and milk products.
- Lactose intolerance is a condition in which people have digestive symptoms—such as bloating, diarrhea, and gas—after eating or drinking milk or milk products.
- A health care provider makes a diagnosis of lactose intolerance based on medical, family, and diet history, including a review of symptoms; a physical exam; and medical tests.
- Basing a diagnosis on symptoms alone may be misleading because digestive symptoms can occur for many reasons other than lactose intolerance.
- Most people with lactose intolerance can tolerate some amount of lactose in their diet and do not need to avoid milk or milk products completely. However, individuals vary in the amount of lactose they can tolerate.
- Research suggests that adults and adolescents with lactose malabsorption could eat or drink at least 12 grams of lactose in one sitting without symptoms or with only minor symptoms. This amount is the amount of lactose in 1 cup of milk.
- Many people can manage the symptoms of lactose intolerance by changing their diet. Some people may only need to limit the amount of lactose they eat or drink. Others may need to avoid lactose altogether.
- People may find it helpful to talk with a health care provider or a registered dietitian to determine if their diet provides adequate nutrients—including calcium and vitamin D. To help ensure coordinated and safe care, people should discuss their use of complementary and alternative medical practices, including their use of dietary supplements, with their health care provider.
- Lactose is in all milk and milk products. Manufacturers also often add milk and milk products to boxed, canned, frozen, packaged, and prepared foods. People can check the ingredients on food labels to find 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 such as lactose intolerance.

Clinical trials are research studies involving people. Clinical trials look at safe and effective new ways to prevent, detect, or treat disease. Researchers also use clinical trials to look at other aspects of care, such as improving the quality of life for people with chronic illnesses. To learn more about clinical trials, why they matter, and how to participate, visit the NIH Clinical Research Trials and You website at [www.nih.gov/health/clinicaltrials](http://www.nih.gov/health/clinicaltrials). For information about current studies, visit [www.ClinicalTrials.gov](http://www.ClinicalTrials.gov).

## For More Information

**Academy of Nutrition and Dietetics**  
120 South Riverside Plaza, Suite 2000  
Chicago, IL 60606-6995  
Internet: [www.eatright.org](http://www.eatright.org)

**International Foundation for Functional Gastrointestinal Disorders**  
700 West Virginia Street, Suite 201  
Milwaukee, WI 53204  
Phone: 1-888-964-2001 or 414-964-1799  
Fax: 414-964-7176  
Email: [iffgd@iffgd.org](mailto:iffgd@iffgd.org)  
Internet: [www.iffgd.org](http://www.iffgd.org)

## Acknowledgments

Publications produced by the Clearinghouse are carefully reviewed by both NIDDK scientists and outside experts. This publication was originally reviewed by Eric Sibley, M.D., Ph.D., Stanford University School of Medicine. Rachel Fisher, M.S., M.P.H., R.D., and Jean Pennington, Ph.D., R.D., Division of Nutrition Research Coordination, NIDDK, reviewed the 2009 version of the publication. Ms. Fisher and Margaret A. McDowell, Ph.D., M.P.H., R.D., Division of Nutrition Research Coordination, National Institutes of Health, reviewed the updated version of the publication.

You may also find additional information about this topic by visiting MedlinePlus at [www.medlineplus.gov](http://www.medlineplus.gov).

This publication may contain information about medications and, when taken as prescribed, the conditions they treat. When prepared, this publication included the most current information available. For updates or for questions about any medications, contact the U.S. Food and Drug Administration toll-free at 1-888-INFO-FDA (1-888-463-6332) or visit [www.fda.gov](http://www.fda.gov). Consult your health care provider for more information.

## National Digestive Diseases Information Clearinghouse

2 Information Way  
Bethesda, MD 20892-3570  
Phone: 1-800-891-5389  
TTY: 1-866-569-1162  
Fax: 703-738-4929  
Email: [nddic@info.niddk.nih.gov](mailto:nddic@info.niddk.nih.gov)  
Internet: [www.digestive.niddk.nih.gov](http://www.digestive.niddk.nih.gov)

The National Digestive Diseases Information Clearinghouse (NDDIC) is a service of the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK). The NIDDK is part of the National Institutes of Health of the U.S. Department of Health and Human Services. Established in 1980, the Clearinghouse provides information about digestive diseases to people with digestive disorders and to their families, health care professionals, and the public. The NDDIC answers inquiries, develops and distributes publications, and works closely with professional and patient organizations and Government agencies to coordinate resources about digestive diseases.

This publication is not copyrighted. The Clearinghouse encourages users of this publication to duplicate and distribute as many copies as desired.

This publication is available at  
[www.digestive.niddk.nih.gov](http://www.digestive.niddk.nih.gov).



National Institute of  
Diabetes and Digestive  
and Kidney Diseases

NIH Publication No. 14-7994  
May 2014