



Lactose Intolerance

What is lactose and why is it important for infants and young children?

Lactose is the primary carbohydrate of mammalian milk and is found exclusively in the milk of all mammals including human milk, cows', goats' and sheep milk. Lactose is a disaccharide and is comprised of the simple sugars glucose and galactose.

Lactose is an important energy source for infants and assists in the absorption of minerals such as calcium.

What is lactose intolerance?

Before lactose can be absorbed by the body, it must be hydrolysed to its component sugars, glucose and galactose by the enzyme lactase. A deficiency of this enzyme, results in lactose intolerance.

Normal, healthy infants are born with the ability to tolerate lactose as it is the primary carbohydrate of breast milk. In most infants, intestinal lactase activity is maximal during the perinatal period; however, after 2–12 years of age, some children develop a low lactase activity (hypolactasia), whilst others retain their lactase activity into adulthood.¹

In infants and young children the symptoms of lactose intolerance can be serious; for example, diarrhoea and dehydration and can greatly affect health and normal growth.

What causes lactose intolerance?

Reduction in lactase activity causes primary maldigestion of lactose, a condition that is occasionally asymptomatic. When symptoms are present, lactose intolerance is diagnosed. It is important to distinguish between primary hypolactasia and secondary causes of maldigestion of lactose, including coeliac disease, infectious enteritis, or Crohn's disease, which have distinct pathogenic and therapeutic implications. Moreover, primary hypolactasia should be distinguished from congenital lactase deficiency (Congenital alactasia), a rare autosomal recessive disease with unique molecular mechanisms that affects infants from birth.¹

Congenital alactasia

Congenital alactasia is a very rare disorder apparent in newborns as soon as milk feeds commence and is due to the absence of the lactase enzyme. There have only been a few dozen cases reported, mainly in Finland.

Developmental (Neonatal) Lactase Deficiency

Developmental lactase deficiency is now defined as the relative lactase deficiency observed among preterm infants of less than 34 weeks' gestation.²

In the immature gastrointestinal tract, lactase and other disaccharidases are deficient until at least 34 weeks' gestation.

Genetic predisposition in many ethnic groups (also known as primary lactose intolerance).

Approximately 70% of the world's population has primary lactase deficiency.² The percentage varies according to ethnicity and is related to the use of dairy products in the diet, resulting in genetic selection of individuals with the ability to digest lactose.² In populations with a predominance of dairy foods in the diet, particularly individuals from or with a northern European background, as few as 2% of the population has primary lactase deficiency.²

Persons originating from Asia, the Middle East, the Mediterranean, as well as the Australian Aborigines gradually lose lactase activity before the age of six.³ These ethnic groups with a predisposition for primary lactose intolerance may also have an increased likelihood of developing secondary lactose intolerance in the first years of life e.g. post gastroenteritis. Tolerance of lactose in these groups can vary considerably, however small amounts of lactose are usually well tolerated.

Although primary lactase deficiency may present with a relatively acute onset of milk intolerance, its onset typically is subtle and progressive over many years. Most lactase deficient individuals experience onset of symptoms in late adolescence and adulthood.

Insult to the small bowel mucosa causing damage to the brush border cells (also known as secondary lactose intolerance).

Secondary lactose intolerance is a temporary condition and occurs when the gut is damaged and the production of the enzyme lactase is interrupted.⁴

Lactase is the first enzyme to be lost and the last to regenerate following damage to the gut. As the gut heals, the activity of lactase is slowly restored. In some cases this can take several months.

Lactase producing cells can be damaged by:

- Acute gastroenteritis particularly rotavirus
- Malnutrition
- Giardia
- Protein allergy and intolerance
- Inflammatory bowel disease
- Gastrointestinal surgery
- Acute coeliac disease
- Crohn's disease
- Certain drugs (e.g: certain antibiotics, chemotherapy treatments)

In some of the above points, the underlying condition may resolve and the gut will recover sufficiently for normal lactase enzyme activity and thus diet to resume.

What are the signs and symptoms of lactose intolerance?

Consider Lactose Intolerance in infants with the following symptoms:

- Acute or chronic diarrhoea
- Feeding intolerance post gastroenteritis*
- Excessive wind
- Abdominal pain and distention
- Failure to thrive
- Scalded buttocks

Like other food intolerances the onset and severity of symptoms is dose related. The amount of lactose that will cause symptoms varies from individual to individual, depending on the amount of lactose consumed, the degree of lactase deficiency, and the form of food substance in which the lactose is ingested.³

*Most cases of gastroenteritis are self limiting, lasting 3–7 days and are commonly due to rotavirus. Despite the short duration of symptoms, the production of the enzyme lactase, responsible for breaking down lactose can be interrupted. This can lead to a temporary lactase deficiency which may in turn may result in a period of temporary lactose intolerance and in more severe cases, protracted diarrhoea and malnutrition. Persistent post gastroenteritis diarrhoea can occur in 29% of cases and evidence for persisting lactose intolerance has been variously reported as between 20 and 30%.⁴

How is lactose intolerance diagnosed in infants and young children?

A referral to a Paediatric Gastroenterologist may be required for cases of persistent symptoms of lactose intolerance in infants and young children.

The following tests may be used to diagnose of lactose intolerance:⁵

A trial of a lactose free diet

A good clinical history often reveals a relationship between lactose ingestion and symptoms. When lactose intolerance is suspected, a lactose-free diet can be tried. During a diagnostic lactose-free diet, it is important that all sources of lactose be eliminated, requiring the reading of food labels to identify "hidden" sources of lactose. Generally, a 2-week trial of a strict lactose-free diet with resolution of symptoms and subsequent reintroduction of dairy foods with recurrence of symptoms can be diagnostic.¹

Many lactose containing foods are rich in calcium and Vitamin D, important nutrients for infants, thus an elimination diet should always be performed for a specified period, under strict medical supervision and preferably in consultation with a Paediatric Dietitian. Other diagnostic measures that may assist in the diagnosis of lactose intolerance:

Stool test

Stool tests are non invasive and may yield clues as to the possible cause of lactose intolerance. The challenge with stool tests revolves around collecting fresh, viable samples.

The carbohydrate content of the bowel motion can be measured. This method is rarely used as false positive and negative results are common.⁶

The stool may also be investigated for its acidity. This test measures the amount of acid in the stool. Undigested lactose fermented by colon bacteria creates lactic acid and other short-chain fatty acids that can be detected in a stool sample.³ Fecal pH will normally be lower (5.0–5.5) in infants compared with older children and adolescents because of the physiologic overload of lactose in their diets, which in turn helps to favor growth of *Lactobacillus* species in the colon.

Stools may also be analysed for the presence of parasites affecting the upper gastrointestinal tract such as *Giardia* and *Cryptosporidia* species² which may be disruptive to lactase production.

Breath Hydrogen Test

Measures the presence of hydrogen in the expired air. Hydrogen is produced when lactose is fermented in the colon and diffuses into the blood stream and is expired through the lungs. This test is simple, inexpensive and non-invasive but is not specific to lactose since any unabsorbed carbohydrates can cause hydrogen production.⁵

Antibiotic use which modify the gut flora can also affect the results. It may require the provision of an abnormally large lactose load, if this is the case it should not be performed on infants or young children due to the risk of diarrhoea and dehydration.

A small bowel biopsy

A small bowel biopsy is invasive and should be conducted following referral to a specialist.

A biopsy measures a range of disaccharides can provide specific measures of enzyme activity (including lactase).⁶

Intestinal biopsy may also uncover an underlying gastrointestinal mucosal problem that is causing the lactose malabsorption.²

However, intestinal lactase concentrations do not seem to correlate well with symptoms of lactose intolerance.²

Is lactose intolerance an allergic condition?

No, food allergy or more broadly as it is known 'Food Hypersensitivity' is an immune response whereas intolerance does not involve the immune system.

Allergies are an overreaction of the body's immune system to a normally harmless substance as if it were toxic. Such substances, known as allergens, may include certain foods, pollens, house dust, animal hair or moulds. Food intolerances describe non-immunological effects including direct pharmacologic effects of chemicals in food or metabolic defects such as lactase deficiency.

It can be hard to tell the difference between symptoms of food allergy and intolerance. Generally in sufferers with what is known as IgE mediated allergy, symptoms usually appear fairly rapidly within first consumption of the food (from immediate to less than 1 hour) and usually involve the skin or gastrointestinal system. Signs or symptoms include swelling, itching, acute hives, vomiting, diarrhoea, breathing difficulties or in severe cases anaphylaxis. However in sufferers with non-IgE mediated food hypersensitivity, symptoms may not appear until several days later.

In food intolerance reactions are generally relatively delayed (1/2 hour to 48 hours). Signs or symptoms include mild abdominal discomfort, chronic/recurrent hives, headaches, irritable bowel, excessive wind, acute or chronic diarrhoea.³ Food intolerance reactions are usually related to the amount of the food consumed. They may not occur until a certain threshold level of the food is eaten, this amount varies for each person.⁷

Management of lactose intolerance in infants and young children

Removal or reduction of lactose containing foods is advised for the management of lactose intolerance.

Fully breast fed infants

It is extremely rare that an infant is born without any ability to metabolise lactose.

Breast milk is best for babies and breast feeding during periods of lactose intolerance is advised and possible.

Symptoms of lactose intolerance occur when the lactose load or dose exceeds the bodies capacity to process or metabolise lactose. Because lactose is naturally in breast milk it is rare that an infant is completely lactose intolerant.

During periods where the lactase enzyme is reduced, for instance in cases of post gastroenteritis, smaller,

more frequent breast feeds may be advised to assist the infant manage the lactose load naturally present in breast milk.

Should the amount of breast milk provided to an infant be reduced in total during this period, breast feeding mothers may wish to express extra milk to assist in the maintenance of their breast milk supply.

Partially breast fed infants

Lactose intolerant infants who are partially breast fed and partially bottle fed may benefit from smaller more frequent breast feeds during the period of lactose intolerance in order to manage the lactose load.

Partially formula fed infants may benefit from the use of a lactose free cows' milk based formula. These formula are available under the Pharmaceutical Benefits Scheme in Australia and the Pharmac Scheme in New Zealand.

Infants who are partially breast and partially formula fed should be breast fed before the formula feed to protect the supply of breast milk. Mothers may wish to express breast milk during this period if the volume of breast milk is reduced during this period.

Formula fed infants

Formula fed infants with confirmed lactose intolerance may benefit from the use of a lactose free cows' milk based formula. These formula are available under the Pharmaceutical Benefits Scheme in Australia and the Pharmac Scheme in New Zealand.

Feeding solids to infants and young children

During periods of lactose intolerance the provision of lactose containing foods should be avoided or minimised.

Many lactose containing foods are rich in calcium and Vitamin D, important nutrients for infants, thus an elimination diet should always be performed for a specified period, under strict medical supervision and preferably in consultation with a Paediatric Dietitian.

Which foods contain lactose?

Lactose is the primary carbohydrate found exclusively in the milk of mammals including humans and cows'. It is unlikely that infants and young children will be completely lactose intolerant and thus some dairy foods with a low lactose content may be tolerated without the symptoms of lactose intolerance to ensure adequate calcium intake.

Where a strict elimination diet is necessary it may be advisable to avoid all sources of lactose.

Many lactose containing foods are rich in calcium and Vitamin D, important nutrients for infants, thus an elimination diet should always be performed for a specified period, under strict medical supervision and preferably in consultation with a Paediatric Dietitian.

Lactose content of various dairy foods⁸

The lactose content of dairy foods varies widely, as do the serving sizes consumed. The following table lists the lactose content of average serves of dairy foods.

DAIRY FOOD	SERVE	LACTOSE CONTENT (g)
Regular milk	250mL	15.8
Cheddar cheese	40g	0.04
Swiss style cheese	40g	0.04
Parmesan cheese	40g	0
Brie	40g	0.04
Ricotta cheese, low fat	40g	0.4
Cream Cheese	22g	0.6
Yoghurt (natural)	200g	9.6*
Ice Cream	50g	2.9
Butter	18g (1 tblsp)	0
Cream	20g (1 tblsp)	0

* The lactose content in yoghurt decreases each day even while it sits in the fridge because its natural bacteria use lactose for energy.

For enquiries please contact the Danone Nutricia Advisory Team

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A resource for Healthcare Professionals

BREAST MILK IS BEST FOR BABIES: Professional advice should be followed before using an infant formula. Introducing partial bottle feeding could negatively affect breast feeding. Good maternal nutrition is important for breast feeding and reversing a decision not to breast feed may be difficult. Infant formula should be used as directed. Proper use of an infant formula is important to the health of the infant. Social and financial implications should be considered when selecting a method of feeding.

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