Lactose intolerance or lactose incompatibility is a classic example of a malabsorption of disaccharides. Lactose intolerance is frequently described in case examples of metabolic disorders. It is one of the most common disorders within the population and is thus of high relevance in practical work.

Definition of Lactose Intolerance

Lactose intolerance is a digestive disorder where lactose, a type of sugar found in milk and milk products is not digested in the body.

Pathophysiology of Lactose Intolerance

Lactose intolerance is caused by a deficiency of the enzyme lactase. This enzyme cleaves the disaccharide lactose in the small intestine. Lactase is essential for the digestion of lactose since the intestine can absorb sugar molecules only in the form of monosaccharides.
Many people suffer from lactose intolerance, which is caused by a lack of lactase because the mucosal cells of the small intestine are unable to produce sufficient amounts of lactase. Lactase has a strong osmotic effect and causes diarrhea. If lactase enters the colon, it is cleaved by intestinal bacteria. This process produces gases, which leads to flatulencies.

**Note:** Lactose consists of two monosaccharides - glucose and galactose!

### Epidemiology of Lactose Intolerance

Many people worldwide suffer from lactose intolerance due to a gradual decrease in enzyme activity of lactase after breastfeeding, which can lead to primary lactose intolerance. The prevalence of lactose intolerance significantly increases from Northern to Southern Europe. About 2% of the Scandinavian population suffers from lactose intolerance, whereas 2 out of 3 people are affected in Italy.

Depending on ethnic background, 15 – 80% of the respective population groups are affected in the USA. The overall number of people suffering from lactose intolerance in the USA is estimated at 25%.
Congenital lactose intolerance is very rare in healthy infants. Very few infants are born with alactasia. They are unable to tolerate the mother’s milk, which contains lactose and develop serious diseases if not treated in time.

**Etiology of Lactose Intolerance**

Lactose intolerance can have primary and secondary causes. Primary causes are either hereditary (rare) and present from birth, or due to a continuously decreased activity of lactase after infancy. This type of lactose intolerance is called adult lactase deficiency.

Secondary types are caused by gastrointestinal diseases due to injuries of the mucosa of the small intestine. Secondary lactose intolerance can be caused, for example, by celiac disease, enteritis, IgA-deficiency or short bowel syndrome.

**Symptoms and Pathology of Lactose Intolerance**

Symptoms occur within an hour of consumption of food containing lactose.

**Complaints correlate with the amount of consumed milk products**

Lactose intolerance frequently manifests itself in childhood and adolescence; however, secondary types can occur at any age.

Undigested lactose enters the colon directly via the small intestine. Subsequently, it is fermented by bacteria, which produces gases (hydrogen and carbon dioxide) and causes the following symptoms:

- Strong spastic flatulencies
- Abdominal cramps/pain
- Bloating
- Diarrhea

Lactose has strong osmotic effects and binds water. This process results to an increased water flow from the tissue inside the colon, which causes more fluid stools and an
acceleration of the vermicular movement of the intestine. This leads to diarrhea.

Symptoms can be very mild or very severe, which might require medical help.

**Note:** A case example can, for instance, present a 19-year old girl regularly suffering from diarrhea for years especially after consuming milk products.

### Diagnosis of Lactose Intolerance

#### Recognizing the lactase deficiency

A commonly used examination for the diagnosis of lactose intolerance is the **H2-breath test**. Only little hydrogen can be detected in people with sufficient amounts of lactase.

Hydrogen is one of the gases that are formed in the bacterial fermentation process of undigested lactase in the colon. Hydrogen is re-absorbed by the intestine and transported to the lungs via the blood stream where it is then exhaled.

In cases of self-diagnosis of lactose intolerance, the affected person has the possibility of carrying out a **diet-test** or an **exposure test**; however, contrary to the hydrogen breath test, they are usually not clear.

If an affected person refrains from eating products rich in milk and no symptoms are observed during this time, one can assume lactose intolerance. A following exposition test can confirm the assumption by having the person with assumed lactose intolerance drink a glass of water containing solved lactose. After a few hours, the mentioned symptoms can be observed in the case of lactose intolerance.

**Note:** For examinations, only the H2-breath test is relevant in diagnosis.

#### Therapy of Lactose Intolerance

The most useful therapy is to refrain from consuming lactose. Every patient can test his or her own tolerance limit in this process.

Persons suffering from lactose intolerance can use food supplements such as lactase pills, which aid the digestion of lactose. However, the patient should still pay attention to lactose-free nutrition.

**Note:** Non-pasteurized yoghurt contains enough bacterial lactase and can therefore be consumed!

#### Prevention of Lactose Intolerance

A thorough repair of the intestinal flora, as well as abstaining from milk products, supports the regeneration of the **intestinal mucosa** and promotes the formation of new healthy **intestinal mucosal cells**.

People suffering from lactose intolerance should pay attention to industrially produced foods, which can contain hidden lactose. Most people tolerate small amounts of lactose e.g. medicaments containing lactose or ripe cheese.
Alternative Foods for Lactose Intolerant Patients

As calcium is a most important mineral found in milk and milk products and is equally required by the body, patients with lactose intolerance need to compensate their calcium requirement from other alternative sources like:

- Vegetables – okra, kale, green leafy vegetables
- Fish
- Calcium-fortified juices and cereals
- Calcium-fortified soya milk and other soya products
- Nuts like almonds

Complications of Lactose Intolerance

Due to the deficiency of calcium in a patient with lactose intolerance, the following complications may occur:

- Weight loss
- Malnutritional diseases like rickets and osteomalacia
- Short stature

Review Questions

The answers are below the references.

1. Which part of the intestine is affected in lactose intolerance?
   
   A. Sigmoid colon  
   B. Rectum  
   C. Small intestine  
   D. Large intestine  
   E. Transverse colon

2. Which of the following diseases frequently causes lactose intolerance?

   A. Celiac disease  
   B. Glycogenosis  
   C. Hereditary fructose intolerance  
   D. IgG-deficiency  
   E. Ulcerative colitis

References

Lactose Intolerance Among Different Ethnic Groups via nationaldairycouncil.org

Das Hammerexamen von M. Buchta, D.W. Höper, A. Sönnichsen (2. Auflage) – Urban&Fischer

Praktische Gastroenterologie von Peter Layer und Ulrich Rosien (4. Auflage) – Urban&Fischer

Correct answers: 1C, 2A

Legal Note: Unless otherwise stated, all rights reserved by Lecturio GmbH. For further legal regulations see our legal information page.