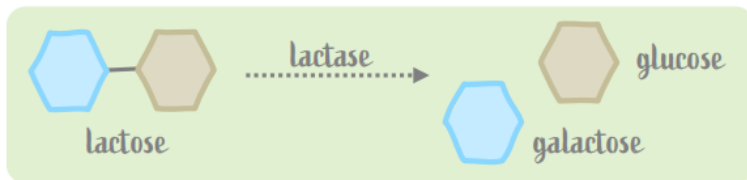


## Lactose and lactose intolerance

### What is lactose?

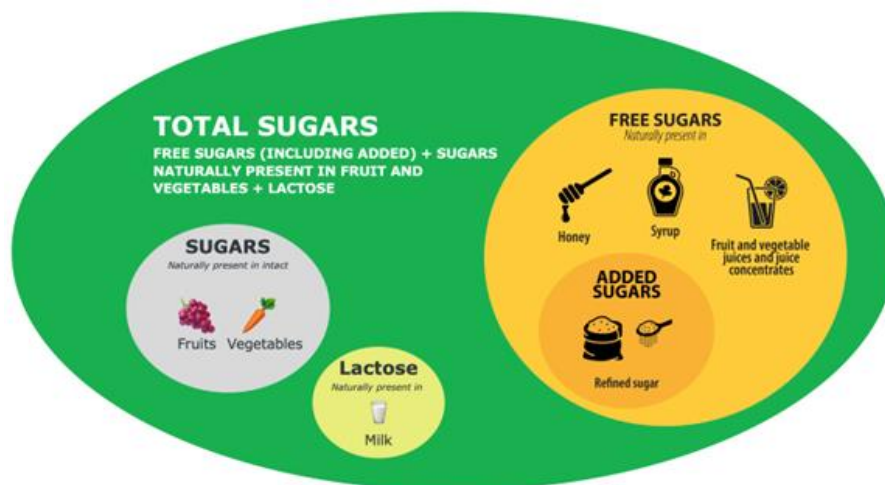
**Lactose is a sugar that is naturally present in milk** (4.7 g/100 ml in cow's milk) <sup>(1)</sup>. Ingested lactose is broken down by **lactase**, a digestive enzyme, into its two fragments: glucose and galactose which are absorbed within the small intestine. <sup>(2,3)</sup>





According to the most recent classification of dietary sugars (EFSA, 2022), **lactose belongs to 'total sugars' category but is excluded from 'free sugars' and 'added sugars' categories** (see Picture 1). EFSA considers that the intake of 'added' and 'free sugars' should be as low as possible in the context of a nutritionally adequate diet. **Contrary to added/free sugars, lactose is not considered to increase the risk of metabolic diseases.**

**Lactose is a source of energy (4 kcal/g), particularly important in infancy, when there is rapid body growth and development.** <sup>(1,4)</sup>


Picture 1. Classification of dietary sugars (made by EDA, adapted from plain language summary of EFSA, 2022)



## How much lactose is present in dairy products?

- **Hard and soft cheeses (ripened cheeses) are naturally free of lactose** <sup>(6,14)</sup> and can be consumed by people that are lactose intolerant. Bacteria ferment part of the lactose and transform it into lactic acid during the ripening process. The remaining lactose is then discharged during the straining process. <sup>(15)</sup> 
- **Yoghurts and fermented milks with live yoghurt cultures improve digestion of lactose in individuals with lactose maldigestion**, as confirmed by EFSA <sup>(18)</sup>. 
- **For people who are lactose intolerant, “lactose-reduced” or “lactose-free” milks are widely available on the market.** “Lactose-reduced” or “lactose free” milks contain the same essential nutrients such as protein, calcium, minerals and vitamins as the regular milk but without lactose. Many producers are also offering larger ranges of lactose-free dairy products such as butter, cream or yogurt <sup>(21)</sup>.

Dairy product (100g)	Average lactose content
Milk	4.7 g
Yoghurt	3.7 g
Cream	3.5 g
Butter	traces
Edam, Gouda	traces
Parmigiano Reggiano	traces



## What is lactose intolerance?

**Lactose intolerance may occur when the activity of the enzyme lactase is not enough to digest the lactose consumed.** When the undigested lactose arrives in the lower parts of the intestinal tract (terminal ileum/proximal colon), it is fermented by intestinal bacteria <sup>(1)(4)</sup>. This fermentation process may induce gastrointestinal symptoms of lactose intolerance, such as abdominal pain, bloating, diarrhoea, and flatulence <sup>(1,2,3)</sup>. However, lactose maldigestion does not always lead to symptoms of lactose intolerance.

EFSA highlights that **milk is such an important component of the diet that before recommending a “low-lactose” diet with the avoidance of milk, lactose intolerance should be formally confirmed by one of the recognised tests.** (e.g. hydrogen breath test, lactose tolerance test) <sup>7</sup>, **as well as the presence of symptoms.** In a “low-lactose” diet, regular milk can be exchanged by lactose-free milk. Beside lactose-free milk many producers offer lactose-free yogurts, lactose-free fresh cheeses or whey cheeses, or lactose-free cream <sup>(21)</sup>. It is worth noting that most ripened cheeses, are naturally low in lactose.

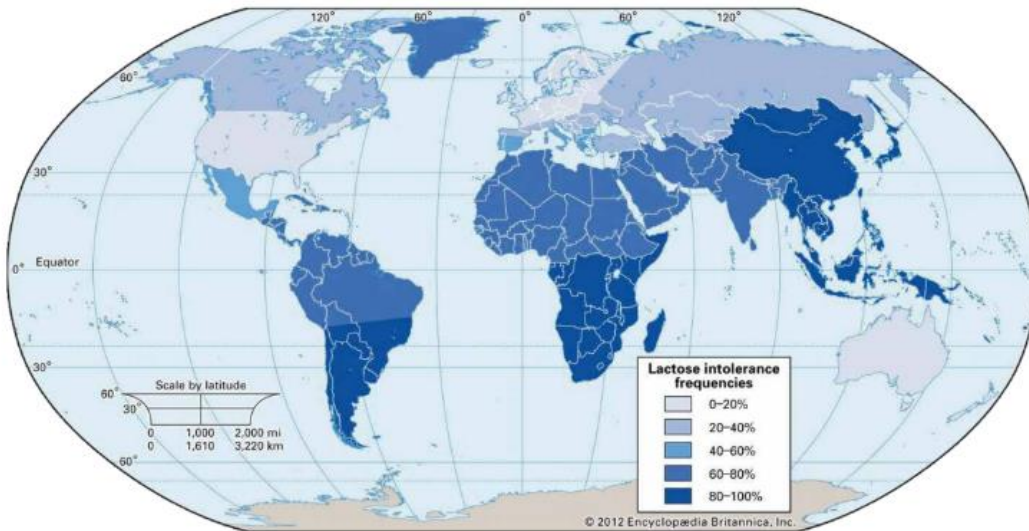
Country	Frequency of lactase deficiency <sup>(7)</sup>
Denmark	4 %
Ireland	4 %
Germany	14 %
Finland	17 %
Austria	20 %
Britain	23 %
Spain	34 %
Poland	37 %
France	38 %
Hungary	40 %
Estonia	43 %
Greece	46 %
Italy	56 %

Vast majority of people with lactose maldigestion **tolerate up to 12 g of lactose in a single dose = 1 large cup of milk 240 ml, with no/only minor symptoms.** Higher doses may even be tolerated if distributed throughout the day. <sup>(7, 23)</sup>



**Lactose tolerance varies widely amongst individuals. Due to this individual variability, setting a single threshold of lactose for all lactose intolerant people is not possible.** <sup>(7)</sup>

The frequency of lactase deficiency in the adult population in Europe varies from 4 to 56 % (see table page 2) <sup>(7)</sup>. The lactase persistence gene “travelled” with the spread of milk farming in Europe - nowadays **only around 4 to 5% of the population in Northern Europe are affected by lactase deficiency** <sup>(6)</sup>. This gene has been favoured by strong natural selection. It has been more strongly selected than skin, hair and eye pigmentation <sup>(24)</sup>. Being able to digest lactose has really served a huge advantage to humans<sup>(18)</sup>.



Lactose intolerance is rare in Europe, e.g. only around 4 to 5% of the population in Northern Europe suffers from lactose intolerance <sup>(18)</sup>

Prevalence of lactose intolerance in the world [adapted from Peters S. & Steijns J., 2018]

## Can people with lactose intolerance consume dairy products?

Depending on their tolerance levels, people with lactose intolerance can usually consume dairy products such as fresh milk, yoghurt, fermented milk and ripened cheese, in small amounts and spread out across the day, without experiencing any unpleasant symptoms. <sup>(1, 6, 8)</sup>

**Gradual consumption of milk may contribute to the increased ability to digest lactose and can reduce symptoms that are related to lactose intolerance.** <sup>(6,12,23)</sup> Recent studies have shown that people suffering from lactose intolerance can decrease the severity and frequency of their symptoms by up to 50% by consuming small amounts of lactose regularly over a period of 10 days. <sup>(8)</sup>

**It is best to consume milk after or during a meal,** instead of consuming it on an empty stomach. Milk can also be consumed with other foods (e.g. cereals) or used in food preparations (e.g. mashed potatoes) for reduced impacts on lactose intolerant people. Some studies show that milk with a higher fat content seems to be better tolerated, as it stays longer in the stomach. <sup>(14,16)</sup>

**Health authorities advise people with lactose intolerance to consume some dairy products in order to achieve the recommendations for calcium and other nutrients** <sup>(8)</sup>. For example, a small portion of cheese (30g), or two pots of yoghurt (2 x 125g) or 250ml of milk all contain about 300mg of calcium. The same amount of calcium requires 3kg of fruits or 750g of vegetables, therefore dairy presents a much more efficient option to reach the recommended intakes of nutrients. <sup>(17)</sup>

## What are the differences between lactose intolerance and cow's milk allergy?

**Milk allergy is an adverse immunological response to milk proteins, observed mainly in children.** The prevalence of cow milk allergy (CMA) in Europe is around 1 % in children and 0.5 % in adults.<sup>(11)</sup> **Lactose intolerance should not be confused with allergy to cow's milk proteins.** Contrary to CMA, lactose intolerance is not an allergic reaction and does not involve the immune system<sup>(10)</sup>, as it is not caused by proteins but by maldigestion of the milk sugar (lactose).<sup>(1)</sup> **Lactose intolerance, contrary to CMA, is not a disease.**

Lactose Intolerance		Cow's Milk Protein Allergy
Lactose (natural <b>sugar</b> in milk)	<b>Cause</b>	Cow milk <b>protein</b>
4-56 %	<b>Prevalence (EU)</b>	Around 1 % in children and 0.5 % in adults
Bloating, flatulence and abdominal pain Constipation or diarrhoea <sup>(1-3)</sup>	<b>Symptoms</b>	Gastrointestinal, dermatologic and respiratory symptoms: urticaria, angioedema, vomits, acute dermatitis and others <sup>(9)</sup>
Lactose intolerance test Hydrogen breath test Intestinal biopsies <sup>(3)</sup>	<b>Diagnosis</b>	Skin prick and blood tests for antibodies
Varying amounts of milk can still be consumed, depending on the individual's tolerance levels. Some yoghurts and fermented milks containing live starter microorganisms and ripened cheese (which contain little to no lactose) can be consumed by all lactose intolerant people	<b>Management</b>	Milk or Dairy exclusion (medical and nutritional supervision)



### What is the impact of “self-perceived” lactose intolerance?

Before recommending a “lactose-free” diet, lactose intolerance should be confirmed by a medical professional using one of the recognised testing methods (see above table). The levels of tolerance vary between lactose-intolerant people and usually allow for some dairy consumption. Indeed, a study has shown that in a sample of individuals, 12.3% perceived themselves to be lactose intolerance with no formal diagnosis<sup>(25)</sup>.

**Many people that suffer from lactose intolerance tend to unnecessarily decrease or stop their milk and dairy product consumption.**<sup>(1,7,13,14)</sup>

**Unjustified avoidance of dairy foods can lead to insufficient intakes of key nutrients<sup>(1,14)</sup> such as calcium, vitamin B2, vitamin B12 and high-quality proteins.**<sup>(14)</sup>

In cases of complete exclusion of dairy from the diet, professional nutritional advice should be sought in order to avoid deficiencies of essential minerals and vitamins, including calcium and riboflavin (vitamin B2).

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