



food intolerances and FODMAP

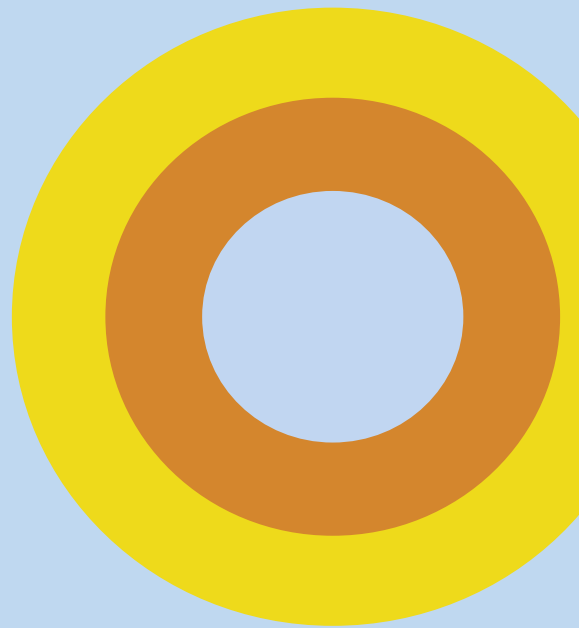
Scientific information for
health professionals

intoleran
digestive experts



food intolerances and FODMAP

Scientific information for health professionals





about Intoleran

Everyone suffers from intestinal issues from time to time. But when they persist, recur or become problematic, it's time to do something about it. Digestive problems are often caused by food intolerances and can be a real nuisance in everyday life. We don't resign ourselves to that because we believe that everyone should be able to live a fulfilling life with food intolerance.

Remko Hiemstra, the founder of our company, is lactose intolerant and saw that there was still a lot of room for improvement. For this reason, he started developing supplements based on his own experience in 2008. Our easy-to-use tablets, capsules and drops assist the body's own enzyme system to better digest problematic products. The efficacy of our supplements has been medically and scientifically substantiated. Our products are also low FODMAP Certified™ by Monash University.

We produce our supplements in our production facility in Donkerbroek, Friesland. The quality and effectiveness of the supplements are of paramount importance. We only use ingredients necessary for the supplements to work, so there are no unnecessary additives. This ensures that as many people as possible can use our products without unwanted side effects.

Our team of digestive experts and dieticians are always ready to provide you with practical advice and additional information about food intolerances and our products. We understand how unpleasant a food intolerance is and we know what you can do about it. With our information and products, you, as a healthcare professional, can better help your clients enjoy food again without unpleasant abdominal discomfort.



enjoy food again

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introduction

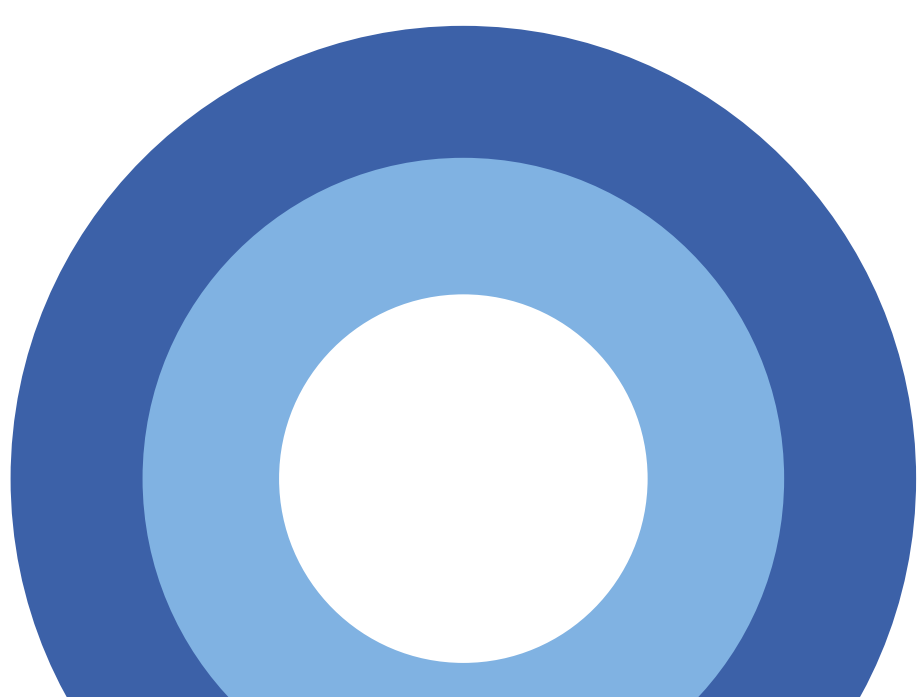

In this brochure, we would like to inform you about the different food intolerances and the corresponding dietary treatment plans based on scientific insights.

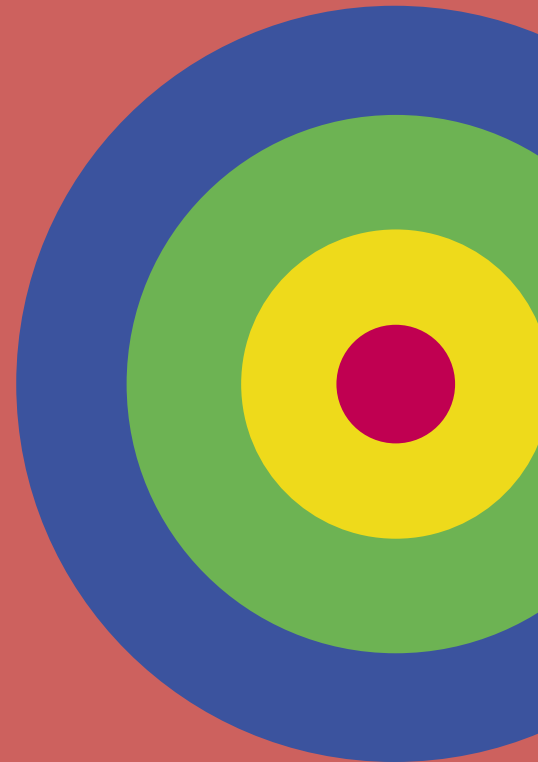
First, we will take a closer look at food intolerances in general, FODMAPs, the FODMAP diet and digestive enzymes. After this, the following intolerances are discussed:

- Lactose intolerance
- Fructose intolerance
- Fructan and galactan intolerance
- Irritable bowel syndrome

For the different intolerances, we discuss not only the physiology, diagnosis and dietary treatment but also the use of Intoleran products.

We then answer some frequently asked questions and provide general product information about our different supplements.





background information



what is a food intolerance?

A food intolerance is a hypersensitivity reaction to a food component, often a certain type of carbohydrate such as lactose or fructose. A food intolerance is a non-allergic food hypersensitivity reaction. The immune system is not involved in this reaction, as is the case with a food allergy or celiac disease. Carbohydrate intolerances, such as lactose intolerance, have become increasingly common in recent years. One of the reasons for this is the increasing consumption of carbohydrates worldwide (1).

Symptoms and complaints of carbohydrate intolerance are mainly caused by enzyme deficiencies or defects in specific transport proteins in the small intestine. However, overloading the digestive process can also lead to an insufficient breakdown of certain carbohydrates in the small intestine. Carbohydrates not absorbed by the epithelium of the small intestine attract moisture in the intestinal cavity through osmotic pressure. This process can cause osmotic diarrhoea. And if the undigested carbohydrates subsequently reach the large intestine, they are fermented by intestinal bacteria with hydrogen gas as a by-product.

These processes lead to characteristic complaints and symptoms such as abdominal pain, gas formation (abdominal bloating, flatulence), nausea, reduced intestinal motility and diarrhoea (1). A less common complaint is constipation caused by the methane gas (CH_4) released during the fermentation of carbohydrates in the colon (42). Figure 1 shows how the fermentation process in the large intestine proceeds after, for example, lactose has not been absorbed in the small intestine. The following chapters will further explain the processes behind the different food intolerances.

By far, the most common food intolerance is an intolerance to lactose, a disaccharide found mainly in dairy products. In addition to lactose intolerance, fructose intolerance and intolerance of fructan and galactan are also common. Food intolerances often manifest themselves at an early age, although they can also cause problems later in life (1).

Nutritional intolerances can be well treated with a diet (of elimination) or supplements. The treatment aims to relieve the symptoms. The risk of developing deficiencies through eliminating certain foods is a point of attention in the dietary treatment. Proper dietary advice can prevent these deficiencies.

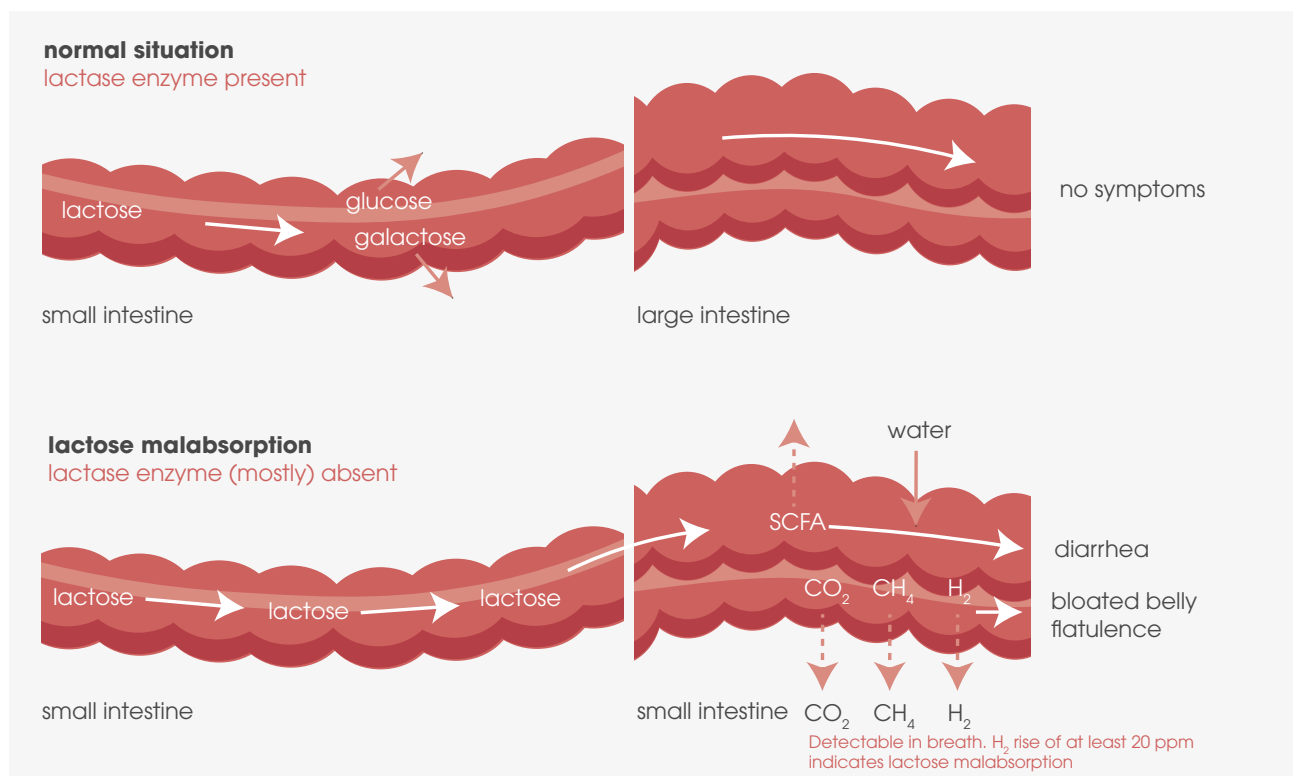


Figure 1: Physiology of lactose malabsorption



Figure 2: the different FODMAP groups and the foods in which they are found

2 what are FODMAPs?

FODMAPs are carbohydrates that are poorly absorbed or not absorbed at all in the small intestine and therefore end up in the large intestine. The term FODMAP stands for:

- Fermentable (quickly broken down by intestinal bacteria)
- Oligosaccharides
- Disaccharides
- Monosaccharides
- And
- Polyols

Saccharide is another word for sugar; a monosaccharide consists of one sugar molecule, a disaccharide of two and an oligosaccharide of three to ten sugar molecules. Saccharides include fructose, lactose, fructo- and galacto-oligosaccharides (fructans and galactans). Finally, polyols are sugar alcohols that consist of a sugar molecule to which an alcohol molecule is attached (7).

FODMAPs have three common characteristics:

1 FODMAPs are poorly absorbed in the small intestine

Molecules that are poorly absorbed in the small intestine end up in the large intestine (7).

2 FODMAPs are small osmotically active molecules

FODMAPs are small concentrated molecules. If the small intestine does not absorb them properly, the body tries to dilute them by forcing water into the gastrointestinal tract. This extra supply of water can cause diarrhoea and also affect the muscular movements of the intestines (7).

3 FODMAPs are short carbohydrate chains which are rapidly fermented by bacteria

The large intestine naturally contains many bacteria. If molecules in the small intestine are not absorbed, they end up in the large intestine. The bacteria in the colon see these molecules as 'food' and quickly break them down. This releases hydrogen, carbon, oxygen and methane gases. How quickly the molecules are fermented depends on the length of the chain. Shorter chains are fermented faster than longer ones (7).

The fermentation of molecules in the colon can cause abdominal complaints. These include a bloated feeling, diarrhoea, constipation, pain and nausea. These complaints are particularly prevalent among people with irritable bowel syndrome. People without irritable bowel syndrome can usually digest FODMAPs without difficulty (4).

Different FODMAP groups

FODMAPs include fructans, galactans, lactose, fructose and polyols. See figure 2.

Fructans are **oligosaccharides**. They consist of chains of fructose molecules with a glucose molecule at the end (7). They are found naturally in several foods, including onions, garlic, artichokes, bananas and cereals (4). No one can actually digest fructans properly in the small intestine, so they always end up in the large intestine. Normally this is not a problem, but in people with irritable bowel syndrome or other intestinal disorders, fructans can cause unpleasant complaints (7).



Galactans are also **oligosaccharides**. They consist of chains of galactose molecules with a fructose and a glucose molecule at the end (7). They are mainly found in legumes such as lentils, chickpeas and beans (6). Like fructans, no one can actually digest galactans. Normally, this does not cause any problems, but in someone with irritable bowel syndrome, galactans can cause annoying complaints (7).

Lactose (also known as milk sugar) is a **disaccharide** composed of glucose and galactose (6). Lactose is mainly found in dairy products such as milk, yoghurt, butter and cheese (1). Lactose is broken down by the enzyme lactase in the small intestine, after which it can be absorbed into the body (7).

Fructose is a **monosaccharide** molecule with six carbon atoms that occurs naturally in various foods such as fruit, vegetables and honey. Fructose is also used as a sweetener in products such as soft drinks, sweets and fruit juices. Fructose is also found together with the monosaccharide glucose in sucrose (1).

Polyols are found in many foods, such as apples, pears, watermelons, avocados, cauliflowers and mushrooms. Polyols are also found in sweeteners such as sorbitol, xylitol and mannitol.

A meal usually contains several FODMAPs. The colon, however, makes no distinction and reacts in the same way to each FODMAP. The effect of this reaction is cumulative: if you are sensitive to several FODMAPs, you often also suffer from more or heavier complaints (7).

2.1 The FODMAP diet

The FODMAP diet has been specially developed for people suffering from irritable bowel syndrome. The aim of the diet is to find out which FODMAPs cause complaints. The FODMAP diet consists of 3 different phases:

- The elimination phase
- The reintroduction phase
- The personalisation phase

The elimination phase

During the elimination phase, all FODMAPs in food (fructans, galactans, lactose and polyols) are avoided for a period of 2 to 6 weeks (43). A longer period is often not desirable because it may cause deficiencies in certain nutrients. FODMAPs are found in many foods, which makes it very difficult to follow the FODMAP diet (especially the elimination phase) (7).

The reintroduction phase

If the complaints have reduced or disappeared after 2 to 6 weeks, the FODMAP groups can be reintroduced one by one. This involves checking how much of the various groups the client can consume before complaints arise. It is important to keep track of complaints so that after testing all FODMAPs, it is clear which group(s) are causing complaints (7).

The personalisation phase

Once it is clear which FODMAPs your client reacts to, you can design a personalised diet by omitting the FODMAPs that cause severe reactions. Make sure that all the important nutrients are present in sufficient amounts. Research has shown that the FODMAP diet is effective in over 70 per cent of patients with irritable bowel syndrome and that complaints are reduced (32).

3 digestive enzymes

Digestive enzymes - with the exception of Xylose Isomerase - are produced in different parts of the body and help break down large molecules in food. Once the enzymes have broken down the larger molecules in the small intestine, the broken down molecules can pass through the intestinal wall and enter the bloodstream. Digestive enzymes work on the key-lock principle whereby an enzyme only fits one type of nutrient. For example, the enzyme lactase only fits on lactose (see figure 3).

Lactase

Lactase is produced by cells in the wall of the small intestine. The lactase breaks down lactose into glucose and galactose, both of which are then rapidly absorbed by the small intestine.

If the small intestine does not produce enough lactase, not all of the lactose is broken down. The undigested lactose attracts water from the small intestine and goes undigested to the large intestine. Once there, the undigested lactose is fermented by intestinal bacteria. This is also known as lactose malabsorption. Depending on the amount of lactose and the sensitivity of the gut, this can lead to unpleasant complaints such as diarrhoea, flatulence and bloating (2).

Alpha-galactosidase

Alpha-galactosidase is an enzyme that breaks down galacto-oligosaccharides (GOS) into smaller sugars. As no-one naturally produces sufficient alpha-galactosidase, everyone suffers from GOS malabsorption. Undigested GOS end up in the large intestine, where the intestinal bacteria ferment them. This process can lead to the formation of gas. Normally you do not notice this, but in people with irritable bowel syndrome, the extra gas can lead to flatulence, a bloated feeling and abdominal pain (2).

Xylose isomerase

The enzyme Xylose Isomerase converts fructose in the small intestine into glucose, which can be more easily absorbed by the intestinal wall. Xylose isomerase is not produced in the body, but it can be produced industrially (3).

If fructose cannot pass through the intestinal wall, it ends up in the large intestine. Here, intestinal bacteria ensure that fructose is broken down by fermentation. This fermentation process releases gases, and osmosis in the small intestine attracts moisture, which can cause bowel problems.

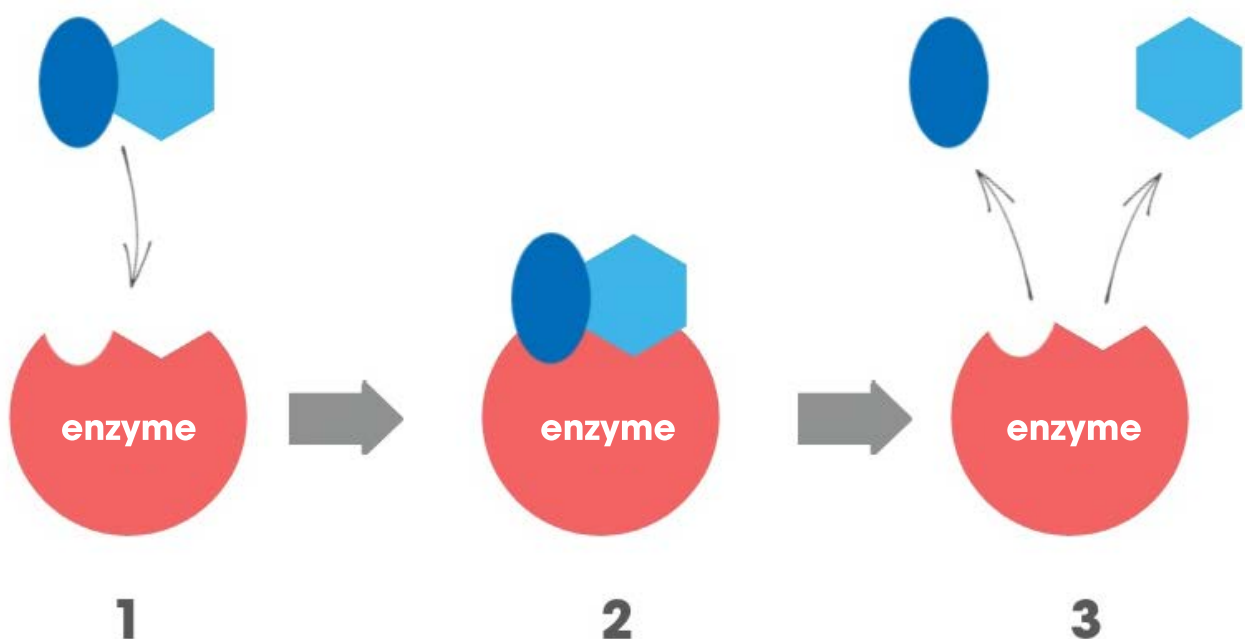


Figure 3: Key-lock principle of digestive enzymes

lactose intolerance



Lactose is a disaccharide that mainly occurs in dairy products such as milk, yoghurt and soft cheeses like young (mature) cheese, mozzarella and mascarpone. In Europe and North America, dairy products make up about 14 per cent of total food consumption. Therefore, those who cannot digest lactose properly have a significant and annoying problem.

what is a lactose intolerance?

Physiology of lactose intolerance

Lactose is normally broken down by the enzyme lactase. Lactase hydrolyses (splits) lactose into glucose and galactose in the small intestine. Lactose intolerance occurs when lactose is not broken down or is broken down insufficiently in the small intestine. Lactose intolerance often involves a shortage of the lactase enzyme (lactase deficiency) or lactose malabsorption, whereby the breakdown of lactose is impeded in some other way. For example, by a too fast passage of food through the intestines (rapid transit time). In this case, the lactase enzyme does not play a role, but the absorption of lactose is still impeded.

In both cases of lactose intolerance and lactose malabsorption, the lactose is not broken down into glucose and galactose but transported in its entirety to the large intestine. There, intestinal bacteria take care of the breakdown of lactose through fermentation. During the bacterial fermentation of lactose, hydrogen (H₂), carbon dioxide (CO₂) and methane (CH₄) are released. In addition, the undigested lactose in the small intestine increases the osmotic pressure, which attracts extra water. As a result of the bacterial fermentation and the increased osmotic pressure, unpleasant bowel

complaints may arise, such as diarrhoea, abdominal pain and gas formation in the intestines (8).

Different forms of lactose intolerance

These are the three types of lactose intolerance (1):

1. Congenital lactase deficiency
2. Primary lactose intolerance
3. Secondary lactose intolerance

Congenital lactase deficiency (CLD) is a rare and severe form of lactase deficiency in which the lactase enzyme is often completely absent from birth due to reduced enzymatic activity (5).

Primary lactose intolerance (adult-type lactase deficiency) is by far the most common type, whereby the activity of the lactase enzyme decreases with age. This process starts between the ages of two and five. Not every population group or ethnicity is equally susceptible to primary lactose intolerance. In Asia, for example, 80-100% of the population suffers from primary lactose intolerance, whereas in Europe, the figure is only 15-70% (1).

In the case of **secondary lactose intolerance**, you are initially able to digest lactose, but an external factor reduces the activity of the lactase enzyme or causes it to disappear completely. Examples include infectious diseases, a virus, an inflammation of the intestinal lining, intestinal surgery or other conditions involving the gastrointestinal tract. Secondary lactose intolerance is often reversible and temporary but can also last a lifetime. For example, if the intestinal wall is so severely damaged, insufficient capacity is left to produce the lactase enzyme (8).

diagnosing lactose intolerance

Recognising the symptoms of lactose intolerance

Although the symptoms of lactose intolerance vary from person to person, almost everyone occasionally experiences abdominal pain, bloating, constipation, diarrhoea, intestinal cramps and flatulence. Symptoms such as fatigue and nausea may also be experienced. The symptoms may occur immediately after the consumption of products containing lactose or only after a few hours. The symptom threshold - the amount of lactose that causes symptoms - varies enormously from person to person and is closely linked, among other things, to the (remaining) level of enzyme activity.

Lactose-free diet

If lactose intolerance is suspected, a lactose-free or low-lactose diet can provide some clarity. If the bowel complaints disappear after following the diet, you can assume that you have lactose intolerance. However, you must exclude the possibility that another dairy ingredient - for example, cow's milk protein or casein - is causing the symptoms.

Diagnostic tests

There are several diagnostic tests to identify lactose intolerance. The two most commonly used tests are the hydrogen breath test and the lactose tolerance test (8).

Hydrogen breath test

The hydrogen breath test is a test that measures the hydrogen content (H₂) in the breath. Sometimes the CH₄ values (methane) are also measured. The hydrogen breath test looks for lactose fermentation in the large intestine, whereby hydrogen is emitted. The client starts the test after having fasted for a period to provide a baseline measurement. The client then takes a pre-calculated amount of lactose. After the lactose is ingested, the hydrogen value is measured every 20 minutes for 2 hours. The symptoms are also analysed during this 2-hour period. If certain hydrogen threshold values are exceeded, the diagnosis of lactose intolerance can be made (1).

The disadvantage of the hydrogen breath test is that false negative test results can occur if someone does not produce hydrogen but methane gas instead and does indeed have a lactose intolerance (8). Methane is not measured in all breath tests. This is the case in about 20 per cent of people with lactose intolerance (1), so it is good to measure both the hydrogen and methane content.

Lactose tolerance test

The lactose tolerance test (LTT) is a test that allows you to measure whether lactose has been converted into glucose and galactose (8). The test works as follows: a baseline measurement is taken via a finger prick. The client must have fasted for a period prior to the test. After the baseline measurement is taken, the client takes a pre-calculated amount of lactose via a lactose-containing drink. Plasma glucose levels are then measured by finger prick every 30 minutes for 2 hours (9). If the plasma glucose level remains below a certain value (i.e. the lactose has not been broken down or has been broken down insufficiently), this indicates a lactose intolerance.

The two tests discussed above are not commonly carried out in the Netherlands. Diagnosing lactose intolerance is preferably done via a lactose-free diet or the FODMAP diet.





dietary treatment for lactose intolerance

The treatment of lactose intolerance aims to reduce or completely prevent the symptoms. Although the most obvious treatment method is to introduce a lactose-free or low-lactose diet, many other options exist.

3.1 lactose-free or low-lactose diet

After diagnosing a lactose intolerance, we first focus on getting the symptoms under control. To make the symptoms disappear, a completely lactose-free diet can be followed for at least 2 to 4 weeks. After this period, products containing lactose are gradually reintroduced in order to determine the individual symptom threshold (1). After determining the symptom threshold and thus the degree of lactose tolerance, a personal nutrition plan can be drawn up. This is adjusted to the amount of lactose a person can tolerate without developing symptoms. If the symptom threshold is very low, a completely lactose-free diet can also be chosen.

The following foodstuffs contain a relatively large amount of lactose and must, therefore, be restricted in a diet low in lactose (1):

- All types of milk
- Soft cheeses such as mozzarella, cream cheese and brie
- Other dairy products such as yoghurt, custard, quark and whipped cream
- Butter
- Products containing milk, cheese, butter or other dairy products such as cakes, biscuits, sauces, chocolate and many other processed foods.

These foods are allowed in a low lactose diet because they are relatively low in lactose or completely lactose free (1):

- Lactose-free milk such as plant milk
- Other lactose-free dairy products such as vegetable yoghurt and quark
- Vegetable butter such as halvarine
- Hard cheeses such as Gouda or Parmesan cheese and Gorgonzola.

3.2 supplements

Lactase supplementation within the dietary treatment is an effective and safe way to reduce symptoms of lactose intolerance. After taking a tablet, capsule or drop containing lactase, the lactose in the food is perfectly well tolerated (20). Both children and adults can effectively break down the lactose in their diet into glucose and galactose after ingesting lactase (15).

Enzyme preparations containing lactase counteract the production of hydrogen (H₂) by inhibiting the fermentation process in the colon. Symptoms such as abdominal bloating, flatulence, diarrhoea and constipation are thus significantly reduced, even in an uncontrolled non-lactose-free diet (15,16). Lactase supplementation replaces the body's own enzyme production, which is lagging behind or entirely absent in people with lactose intolerance (15).

Lactase supplements are preferable to a lactose-free or low-lactose diet when treating lactose intolerance (18). This is because the supplements allow you to maintain a normal and complete diet, preventing certain nutrient deficiencies (15).

Lactase supplementation also offers prospects for infants. For example, babies who are completely lactose intolerant from birth or who suffer from intestinal cramps due to the lactose in the breast milk or artificial formula. Research shows that after lactase supplementation by pre-incubation of the infant formula, there was significantly less hydrogen in the babies' breath (17). In addition, babies who received extra lactase cried significantly less, which indicates the reduction of intestinal cramps caused by lactose (18). You can give a baby extra lactase by adding lactase drops to the artificial milk or expressed breast milk, or by dropping the drops directly into the baby's mouth before feeding. Lactase supplementation enables infants to drink sufficient amounts of milk, providing them with calcium and vitamin D (17).

summary

Lactose is a disaccharide mainly found in milk and other dairy products such as yoghurt and cheese. In lactose intolerance, lactose cannot be properly broken down, so it cannot be absorbed through the wall of the small intestine. This can cause unpleasant abdominal complaints.

Lactose intolerance can be diagnosed if symptoms occur after consuming products containing lactose. Lactose intolerance can also be diagnosed by a hydrogen breath test or a lactose intolerance test.

To reduce the symptoms of lactose intolerance, a lactose-free diet can be followed, or supplements containing the lactase enzyme and probiotics can be taken.

3.2.1 Intoleran lactase products

All our lactase products come from our production lab in Donkerbroek, Friesland. The range consists of tablets, capsules and drops of various strengths. General information on recommendations for use, the duration of action and safety can be found in the chapter 'General information on supplements for food intolerances'.



lactase 2500 tablets

Our lactase 2500 tablets contain 2500 FCC of lactase. Ideal for dosing smaller quantities of lactose for people who react less strongly to lactose. Due to the small size of the tablets, they are easy to swallow and, therefore, also ideal for children.

Suggested use

Take 1-4 tablets before a meal containing lactose. A maximum of 20 tablets per day.

Composition

Besides the lactase enzyme (2500 FCC), the tablets contain a small amount of bulking agent (dextrose and cellulose) and the anti-caking agent magnesium stearate.



lactase 3000 and 10,000 capsules

You can choose between two types of lactase capsules: capsules containing 3,000 FCC lactase for people who react less strongly to lactose and capsules containing 10,000 FCC lactase for people who react relatively strongly to the lactose in their diet.

Recommended use

Take 1-3 capsules at a time just before a meal containing lactose. A maximum of 15 capsules per day.

Composition

In addition to the lactase enzyme (3000 or 10,000 FCC), the capsules contain a small amount of bulking agent (calcium carbonate). The capsule wall is made of HPMC (vegetable source).



lactase 20,000 tablets

Our lactase 20,000 tablets contain 20,000 FCC of lactase. Ideal for meals that contain a lot of lactose and for people who react very strongly to lactose.

Recommended use

Take 0.5 to 2 tablets at a time just before a lactose-containing meal. A maximum of 10 tablets per day.

Composition

Besides the lactase enzyme (20000 FCC), the tablets contain a small amount of bulking agent (cellulose) and the anti-caking agent magnesium stearate and silica.



lactase drops

Our lactase drops contain liquid lactase enzyme with which you can make your own (sweet) liquid dairy products lactose-free. Such as milk, chocolate milk, whipped cream, cooking cream and mascarpone. By adding the lactase drops to these dairy products, you can cook and bake lactose-free.

Recommended use

To get a low-lactose product, add 5 drops to 1 litre of milk or other liquid dairy product. Stir well and leave in the fridge for 24 hours. At least 80 per cent of the lactose will have been broken down by this time. Add more drops for a higher rate of conversion. Do you want to use the product immediately without waiting? Then add 5-10 drops per 120 ml of milk product. Unfortunately, the drops are not acid-resistant, so you cannot use them in acidic dairy products such as yoghurt and buttermilk. In figure 4, you will find a handy overview with the number of drops per dairy product.

You can also use the drops to make infant food such as formula or pumped breast milk low in lactose. We rec-

ommend 1 drop per 50 ml of formula or breast milk. After adding the drops, you can give the food directly to your baby. You can also put the drops in your baby's mouth and then bottle feed or breastfeed them.

Composition

The lactase drops consist of liquid lactase (750 NLU per 5 drops), glycerol and water.

lactase drops

In which products do you use it?

product	per	drops
✓ milk	liter	5
✓ chocolate milk	liter	5
✓ coffee cream	250 ml	5
✓ vla	liter	10
✓ cream,	250 ml	5
✓ cooking cream,	250 ml	5
✓ condensed milk,	250 ml	5
✓ mascarpone,	250 ml	10
✓ cream cheese	250 ml	10

Unfortunately, the drops are not resistant to an acidic environment and are therefore not suitable for making sour milk products such as yoghurt and cottage cheese lactose-free.

Figure 4: Overview of lactase drops in different dairy products

summary

Lactase supplements such as tablets and capsules in various dosages are effective in reducing the symptoms of lactose intolerance.

Lactase drops can be used to make dairy products such as milk and cream lactose-free.

Lactase drops can also help in cases of children and infants with a lactose intolerance.

3.2.2 Probiotics for lactose intolerance

Probiotics are micro-organisms with potential health benefits, such as curing diarrhoea after a course of

antibiotics and reducing symptoms of irritable bowel syndrome (21). Probiotics, therefore, have a generally positive effect on (gut) health. In addition, probiotics can support disorders related to the gastrointestinal tract, such as lactose intolerance (26). The use of probiotics in lactose intolerance has been shown to be effective in reducing or eliminating symptoms (24,26,30). Several probiotic strains are commonly used; these include *Lactobacillus* sp., *Bifidobacterium* sp, *Streptococcus thermophilus* and *Saccharomyces boulardii* (21). Probiotic effects are strain-specific. For example, the strain *Streptococcus thermophilus* can promote lactose digestion in people with lactose intolerance (22).

Probiotics with lactase-producing properties

Lactic acid bacteria such as *Lactobacillus* and *Streptococcus* reduce symptoms of lactose intolerance because they produce the lactase enzyme and can release it into the intestines (27,28). The *Streptococcus thermophilus* strain is specifically known for its lactase-producing property (29). The probiotics with lactase-producing properties release a lactase enzyme of bacterial origin to the jejunum, the intermediate part of the small intestine where the digestion of lactose takes place. The *S. Boulardii* strain of bacteria also increases lactase activity throughout the small intestine. Finally, the strain *Lactobacillus rhamnosus* also has a lactase-producing property (25).

Reduced hydrogen (H₂) production

Certain strains of bacteria, such as *Bifidobacteria* and lactic acid bacteria, can ferment lactose without producing hydrogen in the process (24). Strains such as *Lactobacillus*, *Streptococcus thermophilus* and *Bifidobacteria* promote the digestion of lactose and simultaneously reduce hydrogen production (25, 27). Reduced hydrogen production in the intestines results in less gas formation and, thus, a reduction in the symptoms of lactose intolerance.

Safety

Scientific studies show that the use of probiotics is completely safe. Strains such as *Lactobacillus* have been used successfully in the food industry for many years (23). Side effects of probiotics are rare, and there are no known interactions with medications (21,26).

Usage

Typical daily doses range from 5 to 20 million CFU (colony forming units). An average dose contains 10 CFU (colony forming units) per capsule, which provides sufficient effectiveness (21). When you stop taking probiotics in supplement form, the strains will completely disappear from your intestines within a short period of time. However, the body's own functional enzyme activity will remain unchanged (25).

once-a-day capsules

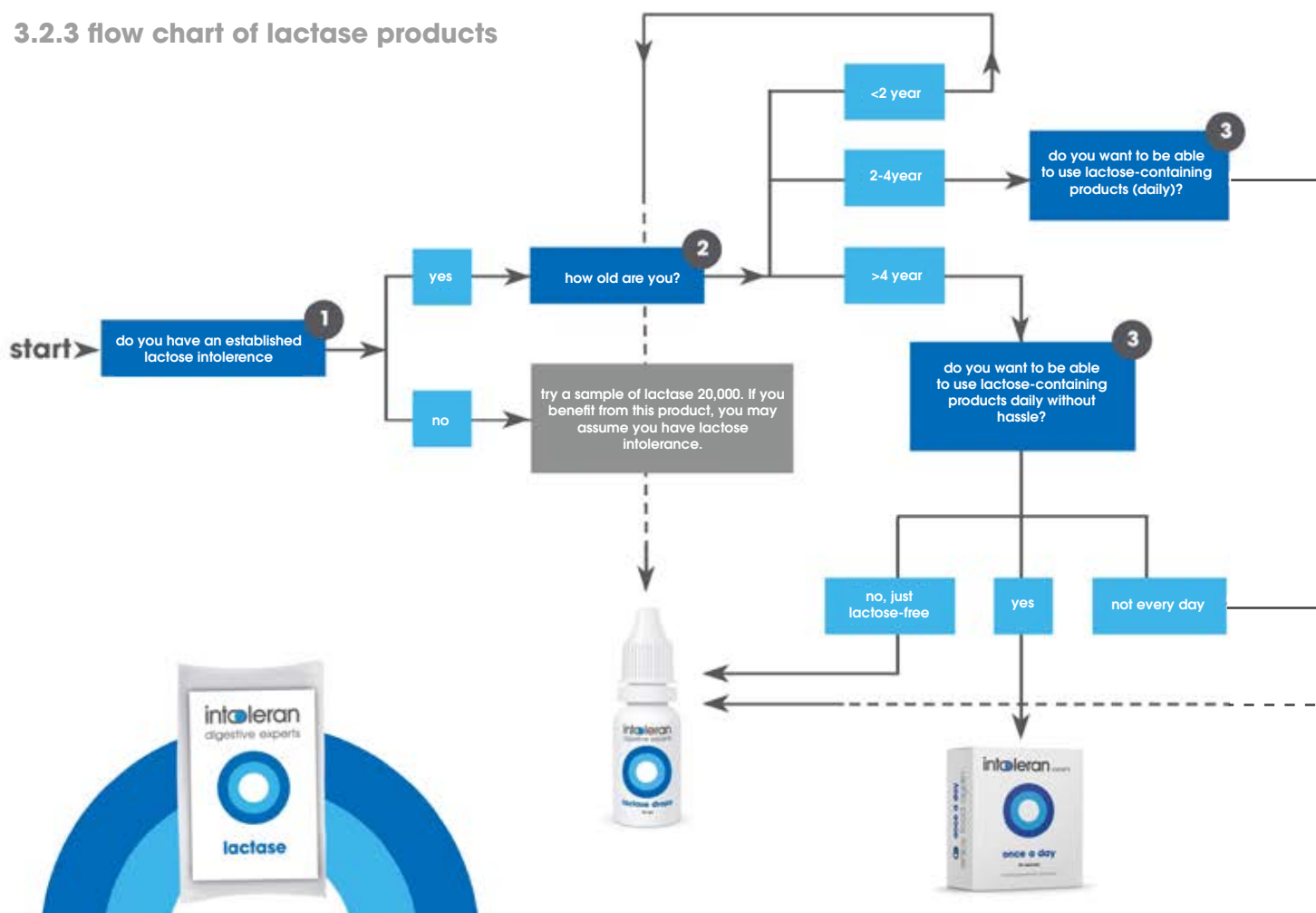
Our once-a-day capsules contain a combination of 6 specially selected lactic acid ferments (lactic acid bacteria) with strains such as Lactobacillus, Bacillus and Streptococcus. The strains all have lactase-producing properties. Some strains have the additional property of reducing hydrogen production or improving lactose absorption. Because you only need to take one capsule a day, this product is the easiest solution for people with lactose intolerance. Suitable for daily and long-term use. And convenient during holidays and for children because you only have to take them once daily.



Recommended use

The once-a-day capsules should only be taken once daily, preferably at a fixed time. The capsules are suitable for children aged 4 and over. Because probiotics need some time to build up and take effect, the once-a-day capsules will not have their full effect until 5-14 days after the first use. The beneficial effects remain as long as you take a capsule every day. When you stop taking them, the probiotic strains will completely disappeared from your intestines within a few days, along with the beneficial effects.

3.2.3 flow chart of lactase products



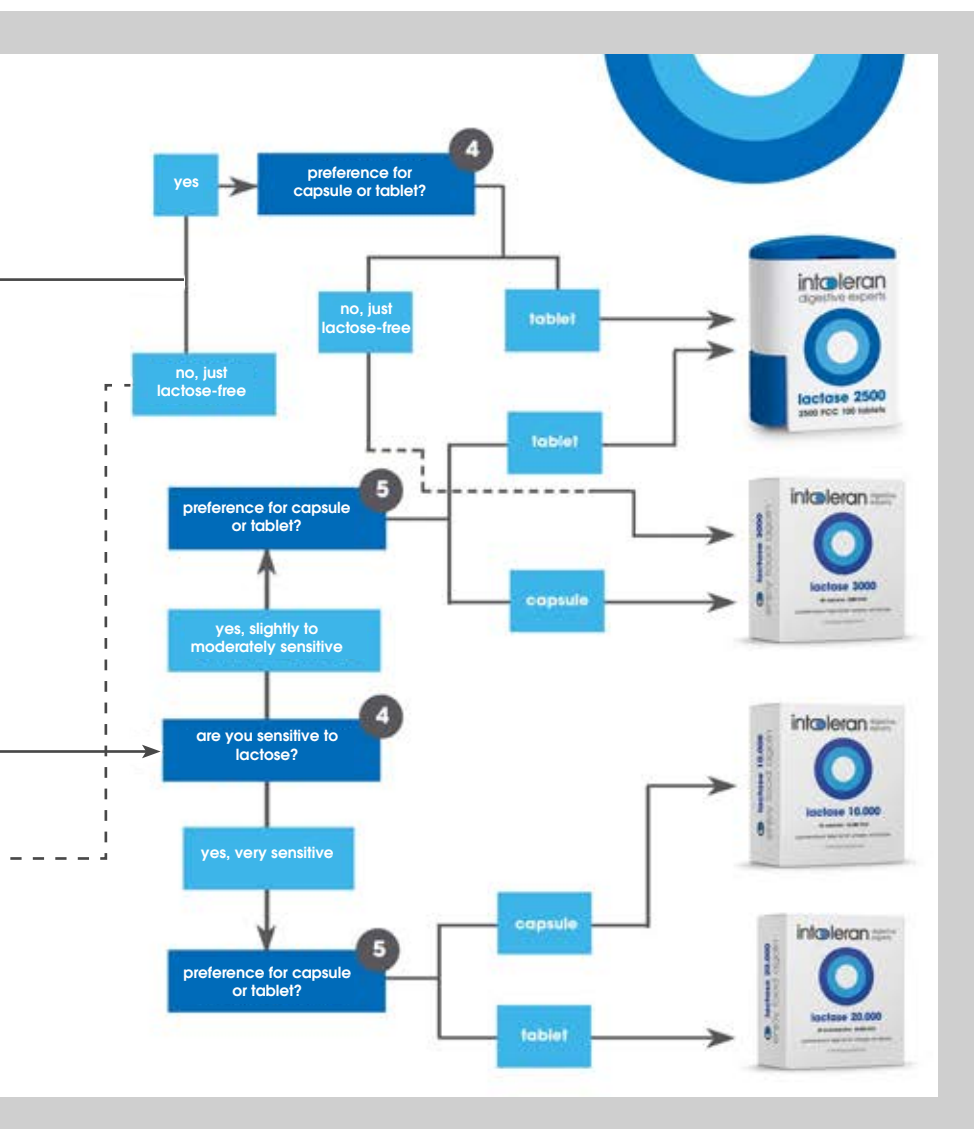
Degree of effectiveness

When taking the once-a-day capsules, most people will be able to digest all lactose-containing products without any problems or complaints. People with a high sensitivity to lactose will be able to use a lactase capsule or tablet as extra support with a lactose-rich meal.

Unfortunately, there is a small group of lactose-intolerant people for whom the probiotic strains do not work. It is often not clear why. If there is still no visible progress after 2 to 4 weeks, you may assume that the once-a-day capsules are not working. It also happens that the effect of the once-a-day capsules can suddenly diminish, for example due to illness or after a course of antibiotics. In this case, stop taking them temporarily and try again after a few weeks.

Composition

The once-a-day capsules consist of a blend of 6 lactic acid bacteria (10 billion CFU per capsule): *Bacillus coagulans*, *Bacillus subtilis*, *Bifidobacterium animalis lactis*, *Lactobacillus casei*, *Lactobacillus rhamnosus* and *Streptococcus thermophilus*. The capsule is made of HPMC and contains ascorbic acid (antioxidant) and acacia gum as a binder.



summary

Taking probiotics is a good way to reduce or completely prevent symptoms of lactose intolerance. Our once-a-day supplement contains a combination of 6 specially selected lactic acid ferments and helps to digest lactose in the intestines without any symptoms. Our once-a-day probiotic supplement is the easiest solution to lactose intolerance: you only need one capsule a day. Once-a-day is ideal for children and holidays but is also suitable for long-term use.

fructose intolerance



Fructose is a monosaccharide that occurs naturally in various foods such as fruit, vegetables and honey. Fructose is also used as a sweetener in products such as soft drinks, sweets and fruit juices(1). Fructose is consumed in three forms: first as a monosaccharide, second with the monosaccharide glucose in sucrose, and finally in a polymerised form in oligosaccharides and polysaccharides. Daily consumption of fructose varies worldwide and is highly dependent on dietary habits and the use of fructose as a sweetener (10). If fructose cannot be properly digested in the small intestine, it can cause unpleasant symptoms.

1 what is a fructose intolerance?

Fructose is normally absorbed into the blood via the intestinal wall using the GLUT-5 transporter. The capacity of GLUT-5 is limited and varies from person to person (19). This GLUT-5 transporter does not work or works less well in people with fructose intolerance. Fructose can also pass through the intestinal wall together with glucose. In this case, the fructose attaches to the glucose that

can pass through the intestinal wall with the help of the GLUT-2 transporter. If there is as much fructose as glucose in the small intestine, fructose can, therefore, be properly digested, even if a person is fructose intolerant (4). If there is more fructose than glucose in the small intestine, part of the fructose cannot pass through the intestinal wall of someone with fructose intolerance. This part ends up in the large intestine, where intestinal bacteria break down the fructose by fermentation. This fermentation process releases gases and attracts fluid, which can cause bowel complaints such as abdominal pain, bloating and flatulence.

Malabsorption of fructose, as described above, is the most common form of fructose intolerance. There is also a hereditary disorder of fructose metabolism called hereditary fructose intolerance (HFI). HFI is a rare metabolic disease of fructose metabolism that can lead to life-threatening high blood glucose levels (hyperglycaemia) and liver failure after fructose consumption (44). In the following chapters, we only discuss the malabsorption of fructose and do not consider HFI.

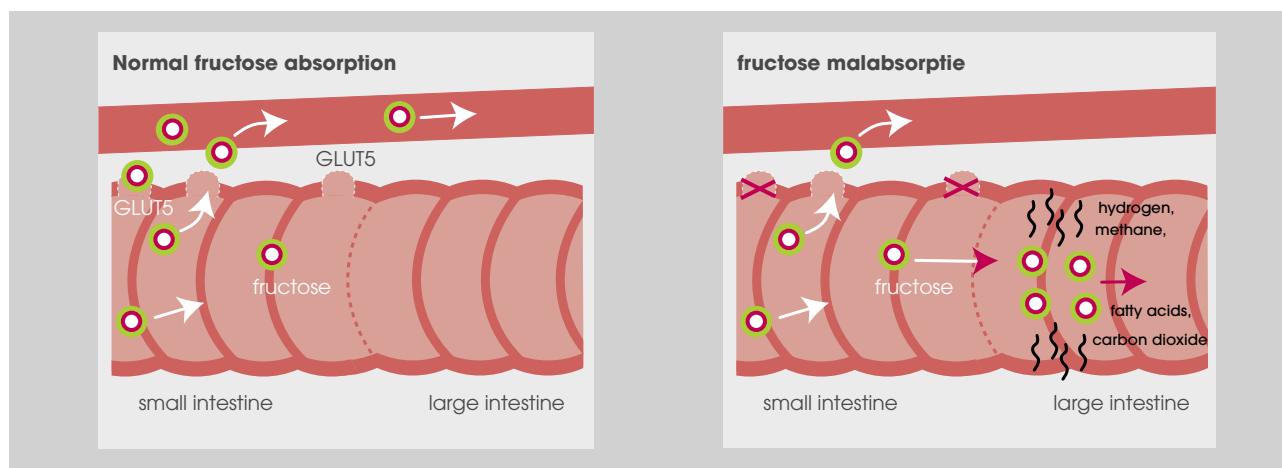


Figure 5: physiology of fructose malabsorption

2 diagnosis of fructose intolerance

Recognizing symptoms in fructose intolerance

Although the symptoms of fructose intolerance may vary considerably from person to person, they almost always include bowel complaints such as abdominal pain, diarrhoea and bloating. Nausea can also occur (1). The symptoms often occur after consuming products containing fructose. Both immediately afterwards and after a few hours. The amount of fructose that a person can digest before symptoms arise, the so-called complaint threshold, varies from person to person and is related to enzyme activity.

Symptoms of fructose intolerance are very similar to

symptoms of other intolerances and disorders. It is, therefore, difficult to diagnose fructose intolerance based on the symptoms alone. Additional diagnostic tests are usually required.

Hydrogen breath test

One of the ways of diagnosing fructose intolerance is the hydrogen breath test, in which the hydrogen content in the breath is measured. This test is also used to diagnose lactose intolerance, although the approach differs (see p.13 under the heading diagnosing lactose intolerance). The test involves dissolving 25 grams of fructose in water to produce a 10 per cent fructose solution. The client drinks this solution, after which a breath sample is

taken every 30 minutes for 3 hours. A certain rise or fall in the hydrogen and/or methane content of the breath is the basis for the diagnosis of fructose intolerance (11).

One problem with this test is that the symptoms are not always included in the diagnosis. This problem arises when the symptoms appear with some delay and do not manifest themselves until after the test. Some doctors do not include these symptoms in their diagnosis and, therefore, exclude a fructose intolerance. Also, the patient may experience symptoms during the test while no increase in the hydrogen value is visible(11), which sometimes leads to an incorrect diagnosis.

A breath test cannot determine the degree (mild or severe) of fructose intolerance, which requires additional testing. The hydrogen breath test is certainly not perfect, but it is currently one of the best ways of diagnosing fructose intolerance (11). However, this test is little used in

the Netherlands, and we mainly employ the method of a low-fructose diet and the FODMAP diet.

Low fructose diet

When a fructose intolerance is suspected, a diet low in fructose can be followed temporarily to see if the symptoms disappear. It is not necessary to follow a completely fructose-free diet as long as there is a 1:1 ratio of fructose to glucose. This 1:1 ratio enables fructose to hitchhike with glucose and thus be absorbed through the intestinal wall (45). Therefore, if there is (approximately) the same amount of fructose as glucose present in the intestines, the symptoms will be absent.

If the bowel complaints that previously occurred after eating food containing fructose have disappeared after the low-fructose diet, you can assume that you have fructose intolerance. A diet low in fructose can also be part of the FODMAP diet.



3 dietary treatment after diagnosing fructose intolerance

Once you have been diagnosed with fructose intolerance, it is vital to use the correct dietary treatment to prevent symptoms as much as possible. A low-fructose diet plays an essential role in this. It is also advisable to inform patients with fructose intolerance about a balanced intake of fructose and glucose. In addition to a diet low in fructose, food supplements containing the enzyme Xylose Isomerase, possibly in combination with the diet, can help to reduce symptoms. With these adjustments, intolerance symptoms are reduced in 60-90% of people with fructose intolerance (1).

3.1 dietary advice

It is important not to consume more than 10 grams of fructose a day in a low-fructose diet. Fructose can be found in various kinds of fruit and vegetables and honey. Fructose is also added to many products as a sweetener (1). It is also important to avoid free fructose (excess fructose in the gut) and to have a 1:1 ratio of fructose to glucose.

Foods that should be limited within a low-fructose diet because they are relatively high in fructose include (1):

- Fruit such as apples, pears and cherries
- Dried fruit such as sultanas and dates
- Vegetables such as broccoli, carrots, cauliflowers and tomatoes
- Corn
- Honey
- Soft drinks
- Sweets

- Desserts sweetened with fructose
- Fruit juices such as apple and pear juice
- Sauces such as ketchup, barbecue sauce, syrup and chutney

Foods that are allowed in a fructose free diet because they contain little or no fructose include (1):

- Vegetables such as celery, cucumber, lettuce, pumpkin, spinach and courgette
- All meat, fish and poultry
- Dairy products

Foods with a 1:1 ratio of fructose to glucose or more glucose than fructose (45):

- Stoned fruit such as apricots, nectarines, peaches and prunes
- Berries such as blueberries, blackcurrants and cranberries
- Citrus fruit such as grapefruit, lime, lemon, mandarin and orange
- Other fruits such as ripe bananas, kiwis, pineapples, passion fruit, raspberries and strawberries.

3.2 supplements

In addition to a diet low in fructose, supplements containing the enzyme Xylose Isomerase can help reduce the symptoms of fructose intolerance (1, 3). Xylose Isomerase converts fructose into glucose, which can be absorbed more easily via the small intestine than fructose.

Food supplements containing Xylose Isomerase reduce hydrogen excretion (measured by the hydrogen breath



summary

Fructose is a monosaccharide found in various foods such as fruit, vegetables, honey, soft drinks, fruit juices and sweets.

In fructose intolerance, fructose cannot be properly absorbed by the intestinal wall, which can cause unpleasant abdominal complaints.

A fructose intolerance can be diagnosed if symptoms occur after consuming food containing fructose (within the FODMAP diet) or via a hydrogen breath test.

To reduce the symptoms of fructose intolerance, a fructose-free diet or supplements containing the enzyme Xylose Isomerase may be taken.



test) (3). This is a sign that fructose is being better digested, and symptoms such as bloating, abdominal pain and flatulence will decrease. Xylose Isomerase has a low affinity (activity per unit); therefore, there must be a significant amount (units) of enzyme in the supplements (19). Supplements do not eliminate the cause, but they help to reduce the symptoms and complaints of fructose intolerance.

3.2.1 Intoleran fructose

The Intoleran fructose supplement contains 7500 units of Xylose Isomerase per capsule. The supplement is produced in our production lab in Donkerbroek, Friesland. General information on recommendations for use, the duration of action and safety can be found in the chapter 'General information on supplements for food intolerances'.

Recommended use

Take 1-3 capsules at a time just before a meal containing fructose. A maximum of 15 capsules per day.

Composition

The fructose capsules contain the Xylose Isomerase enzyme (7500 units per capsule) as well as a little bulking agent (calcium carbonate). The capsule itself is made of HPMC.

summary

Xylose Isomerase enzyme can help reduce the symptoms of fructose intolerance

Intoleran has a supplement with Xylose Isomerase enzyme: fructose

Fructose is suitable for children from 2 years of age

fructan and galactan intolerance



Fructans are oligosaccharides, chains of fructose molecules with a glucose molecule at the end (7). They occur naturally in various foods such as onions, garlic, artichokes, bananas and cereals (4). Galactans are also oligosaccharides. They consist of a chain of galactose molecules with a fructose and glucose molecule at the end (7). They are mainly found in legumes such as lentils, chickpeas and beans (4). When fructans and galactans are not properly digested in the small intestine, it can cause unpleasant symptoms.

what is a fructan and galactan intolerance?

Fructans and galactans are oligosaccharides that the human body can only break down to a limited extent in the small intestine. Of all the fructans consumed, about only 5 to 15 per cent are absorbed in the small intestine. This is because there is no enzyme in the body to split or break down oligosaccharides (7, 11). In fact, no one can digest fructans and galactans properly, but some people experience more complaints than others (7). Since fructans and galactans are not absorbed by the small intestine, they end up in the large intestine. Here, intestinal bacteria ensure that they are broken down by fermentation. This fermentation process releases gases and attracts moisture (11).

diagnosing fructan and galactan intolerance

Recognising symptoms

Although the symptoms of fructan and galactan intolerance can vary significantly from person to person, the most common symptoms are abdominal pain, bloating, constipation, diarrhoea, intestinal cramps and flatulence. These symptoms often occur immediately after consumption of products containing fructans and/or galactans, but may also occur several hours later. The threshold of symptoms, the amount of fructans and/or galactans a person can digest before symptoms occur, varies from person to person and is related to enzyme activity.

Symptoms of fructan and galactan intolerance are very similar to those that may occur with other intolerances and disorders. Therefore, it is difficult to make a diagnosis based on the symptoms alone. Fortunately, there are several ways to diagnose fructan and galactan intolerance.

A diet low in fructans and galactans

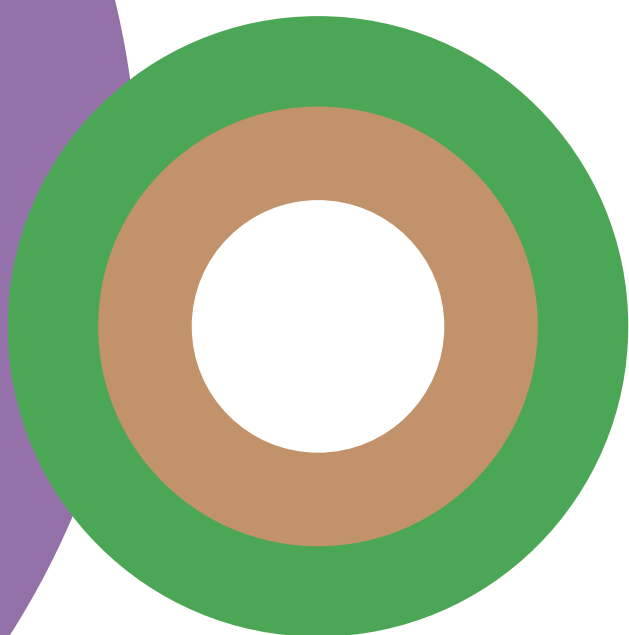
If fructans and galactans are suspected, a diet low in fructans and galactans can be followed temporarily. If the bowel complaints that previously occurred after eating foods containing fructans and galactans disappear, you may assume that you have a fructan and galactan intolerance. A diet free of fructans and galactans can also be part of the FODMAP diet (32).

Hydrogen breath test

There is currently no standardised test for diagnosing fructan and galactan intolerance. The hydrogen breath test could be a solution, but there have not been enough studies to date to make a definite diagnosis (11, 12). In addition, no one can digest fructans and galactans properly, which probably means that everyone will have certain hydrogen concentrations measured in their breath. This makes it difficult to diagnose fructan and galactan intolerance with a hydrogen breath test anyway (32).

Gluten intolerance and fructans

Many products containing gluten also contain fructans. Examples include cereal products made from wheat. Since gluten intolerance (not celiac disease) causes similar symptoms to fructans intolerance, there is a risk of misdiagnosis (46).





dietary treatment for fructan and/or galactan intolerance

Once fructan and galactan intolerance has been diagnosed, it is vital to use the correct dietary treatment to prevent symptoms as much as possible. This can be achieved through dietary advice and supplements.

3.1 dietary advice

There is no clear dietary treatment guideline for fructan intolerance yet because not enough research has been done. However, it is clear that identifying and eliminating problematic foods containing fructans is essential. Restricting the intake of fructan-containing foods may reduce symptoms (11).

Foods that should be restricted within a fructan-low diet because they are relatively high in fructans (11):

- Wheat-containing products such as bread, pasta and couscous
- Onions and garlic
- Vegetables such as sprouts, broccoli and artichoke
- Cabbage

Foods that are allowed in a low-fructan diet because they contain relatively few fructans or none at all (11):

- Fruits such as oranges, strawberries, limes, lemons, cantaloupe melons

Foods that should be restricted within a low galactan diet because they are relatively high in galactans (11):

- Soya-containing products such as soya milk, soya yoghurt and vegetarian burgers
- Legumes such as lentils, chickpeas and beans
- Hummus
- Large amounts of coffee

Foods that are allowed within a galactan-poor diet, because they are relatively low in galactans or contain no galactans at all (11):

- Vegetables such as carrots, tomatoes, spinach, lettuce and cucumbers

3.2 supplements

In addition to following a diet low in fructans and galactans, supplements with the enzyme alpha-galactosidase may also help reduce symptoms of fructan and galactan intolerance. Alpha galactosidase is an enzyme that can break down oligosaccharides into smaller molecules that can easily pass through the intestinal wall (2). This prevents the fructans and galactans from entering the colon and prevents unpleasant abdominal complaints. Supplements do not eliminate the cause, but they do help to reduce the symptoms and complaints.

Much research has been done into the use and safety of Alpha Galactosidase, for example, by the American brand Beano. In 1994, they demonstrated, among other things, that Alpha Galactosidase is safe and can reduce abdominal complaints such as flatulence (33). This also applies to children and young adults. Research has also shown that Alpha Galactosidase is effective in reducing abdominal complaints such as bloating and flatulence in children between the ages of 4 and 17 (31).

summary

Fructans and galactans are oligosaccharides found in foods such as garlic, onions, legumes and beans.

In the case of fructan and galactan intolerance, fructans and galactans are not properly absorbed through the digestive tract. This can lead to unpleasant abdominal complaints.

A fructan and galactan intolerance can be diagnosed if symptoms occur after eating food containing fructans and galactans (within the FODMAP diet).

To reduce the symptoms of fructans and galactans intolerance, a diet free of fructans and galactans can be followed. Supplements with the enzyme alpha-galactosidase may also reduce symptoms.

3.2.1 Intoleran fibractase

At Intoleran, we have developed two supplements with the alpha-galactosidase enzyme: fibractase and fibractase forte. They are produced in our lab in Donkerbroek, Friesland. General information on recommendations for use, the duration of action and safety can be found in the chapter 'General information on supplements for food intolerances'.





fibractase

Fibractase capsules contain 600 units of Alpha Galactosidase per capsule. This low dosage is ideal for people who react less strongly to fructans and/or galactans.

Recommended use

Take 1-3 capsules before a meal containing fructans and/or galactans. A maximum of 15 capsules per day.

Composition

The capsules contain the Alpha Galactosidase enzyme (600 units per capsule), and also contain a small amount of bulking agent (calcium carbonate). The capsule itself is made of HPMC.

fibractase forte

Fibractase forte capsules contain 1200 units of Alpha Galactosidase per capsule and are our highest-dosed Alpha Galactosidase capsules. Ideal for people who react strongly to fructans and/or galactans or before a meal rich in fructans and/or galactans.

Recommended use

Take 1-3 capsules before a meal containing fructans and/or galactans. A maximum of 15 capsules per day.

Composition

The capsules contain the Alpha Galactosidase enzyme (1200 units per capsule), and also contain a small amount of bulking agent (calcium carbonate). The capsule itself is made of HPMC.



choosing fibractase or fibractase forte?

We recommend starting with the highest dosage and then reducing it if necessary. That allows you to see clearly whether the product works or not. If you start with a lower dosage and there is no improvement, you don't know whether it is because of the low dosage or because the product doesn't work.

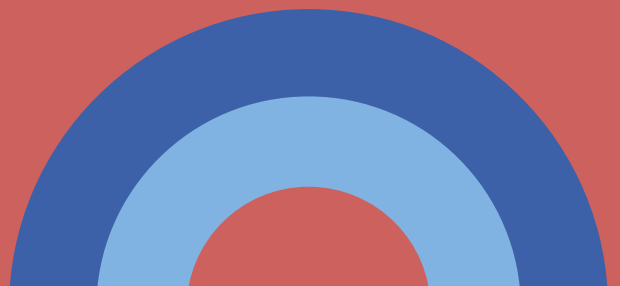
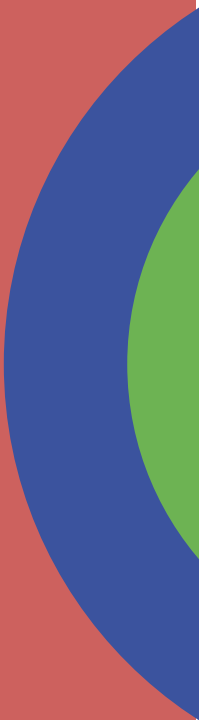
summary

The Alpha Galactosidase enzyme can help reduce the symptoms of fructan and galactan intolerance. Intoleran has two different supplements with the enzyme Alpha Galactosidase: fibractase and fibractase forte.

Advice: start with fibractase forte and then later reduce it if necessary.

Fibractase and fibractase forte are suitable for children from 2 years of age.

irritable bowel syndrome



1 what is irritable bowel syndrome (IBS)?

Irritable bowel syndrome (IBS) is a disruption in the function of the gastrointestinal tract. It is a chronic disorder affecting a large part of the population worldwide. In the Netherlands, about 10 to 15 per cent of the population has IBS. IBS is characterised by recurring abdominal pain and abdominal complaints, such as diarrhoea or constipation. These symptoms are caused by the intestine making too many or too few movements (34, 36, 39).

Based on the predominant stool pattern, we can classify PDS into 4 major subtypes: IBS with constipation (IBS-C), IBS with diarrhoea (IBS-D), IBS with mixed bowel habits (IBS-M) and unclassified IBS (38, 41).

The cause of IBS is not yet known, and is still the subject of much research. However, it is clear that, among other things, a low-fibre diet, an irregular lifestyle, too little physical activity, stress, genetic factors, intestinal infections and the imbalance of bacteria in the large intestine can play a role in the occurrence of IBS and in the worsening of the symptoms (39, 7).

2 diagnosing IBS

Recognising symptoms of irritable bowel syndrome

The symptoms of IBS often appear during adolescence (41). Although they may vary greatly from person to person, there are several symptoms that can identify IBS: abdominal pain, abdominal cramps, difficulty in defecating, bloating and flatulence. In addition, digestive symptoms such as acid regurgitation, heartburn and nausea are common. However, non-gastrointestinal conditions such as pelvic pain, weight disorders and chronic fatigue may also occur. Finally, IBS can also cause psychological symptoms such as anxiety and depression (41).

Because the symptoms of IBS are so varied and because they are so similar to symptoms of other intolerances and disorders, it can be difficult to make a diagnosis of IBS. Fortunately, a diagnostic tool has been developed.

Rome IV criteria

You can diagnose IBS with the help of the Rome criteria. The most recent version of this guideline (Rome IV criteria) was released in May 2016. It is expected to be updated in 2026 (37, 38).

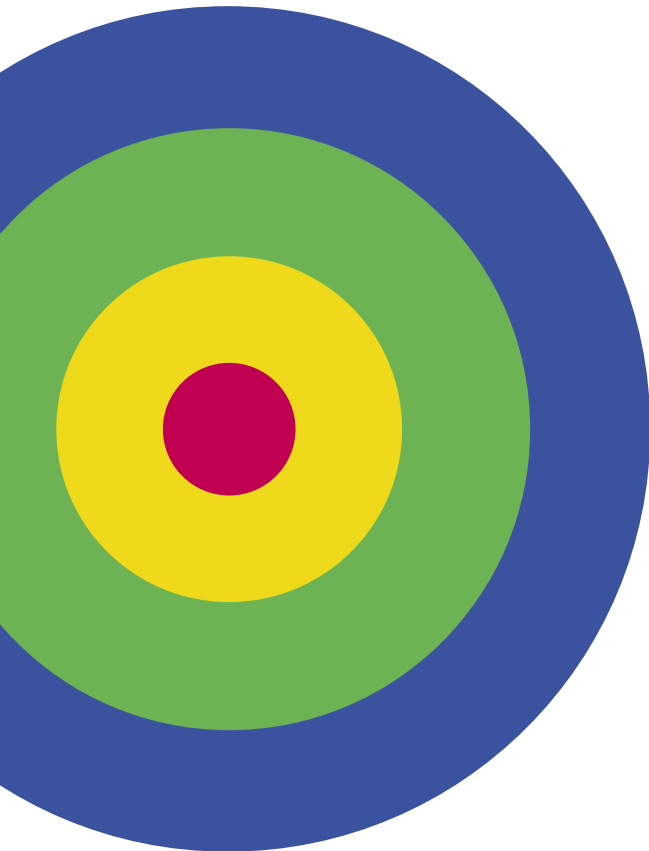
The Rome criteria were developed by the Rome Foundation. This organisation supports activities aimed at gathering scientific information on, for example, IBS to facilitate its diagnosis and treatment. Scientists from all over the world have participated in these studies (40).

There are no biological markers to diagnose IBS. It is a pattern of symptoms that structural biochemical or anatomical abnormalities cannot explain, nor can it be explained by other gastrointestinal diseases. Only after ruling out pathological abnormalities of all abdominal organs can the diagnosis of IBS be made (39).

These are the Rome IV criteria (38):

- The symptoms must have been present for more than 6 months.
- The patient must have had abdominal pain averaging at least 1 day a week for the past 3 months.
- The patient must have at least 2 of the following 3 symptoms:
 - Abdominal pain related to bowel movements
 - A change in the frequency of bowel movements in the form of diarrhoea or constipation
 - A change in the form of bowel movements: too hard or watery.

Symptoms that may reinforce the diagnosis include abnormal stool consistency, mucus in the stool, bloating, symptoms that get worse after a meal, heartburn, headaches, fibromyalgia, bladder problems and pain during sex. Symptoms may vary from person to person, but they are unfortunately insufficient on their own to diagnose IBS (37).





3 dietary treatment for IBS

After the diagnosis of Irritable Bowel Syndrome, it is essential to apply the appropriate treatment to reduce or prevent symptoms as much as possible. Finding out the origin of the symptoms is central to the treatment. The best results are achieved with a combination of dietary and lifestyle modifications (39). Taking supplements with digestive enzymes can also alleviate the symptoms.

3.1 dietary advice

Some foods can provoke the symptoms of IBS, and some foods can reduce the symptoms (35). It is important to inform patients about these.

Healthy diet

A healthy diet is an effective and simple way to reduce symptoms of IBS, although there is currently no conclusive scientific evidence. Apart from that, a healthy diet is, in any case, essential for getting all the important nutrients (35, 39). It is also important to eat regularly (39).

Fibre

Adequate fibre in the diet can have a positive influence on intestinal health. Research has shown that soluble fibre can reduce general IBS symptoms and abdominal pain. Insoluble fibre lacks these positive effects (35, 39).

Fluids

In addition to a healthy diet and sufficient soluble fibre, people without IBS should also consume at least 2 litres of fluids per day (39).

The FODMAP diet

FODMAPs increase the amount of fluid in the small intestine, which can lead to bowel problems in people with IBS (35). In 70 per cent of people with IBS, FODMAPs can cause symptoms such as abdominal pain and bloating (41). To find out which FODMAPs cause the symptoms, it may be helpful to follow the Low FODMAP diet. After the FODMAP diet, a personalised diet can be created that omits the FODMAPs that cause symptoms. Following the low FODMAP diet can lead to less abdominal pain, flatulence, and less bloating. It may also result in more regular stools (35).

Adhering to the low FODMAP diet is very complicated because FODMAPs are found in a lot of products. In addition, it can lead to a lower intake of fibre, iron and calcium, among other things. It is, therefore, important to draw up a plan with your client to avoid deficiencies (35).

Lifestyle factors

In addition to the above factors, a number of lifestyle factors are important in treating IBS (39).

- Respond to the urge to defecate (but do not push)
- Avoid tension and stress as much as possible
- Adequate exercise
- Losing weight can be beneficial for overweight patients
- Do not smoke

summary

Irritable bowel syndrome (IBS) is a disruption of the function of the gastrointestinal tract and is characterised by recurrent abdominal pain and upset stomach.

IBS can be diagnosed using the Rome IV criteria. There are several dietary and lifestyle concerns in the treatment of IBS: a healthy diet, adequate fibre, adequate fluids and a healthy lifestyle.

FODMAPs can cause symptoms in IBS. The FODMAP diet can be followed to determine which FODMAPs cause and reduce symptoms.

Supplements with digestive enzymes can be used to reduce symptoms in IBS.



3.2 supplements

In addition to dietary and lifestyle changes, supplements containing digestive enzymes can help reduce symptoms of IBS. Supplements do not eliminate the cause, but they do help to reduce the symptoms and complaints associated with IBS.

Probiotics

Probiotics are living microorganisms consisting of gut-friendly bacteria and sometimes yeast. They are ingested through probiotic-rich foods and supplements. Several studies have been conducted with different strains of bacteria, including the Bifidobacterium, Lactobacillus and Streptococcus strains. These studies show that probiotics can reduce generalised IBS symptoms and abdominal pain (41). However, little is known about the exact effect of probiotics in IBS, so we do not yet know which strain(s) work best. More research is needed (35, 41).

3.2.1 Intoleran quatrase

In our lab in Donkerbroek, Friesland, we have developed two supplements for irritable bowel syndrome: quatrase and quatrase forte. The supplements contain 4 different enzymes: Lactase, Xylose Isomerase, Alpha Galactosidase and Invertase. These enzymes help with the digestion of lactose, fructose, fructans & galactans and sucrose.

Quatrase helps to digest all FODMAPs except polyols.

Because we added the enzyme invertase, quatrase also helps to digest sucrose. This is officially not a FODMAP but does cause similar symptoms.

Quatrase and quatrase forte are both suitable for reducing the symptoms of IBS. General information on recommended use, duration of action and safety can be found in the chapter 'General information on supplements for food intolerances'.

Quatrase as a FODMAP check-in

For clients with unexplained bowel complaints such as abdominal pain, abdominal cramps, bloating, or flatulence, quatrase (forte) can be used as a FODMAP check-in. If the symptoms diminish after taking, it is clear that they are caused by one or more FODMAPs. A FODMAP diet can then be used to determine which FODMAPs are causing the symptoms. Clients who prefer not to follow the FODMAP diet can continue to use quatrase (forte). The use of quatrase is harmless; the body's own enzymes, which are not used in the small intestine, leave the body through the stool.

Quatrase in sports-related bowel complaints

Sports-related bowel complaints are relatively common, particularly among endurance athletes such as runners and cyclists. FODMAPs often play a major role in this because, during prolonged physical exertion, the digestion of fermentable carbohydrates (FODMAPs) slows down, causing them to end up fermenting in the colon (47, 48). Taking one or more capsules of quatrase (forte) just before the often carbohydrate-rich (and therefore FODMAP-rich) meal before exercise, the FODMAPs can be broken down in the small intestine. This prevents them from entering the large intestine, thus preventing unpleasant bowel complaints and a reduction in performance during (endurance) sports.



Quatrase

Quatrase capsules contain 5000 FCC lactase, 5000 units Xylose Isomerase, 600 units Alpha Galactosidase and 250 units Invertase per capsule.

Recommended use

Take 1-3 capsules just before a meal containing FODMAPs. A maximum of 15 capsules per day.

Composition

The capsules contain 4 different enzymes and a little bulking agent (calcium carbonate). The capsule itself is made of HPMC.



Quatrase forte

Quatrase capsules contain 10,000 FCC lactase, 7500 units Xylose Isomerase, 1200 units Alpha Galactosidase and 500 units Invertase per capsule.

Recommended use

Take 1-3 capsules just before a meal containing FODMAPs. A maximum of 15 capsules per day.

Composition

The capsules contain 4 different enzymes and a little bulking agent (calcium carbonate). The capsule itself is made of HPMC.

Choose quatrase or quatrase forte?

We recommend starting with the highest dosage and then reducing it if necessary.

This way, you can clearly see whether quatrase works or not.

If you start with a lower dosage and there is no improvement, then you will not know whether it is due to the low dosage or whether the product is not working.

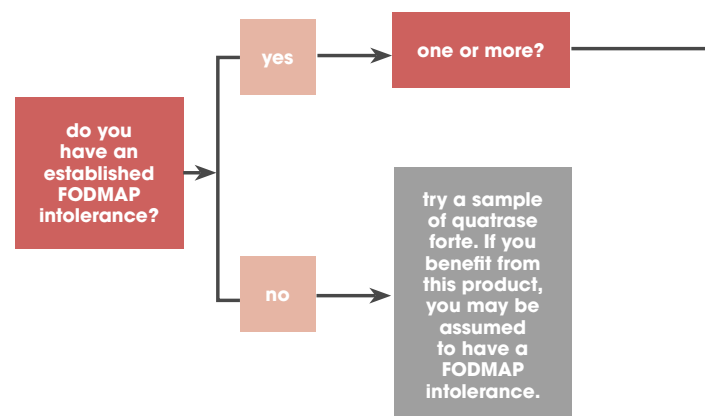
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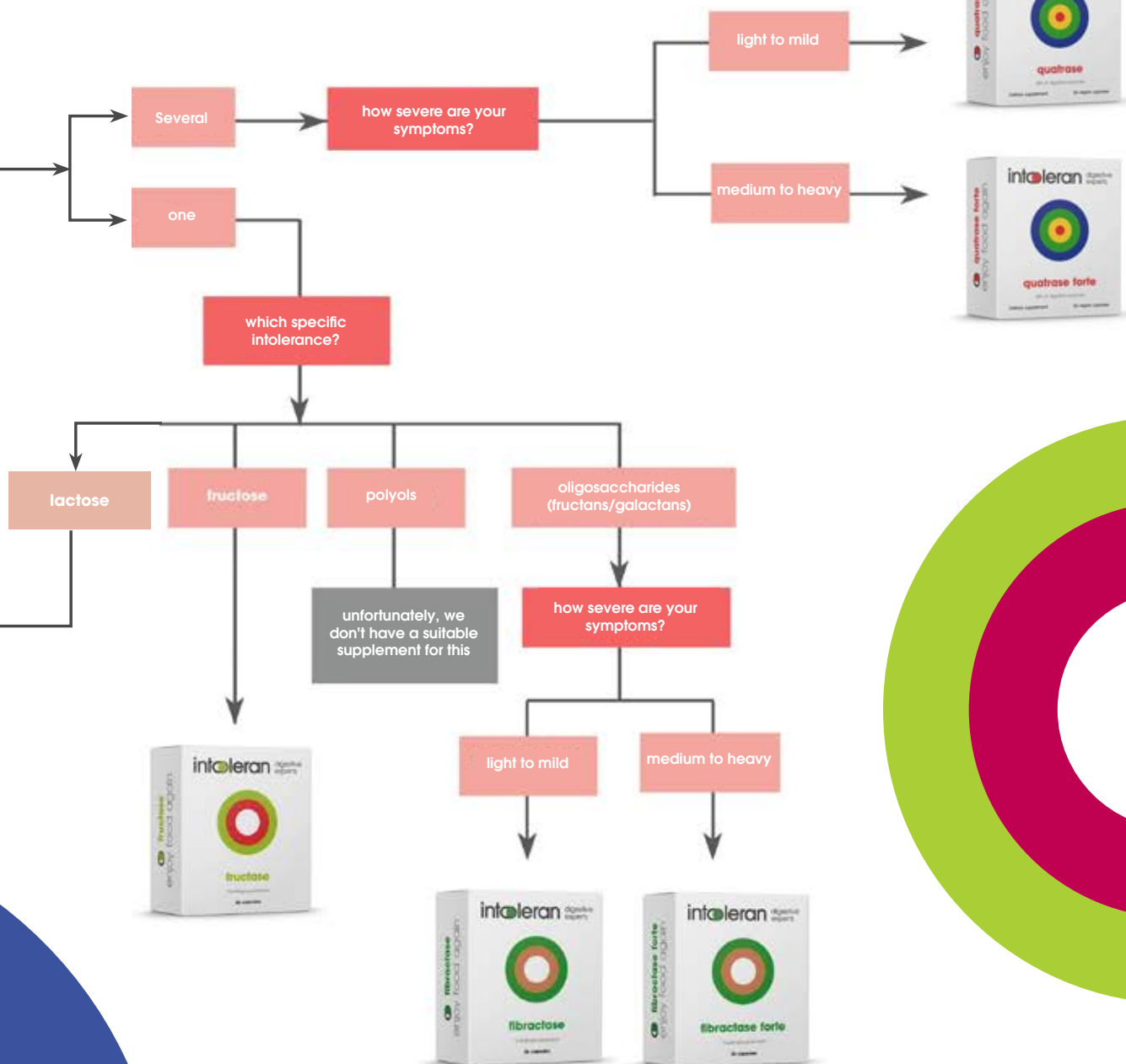
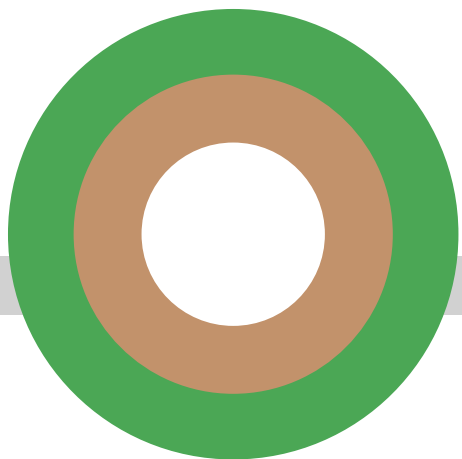
Quatrase forte is the leading FODMAP supplement. It can be used in a wide range of situations, such as IBS, multiple intolerances and as a FODMAP check-in.

Advice: start with quatrase forte and then later reduce it if necessary.

Quatrase (forte) is suitable for children from 2 years of age.

3.3 flow chart FODMAP products







general information on supplements for food intolerances



Because we produce all our products ourselves in our production facilities in Donkerbroek, Friesland, we can guarantee the origin, quality and safety of the ingredients used at all times. We have a variety of tablets, capsules and drops in our range, in different strengths and for various food intolerances. This chapter tells you how to use the supplements and for which food intolerances they are suitable.

The sources of our enzymes

All our supplements contain digestive enzymes of plant origin as active ingredients.

- The lactase enzyme β -Galactosidase in our lactase capsules and tablets and in quatrase is obtained from the plant source *Aspergillus oryzae*. For the liquid lactase in our lactase drops, we get it from *Saccharomyces Marxianus*.
- The enzyme Xylose Isomerase as used in fructose and quatrase is produced at a pharmaceutical company and it is of plant origin.
- The enzyme Alpha Galactosidase, as used in fibractase and quatrase, is extracted from the plant source *Aspergillus Niger*.
- The enzyme Invertase, as used in quatrase, is extracted from the yeast *Saccharomyces Cerevisiae*.

Safety

The enzymes used in our products cannot pass through the intestinal wall and, thus, remain in the intestine until they leave the body by the natural route. The enzymes have only one task in the intestines: to break down the nutrients that cause complaints. They are completely safe and do not harm or interfere with other processes in the intestines. Any surplus enzymes in the intestines will quickly leave the body through the natural route. The use of our supplements is completely safe, both on a daily basis and a long-term basis. You can use them without restrictions alongside other supplements and medication,

and there are no contraindications or side effects. All our supplements can be used during pregnancy and when breastfeeding.

Dosage and strength

The dosage of our supplements is expressed in FCC or units. Here, the higher the FCC value or the number of units, the more active enzyme the product contains and the more the symptoms-causing nutrients are broken down. The ideal dosage differs from person to person and depends on the degree of intolerance and the amount of the foodstuff causing the symptoms.

Duration of action

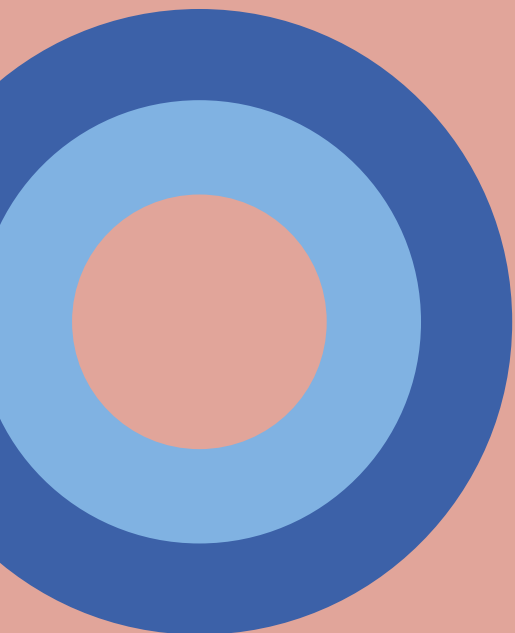
Our products work for about 30 to 45 minutes from the moment they are taken (the duration of action). If, after 30 to 45 minutes, you want to eat or drink something that contains the foodstuff causing the symptoms, you will have to take another tablet or capsule. For the enzymes to work optimally, we recommend that you take the tablets or capsules just before or with the first bite of the meal. This allows the enzymes to mix well with the food and pass through the stomach and intestines together.

Recommended use

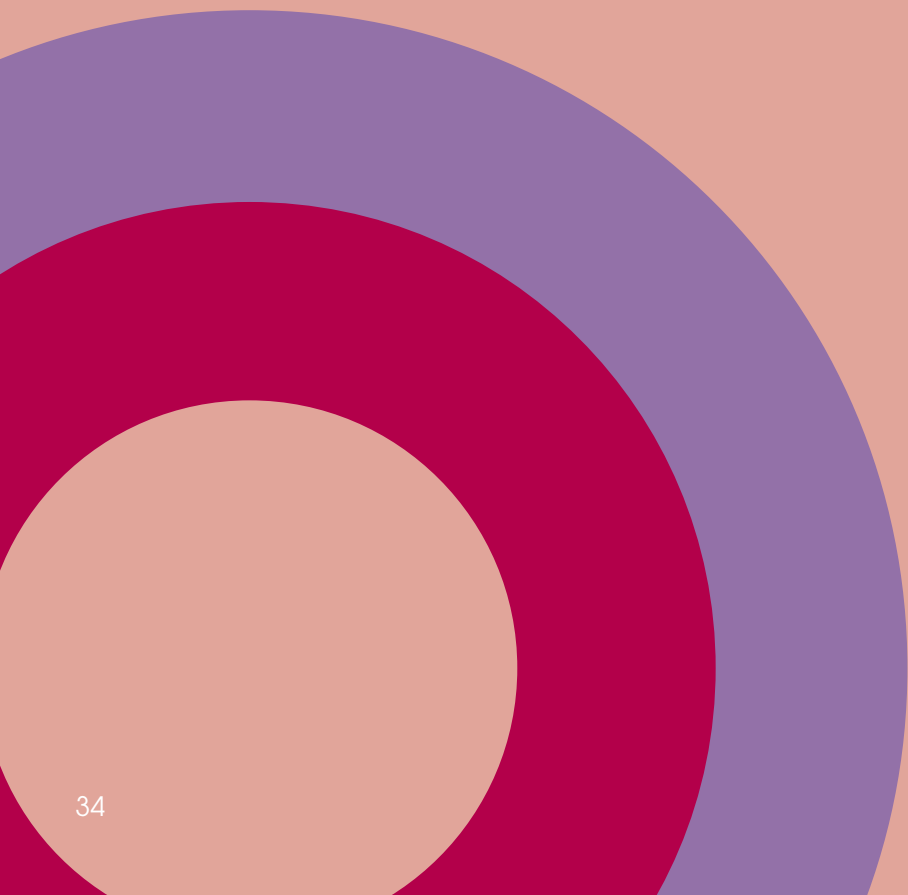
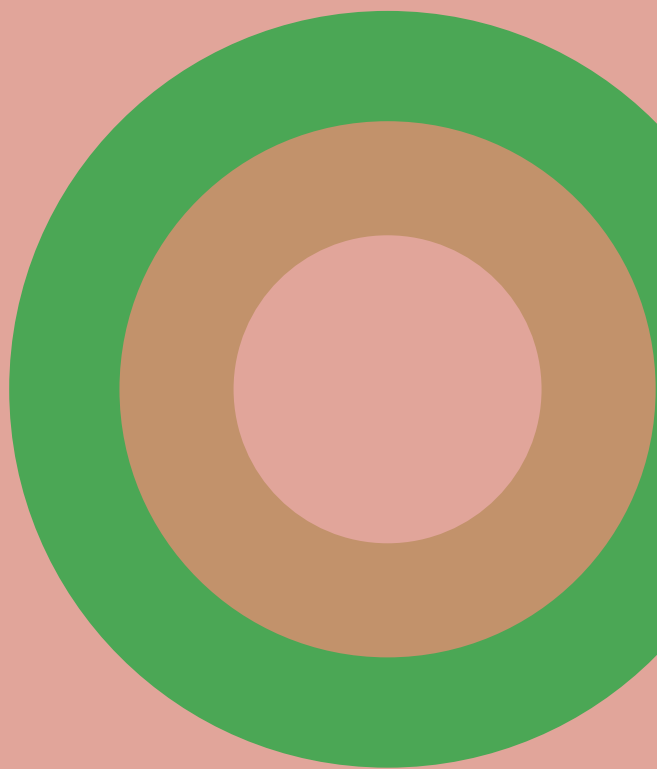
You can take the capsules and tablets before each meal. For example, with some water. Young children and people who have difficulty swallowing can also open the capsule and take the contents separately. For example, by dissolving the contents in a glass of water or sprinkling it over food (caution: do not put in hot food above 50 degrees Celsius). The capsules are suitable for children 2 years and older, but for once-a-day we recommend a minimum age of 4.

Allergy information

With the exception of once-a-day, our products do not contain any animal materials and are therefore suitable for vegetarians and vegans. Once-a-day is suitable for vegetarians. None of our products contain gluten or soya.



FAQs



frequently asked questions by dietitians

As a healthcare professional, can I order samples?

Yes, you can. As a dietitian or healthcare professional, you can order free samples to give to your clients. This can be done via the request form on the professionals page on our website or by sending an email to info@intoleran.com. You can order samples of all our products, except once-a-day, quatrase and fibractase.

Why are there no samples of once-a-day, quatrase and fibractase?

It takes some time to find out if once-a-day works, so a sample would have to contain too many capsules. You can try the once-a-day capsules without obligation. If they do not work, we will refund the full purchase price. In the case of quatrase and fibractase, it is necessary to start with the strongest dosage in order to determine whether or not the product works. Therefore, you can only order test samples of quatrase forte and fibractase forte.

What strength of lactase tablets/capsules should I recommend to my client?

For lactose intolerance, intoleran has a wide range of supplements. Lactase 2500 in tablet form is our lowest-dosage lactase supplement. It is ideal for people with a low degree of intolerance and for meals containing only a small amount of lactose. The tablet is the size of a sweet, so it is also particularly suitable for children.

Lactase 3000 is our standard capsule. These supplements are also intended for people with a low degree of intolerance and for taking with meals that contain little lactose.

Lactase 10,000 is our relatively high-dosage capsule, ideal for people with a high degree of intolerance and meals that are high in lactose.

Lactase 20,000 is our highest-dosage supplement. Ideal for people with a high degree of intolerance or very high amounts of lactose. The tablets are breakable and, therefore, easy to dose.

The choice of tablet or capsule depends on personal preference, but the effect is identical.

Can you use once-a-day for a longer period of time?

Yes, once-a-day capsules have no disadvantages or side effects, even with long-term use. Many of our customers have been using once-a-day for years with great pleasure.

Once-a-day used to work well but now it is less effective. How is this possible?

For most people, even with long-term use, the effect of once-a-day will not diminish. However, under certain

circumstances, it can temporarily stop working, for example, if you are ill (with vomiting and/or diarrhoea) or during a course of antibiotics. We then advise you to temporarily stop taking the capsules and start again later. Is it still not working as before? Then we recommend that you try lactase 20,000.

The recommended dosage is 1 to 4 capsules or tablets per day; how many should I start with?

Many of our products have a recommended dosage of 1 to 2 break tablets, 1 to 3 capsules or 1 to 4 tablets. We recommend starting with the highest dosage. This will give you a good idea of how the supplement works. If it works, you can reduce the dosage until you have established the minimum dosage. There is no actual need to reduce the dosage, as taking too high a dosage has no negative impact on your health.

Can you chew the tablets?

Yes, this isn't a problem. However, please note that enzymes may stick to the molars, causing less of them to end up in the intestines and the product to work less well. It is, therefore, better to take the tablets without chewing, with a little water.

Can you use intoleran products during pregnancy?

Yes, all intoleran products are safe to use during pregnancy and while breastfeeding. This is because the enzymes only break down carbohydrates and do nothing else. The enzymes only work in the intestines; they do not enter your body. Any surplus enzymes leave your body through your stool.

Does the health insurance company reimburse the supplements?

Unfortunately, our supplements are not (yet) covered by health insurance companies. We hope that this will be possible in the near future. However, the cost of our supplements does fall under dietary costs, which you can partially reclaim on your tax return. As a dietitian, you can write a certificate for your client.

Does intoleran have other products besides those for FODMAPs?

Yes, in addition to supplements for the various FODMAPs, intoleran also has supplements for other intolerances. For histamine intolerance, we have three different products: DAO plus, DAO mini and cozidase. DAO plus and DAO mini both contain the Diamine Oxidase enzyme which helps to break down histamine in the body. Cozidase contains building blocks that enable the body to produce its own Diamine Oxidase. There is also intoleran starchway, a product for starch and/or sucrose intolerance and CSID. It contains the enzymes Invertase and Gluco-Amylase that can help break down starch and sucrose in the small intestine.



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If you still have questions after reading this brochure, our Intoleran dieticians are ready to answer them. Please feel free to contact us.

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