Your gut bacteria thank you for setting out on this journey!

With this test, you have taken an important step. Now all that remains is to keep moving forward. We are right beside you!

Why is the gut microbiome so important?

Your gut contains around 39 trillion bacteria, which is about as many as there are cells in your body. Just as people fulfil different roles in daily life, so do all of your gut bacteria. They:

- collect energy from food;
- regulate your appetite and body weight;
- affect your organs' reaction to insulin;
- release inflammation-reducing compounds;
- boost the integrity of the intestinal barrier;
- support the immune system;
- produce vitamins;
- prevent toxins from entering the bloodstream.

Having your microbiome thrown out of balance (or in a state of dysbiosis), however, can lead to undesirable consequences:

- cardiovascular disease (atherosclerosis, high blood pressure, high cholesterol);
- nutrient deficiency in intestinal cells (weak intestinal barrier);
- gut inflammation(Crohn's disease, ulcerative colitis, IBS, leaky gut);
- metabolic disorders (obesity, overweight, type 2 diabetes);
- immune system allergies (asthma, wheat allergy, secondary lactose intolerance);
- colon cancer;
- disruption ofthegut–brainaxis (depression, autism, binge-eating disorder, Alzheimer's, Parkinson's);
- yeast infections and skin diseases (eczema, atopic dermatitis);
- hormonal imbalance.

Fortunately, there is much you can do to help your good gut bacteria flourish and help you lead a healthy life full of accomplishments. All you need to do is simply follow the recommendations in this report.

What will you find in this report?

1. Personalised (dietary) recommendations based on your results (page 3)
2. A summary of the key base indicators for your microbiome (page 4)
   - Diversity and species-richness (page4)
   - Microbiome type (page5)
   - Intestinal barrier integrity (page6)
   - Probiotic bacteria (page7)
   - Gut–brain communication (page8)
   - Vitamin production (page9)
   - Overweight and obesity (page10)
   - Bacteria associated with inflammatory bowel disease (IBD) (page 12)
   - Kidney health (page14)
   - Fibre, protein, and fat intake (page15)
3. A detailed overview of your gut bacteria (page 17)

In the appendices you will also find:

4. Fibre content figures for different food groups (page 28)
5. General recommendations for promoting (gut) health (page 29)

What the microbiome test does NOT show you and what you will NOT get from this report:

- this report does not constitute a medical diagnosis by a doctor; the
- results presented here are not suitable for diagnosing gut inflammations; the microbiome test does not identify food intolerances or allergies;
- the microbiome test does not show the presence/absence of fungi,
- parasites, or viruses in your gut.

Personalised recommendations based on the results

Foods Your microbiome needs:

CEREALS
rice*, whole grain barley, barley, brown rice, multigrain vegetables

VEGE TABLES
potato*

PROBIOTIC PRODUCTS
probiotic dairy,fermented

Foods to reduce:

CEREALS
buckwheat

VEGE TABLES
spinach

MEAT
fish, animal-derived products, poultry

SWEETS
candies,cookies, sweetened beverages, pastries and other sweets

OT H ER
oxalates, sulphates, raw cocoa

* cooked and cooled to refrigerator temperature
** raw; thefibercontent depends on thedegreeofripeness

Fibre blend recommendation:

Feel good inside

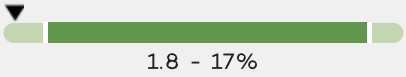
Fibers feed your microbiome and contribute to digestion regularity. In addition, fibers help to slow the rate at which sugar is absorbed into the bloodstream and keep blood cholesterol level normal.

Additional recommendations:

See Appendix2 for moreinformation.

We have no further personalised recommendations for you. For general recommendations on how to promote gut health, see Appendix 2.

Summary of key base indicators for your microbiome



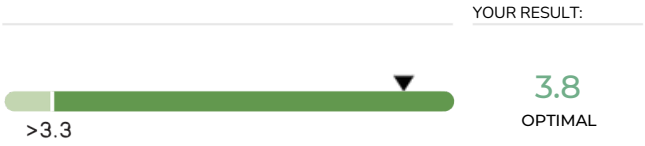
Area represents the optimal range

1.8-17% Optimal range in numbers Your result

Diversity and species-richness of the microbial community

Microbiome diversity

YOU VS A CONTROL GROUP OF HEALTHY INDIVIDUALS:



A diverse microbial community (wide variety of bacteria) indicates good gut health.

Low diversity corresponds to a lower protective capacity of the microbiome. Low diversity can contribute to various diseases (gut diseases, metabolic diseases (including obesity, type II diabetes), neurological diseases (anxiety, depression, Parkinson's disease), heart and kidney diseases, etc.).

Species-richness

YOU VS A CONTROL GROUP OF HEALTHY INDIVIDUALS:

There were 146 different bacterial species detected in your gut (around 93-129 species are usually present in a healthy community).

Species-richness = the ability of the bacterial community to adapt to changing conditions.

Lower species-richness can lead to critical changes in the microbiome community. For example, the disappearance of beneficial gut bacteria or the proliferation of inflammatory species. Low species-richness can result, for example, from taking antibiotics or from a poorly balanced diet that is low in fibre.

How to promote the diversity and species-richness of the gut community

- Through a balanced and healthy diet that is rich in fibre and includes a variety of plants. Remember that all plants contain fibre. The foods with the highest fibre content are legumes, whole grains, seeds, nuts, fruits, berries, and vegetables. The recommended daily fibre intake is at least 25 g for women and at least 35 g for men.
- By consuming fermented foods, which contain bacteria that are essential for gut health. Fermented probiotic foods include, for example, fermented vegetables and mushrooms, raw sauerkraut, raw pickled cucumber, kimchi, unflavoured yoghurt, and kefir.
  The best results can be obtained by consuming sufficient fibre and a small amount of fermented foods daily.
  References: 1, 2, 7, 8

Microbiome type (or enterotype)

YOUR TYPE: BACTEROIDES

Although, based on current knowledge, no one type of microbiome can be set above others as a measure of health, your microbiome type primarily reflects your long-term dietary habits.

Gut microbial communities can essentially be divided into two cat ego r i es:

- *Bacteroides* enterotype – associated with a Western diet rich in simple sugars and proteins and fats (indicating a lower relative intake of fibre that promotes the growth of bacteria that are beneficial for the gut);
- *Prevotella* enterotype – associated with a diet that includes complex carbohydrates and fibre (indicating a consistent and extended intake of high amounts of fibre needed by beneficial gut bacteria).

Microbiome types are relatively stable, and transitioning from one type to another requires a long-term change in eating habits. The prevalence of the *Prevotella* genus in the gut community has decreased across the globe, and in many cases the *Prevotella* type is not reached even after several years of maintaining an appropriate diet.

To promote the development of the *Prevotella* enterotype:

- Decrease your intake of foods that are high in protein and fat, in particular the consumption of animal products and products rich in fast- digesting carbohydrates (e.g., white wheat flour- based pastries, white rice, confectionery, biscuits, sweetened beverages).
- Add as many fibre-rich plant-based foods as possible to your diet.
- We recommend following this golden rule of nutrition: 80% foods of plant origin and 20% animal products.

References: 3,4

Intestinal barrier integrity

IMPROVABLE, THE INDICATORS ARE NOT COMPLETELY IN BALANCE

The integrity of your intestinal barrier indicates how well your immune system is functioning.
A sufficiently strong protective lining of the intestine prevents harmful pathogens, toxins, and other contaminants from entering the bloodstream.

Some types of bacteria are needed in your microbiome community because they help r e stor e the mucus membrane thatprotectstheinside of the gut and boost the integrity of the intestinal barrier.

If this mucus restoration process is disrupted, however, the mucus membrane becomes thinner and the immune cells trigger an inflammatory process in the body.

This first leads to an intestinal barrier disorder (so-called leaky gut syndrome), where both food particles and bacteria pass through the intestinal cells and travel down the bloodstream into further areas of the body. In more severe cases and with prolonged chronic inflammation, the protective functionofthegut is completely disrupted, the mucus membrane is destroyed, and ulcers begin
to form (inflammatory bowel disease).

BACTERIA THAT BOOST THE INTEGRITY OF THE INTESTINAL BARRIER:

Butyric acid-producing bacteria

22%
OPTIMAL

Akkermansia (genus)

2.7%
IM PR OVABL E

BACTERIA THAT WEAKEN THE INTESTINAL BARRI ER:

Bacteria associated with gut inflammation

3.5%
IM PR OVABL E

Lachnoclostridium gnavus

0%
OPTIMAL

Lachnoclostridium torques

0.1%
OPTIMAL

How to boost the integrity of your intestinal barrier:

The protective capacity of the gut can be boosted by eating more fibre less so called fast carbohydrates. Gut supporting butyric acid producing bacteria can be supported by consuming low-digestible starch and pectin-rich foods such as potatoes (boiled and cooled down to fridge temperature), whole-grain rice, cabbage, apples, and plums. In case of inflammation, you should prefer soluble fibre (e.g., oat or barley rich in beta-glucans and pectin-
containing foods such as cabbage, apples, and plums) and avoid fibrous foods and bran.

Intestinal inflammatory processes are also triggered by various preservatives, emulsifiers, and other additives (e.g., benzoates and sorbates, carboxymethyl cellulose (E466), carrageenan (E407)), as well as alcohol.

References: 9,10,11,
61

Probiotic bacteria

IMPROVABLE, THE INDICATORS ARE NOT COMPLETELY IN BALANCE

Probiotic bacteria have health-promoting properties. They help maintain digestive health, support the immune system and metabolism, protect against inflammatory bacteria, produce vitamins (K2, B12, B9), promote nutrient uptake, and more besides.

In addition, probiotic bacteria help to balance the microbiome if it has been damaged by antibiotics, medicines, and birth control pills, and can relieve diarrhoea.

PROBIOTIC BACTERIA:

Probiotic bacteria are in:

Fermented vegetables e.g., sauerkraut, pickled cucumber, kimchi) and mushrooms, as well as olives in brine. Home-fermented or non-heat-treated products are best, as processing at high heat destroys good bacteria and reduces the effectiveness of the products. Note: Adding vinegar also kills probiotic bacteria.

Probiotic supplements. We recommend probiotic supplements that contain human-specific (primarily human-origin) bacteria rather than plant-derived ones, and choosing products with the widest range of bacteria (i.e. containing both Lactobacillus and Bifidobacterium strains).

References: 26, 27, 28

Fermented dairy products (e.g., kefir, yoghurt, cheese, sour milk). Pasteurisation destroys probiotic bacteria in the lactic starter in dairy products, but they are reinserted into many products in later production stages. At the store, we recommend choosing products labelled as including added probiotic bacteria.

Scientists still do not fully understand how well probiotics can survive in the human gut. The beneficial effects of probiotic bacteria mainly stem from essential compounds produced as byproducts of their metabolic processes (so-called postbiotics), which are effective even if the bacterium does not permanently colonise the gut.

The best results are yielded by combining probiotic foods and fibre, as fibre is a food source for probiotic bacteria and thus promotes the survival of the bacteria in the gut.

Gu t– brain communication

IMPROVABLE, THE INDICATORS ARE NOT COMPLETELY IN BALANCE

Our gut and brain are constantly communicating with each other via multiple pathways. Due to this close communication, our digestive system affects whatwe feel (our emotions) andthink.

Nervoussystemsignals are mediated by neuro - transmitters, many of which (such as serotonin and dopamine) canbeproducedby gutbacteria .

Your brain receives happiness signals largely from your gut!

It is estimated that 90% of the precursor for serotonin (the so-called happiness hormone) and 50% of the dopamine (the feel-good hormone) in our bodies is produced in the gut.

Changes in your gut community can lead to changes in the amount and type of signal compounds produced by the bacteria. This can result in disrupted communication between the brain and the gut.

BACTERIA THAT PROMOTE COMMUNICATION BETWEEN THE BRAIN AND THE GUT:

Bifidobacterium

1.0% OPTIMAL

L ac t obac i lli us

0% IM PR OVABL E

Faecalibacterium

9.2% OPTIMAL

Coprococcus

3.9% OPTIMAL

BACTERIA THAT IMPAIR COMMUNICATION BETWEEN THE BRAIN AND THE GUT (PROMOTING DEP RESSI O N):

Enterobacteriaceae

0.5% IM PR OVABL E

How to improve communication between the brain and the gut:

In case of frequent anxiety or mood problems (e.g., depression), it is important to include omega-3 fatty acids in your diet. Add flaxseed or hemp seed oil to your meals, eat fatty fish (e.g. sprat, salmon, mackerel), or take omega-3 dietary supplements.

To support mental health, it is recommended to consume 3–4 tablespoons of fermented foods daily. Magnesium and B vitamins also help keep your mind sharp.

References: 12,13, 44, 62, 63

Vitamin production

NEEDS ATTENTION, MOST OF
THE INDICATORS ARE OUT OF BALANCE

Humans obtain a large portion of the vitamins needed by their body from food (with the exception of vitamin D, which the body produces in the skin when exposed to sunlight). A considerable amount of the K and B vitamins we need on a daily basis are produced by our gut bacteria.

Vitamin K is important for blood clotting, heart disease prevention, bone metabolism, and kidney function.

Two major groups can be distinguished in the vitamin K family:

- phylloquinones (K1),
- menaquinones (K2).

Vitamin K1 is found in plants, while K2 is produced by bacteria. The human body needs both vitamins K1 and K2, as they play different roles in our metabolism: K1, for example, is mainly involved in blood clotting, while K2 improves vascular elasticity.

For B vitamins, it is estimated that at least 30% of the daily amount needed by our bodies is produced by bacteria in the gastrointestinal tract as cobalamin (B12), folate (B9), niacin (B3), and pyridoxine (B6).

The latter are produced by most gut bacteria, but cobalamin and folates only by bacteria belonging to the genera *Lactobacillus*, *Bifidobacterium*, *Bacteroides* ja *Prevotella*.
Vitamins B1–B12 are water-soluble vitamins and are essential for life because they support a number of organ functions.

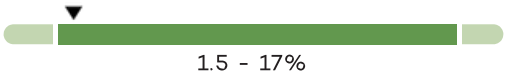
To find out more about the importance of different K and B vitamins and which foods they are found in,
References: 29, 30

VITAMIN-PRODUCING BACTERIA:

Lactobacillus vitamin K; cobalamin (B12)

0%
IM PR OVABL E

Bacteroides vitamin K; cobalamin (B12); folate (B9)

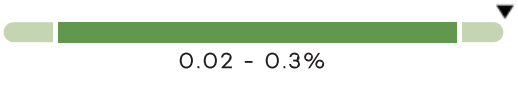


2.1%
OPTIMAL

Bifidobacterium folate (B9)

1.0%
OPTIMAL

Escherichia vitamin K;



0.4%
IM PR OVABL E

Prevotella vitamin K; folate (B9)

0%
IM PR OVABL E

Eubacterium rectale vitamin K;

0.1%
IM PR OVABL E

Overweight and obesity

GOOD, MOST OF THE INDICATORS ARE IN BALANCE

Overweight and obesity are strongly linked to the microbiome. The microbiome community of overweight individuals has been found to differ from that of people with normal body weight.

The link here is a two-way road where a high-calorie but low-nutrient dietand lack of exercise promote the growth of bacteria that contribute to obesity and weight gain Meanwhile, proper nutrition and exercise promote the growth of bacteria that help keep your body weight at a normal level and support your metabolism.

The bacteria in your gut also help regulate your appetite by producing various signalling compounds that interact with the brain.

A diet that is low in fibre promotes the growth of bacteriathat make you cravecalorie-richbut nutrient-poor foods(e.g., sweets, pastries, white pasta, fatty meats).

Conversely, with a diet that is high in fibre, your gut becomes colonised by bacteria that make you desire nutrient-rich and healthy foods.

Consuming food releases dopamine into our bodies (which creates a feeling of motivation and pleasure), and it is in our nature to constantly seek more of it. This is why we tend to eat more when experiencing stress, bad moods, or trauma.

BACTERIA THAT ARE FOUND IN LOW ABUNDANCE IN OVERWEIGHT INDIVIDUALS:

Faecalibacterium

9.2%
OPTIMAL

Methanobrevibacter smithii

1.0%
OPTIMAL

BACTERIA THAT ARE FOUND IN HIGH ABUNDANCE IN OVERWEIGHT INDIVIDUALS:

Dorea longicatena

0.7%
OPTIMAL

Lachnoclostridium gnavus

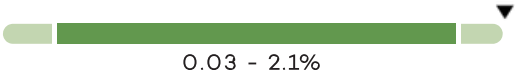
0%
OPTIMAL

Lachnoclostridium torques

0.1%
OPTIMAL

BACTERIA THAT ARE FOUND IN HIGH ABUNDANCE IN NORMAL-WEIGHT INDIVIDUALS:

Akke r m ansi a



2.7%
IM PR OVABL E

Chr i st e nse ne llac e ae

2.7%
OPTIMAL

Foods and habits that help maintain a normal body weight:

We recommend avoiding refined cereals (white bread, pastries, pasta, pizza, and other white wheat flour products) and foods that contain excessive amounts of saturated fat and sugar (fatty and processed meat products such as bacon, salami, raw sausages, boiled sausages, frankfurters; sweets such as milk chocolate, sweetened beverages, etc.).

Instead, you can add more vegetables, whole grains (oats, buckwheat, barley), berries, and high-fibre bran to your meals.

If you are overweight, we recommend consulting a nutritionist, who will support and guide you in forming health-promoting habits.

References: 31, 32

Bacteria associated with inflammatory bowel disease (IBD)

IMPROVABLE, THE INDICATORS ARE NOT COMPLETELY IN BALANCE

Inflammatory bowel disease (IBD) is a serious bowel disease in which the mucus membrane protecting the intestinal epithelium is damaged and ulcerous.

IBD encompasses two diseases:

1. ulcerative colitis,
2. Crohn's disease.

IBD involves pronounced inflammatory processes that can be detected in tests run by a physician.

Another increasingly common gastrointestinal disorder is irritable bowel syndrome (IBS). In contrast to IBD, IBS is not accompanied by signs of inflammation and ulcers, and is closely linked to nervous system disorders. For example, stressful situations might trigger changes in bowel function (diarrhoea or constipation). IBD can be preceded by 'leaky gut syndrome' and followed by colon cancer. All of these conditions must be diagnosed by a doctor. Blood, microbiome, and other tests can be used to support the diagnosis.

BACTERIA WHOSE ABUNDANCE DECREASES WITH IBD:

Akkermansia
2.7% IMPROVABLE
0.03 - 2.1%

Faecalibacterium
9.2% OPTIMAL
>5.3%

Prevotella
0% IMPROVABLE
>0.02%

Roseburia
1.5% OPTIMAL
>1.1%

Phascolarctobacterium
0% IMPROVABLE
>0.03%

Christensenellae
2.7% OPTIMAL
>0.7%

Ruminococcus bromii
5.9% OPTIMAL
>0.3%

Eubacterium rectale
0.1% IMPROVABLE
>0.2%

BACTERIA WHOSE ABUNDANCE INCREASES WITH IBD:

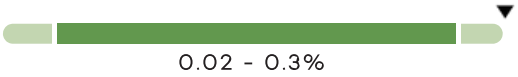
D e sulfovi br i o

1.0%
IM PR OVABL E

Lachnoclostridium gnavus

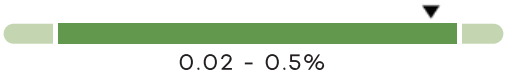
0%
OPTIMAL

Escherichia



0.4%
IM PR OVABL E

Enterobacteriaceae



0.5%
IM PR OVABL E

Lachnoclostridium torques

0.1%
OPTIMAL

F usobac t e r i um

0%
OPTIMAL

What should you eat when suffering from inflammatory bowel disease?

When suffering from IBD, your gut will be sensitive and you might not tolerate many foods that are normally healthy. In such a case, you will need to monitor which foods cause you more discomfort, avoid consuming them in large quantities, and reintroduce them into your diet little by little once your digestion begins to improve.

We advise following these guidelines:

- Eat more meals per day with a lower quantity of food per meal. Avoid gluten-rich foods if they are causing you
- problems (instead, eat buckwheat, for example). Avoid dairy products if you are lactose intolerant. Prefer lactose-
- free dairy products. Avoid highly fibrous foods (bran and hard-skinned fruits and vegetables). Vegetables that are
- too hard when raw (e.g., cabbage, carrots) should be eaten cooked.
- Prefer water-soluble fibres. For example, foods rich in pectin (blueberries, plums) and beta-glucans (oat flakes). These should be boiled (porridge instead of muesli) or soaked overnight.
- Avoid sugary foods (including sweet fruit juices).
- If you also suffer from bile problems, avoid fatty foods. We recommend limiting your intake of omega-6 fatty
- acids (e.g., sunflower, corn, and soybean oil, deep-fried foods, potato chips, and other fast food). Avoid foods that
- contain additives (such as emulsifiers and stabilisers). We recommend limiting (or preferably avoiding) your
- consumption of coffee and alcohol. These can exacerbate the disease.
- We recommend avoiding birth control pills. Consider other contraceptive methods instead.
- Meditation can also help.

References: 35, 36, 37, 42

Kidney health

The most common cause of kidney stones is increased uptake of oxalate (an organic acid found in many plants), which binds minerals, thereby hindering the absorption of calcium.

Oxalic acid binds calcium into calcium oxalate, crystallising in the process. The accumulation of these solid crystals results in the formation of kidney stones. Oxalates are not broken down by the human body itself, but the genus

Oxalobacter
is capable of doing so in the gut.
BACTERIA THAT PREVENT KIDNEY STONES:

O x alobac t e r
NOT DETECTED -
INCREASED RISK
OF KIDNEY STONES

Oxalobacter has been found to be only half as widespread in people suffering from kidney stones as in healthy individuals, so this bacterium is a good indicator of predisposition to kidney stones.

Inflammation of the bladder can also contribute to the formation of kidney stones. If you have kidney problems, consult a nutritionist for help in putting together a personalised diet for you.

Foods that help prevent kidney stones:

- We recommend reducing your intake of oxalic acid-rich foods (spinach, rhubarb, chard, sorrel, green beans, buckwheat, amaranth, almonds, cashews, sesame seeds, tahini, cocoa, dark chocolate, soy products).
- As foods that are high in fat promote the absorption of oxalates, we also recommend reducing your consumption of fatty foods, especially in the absence of *Oxalobacter*.
- The content of oxalic acids in foods can be partially reduced by heating. The order of magnitude depends on the specific food and the heating method — boiling is the most effective. Soaking legumes overnight before cooking also helps reduce the oxalic acid content.
- One of the key factors in the prevention of kidney stones is sufficient water intake, as this helps cleanse the kidneys naturally.

The golden rule is to consume 28–35 ml of fluid per kilogram of body weight daily (including water from fresh foods of plant origin).

References: 38, 39

How does your current diet affect your bacterial community?

Fibre,protein,and fat intake

GOOD, MOST OF THE INDICATORS ARE IN BALANCE

Fibre is the best source of food for our gut bacteria. Consuming a variety of fibres promotes the development of a diverse microbial community, which in turn ensures a strong and stable immune system.

A diet that is excessively high in protein and fat increases the amount of bile in the gut, which can kill off many beneficial bile-sensitive bacteria.

Eating a low-fibre diet causes our gut bacteria to turn to alternative nutrients, including amino acids and intestinal mucus, which leads to weakening of theintestinal barrierandcontributestothe development and worsening of chronic inflammatory conditions.

Inflammatory conditions in the body in turn affect the functioning of our immune system and are linked to a number of modern diseases such as obesity, metabolic disorders, cardiovascular diseases, and autoimmune diseases.

Fibre plays a major role in human health as it removes excess cholesterol, toxins, heavy metals, and dead microbes from the body.

Fibre regulatesdigestion and prevents large fluctuationsinblood sugar (which can affect mood and energy levels).

BACTERIA THAT ARE INDICATIVE OF A LOW-FIBRE DIET:

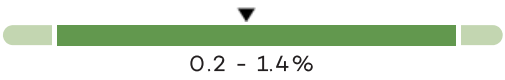
Colli nse lla

1.2%
OPTIMAL

Dorea longicatena

0.7%
OPTIMAL

Coprococcus comes



0.7%
OPTIMAL

BACTERIA THAT ARE INDICATIVE OF A HIGH-FIBRE DIET:

Bifidobacteria

1.0%
OPTIMAL

Ruminococcus bromii

5.9%
OPTIMAL

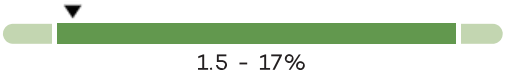
Prevotella

0%
IM PR OVABL E

Summary of base indicators

BACTERIA THAT ARE INDICATIVE OF A HIGH-FAT AND HIGH-PROTEIN DIET:

Bacteroides



2.1%
OPTIMAL

Bi lophi la

0.01%
OPTIMAL

D e sulfovi br i o

1.0%
IM PR OVABL E

Fibre recommendation:

Fibers feed your microbiome and contribute to digestion regularity. In addition, fibers help to slow the rate at which sugar is absorbed into the bloodstream and keep blood cholesterol level normal.

Dietary options for supporting your gut bacteria:

- We recommend replacing meat and animal protein in some of your meals with sources of plant protein such as legumes (lentils, beans, peas), tofu, tempeh, and protein-rich cereals (e.g., quinoa, amaranth, raw buckwheat).
- We recommend not to consume meat in quantities that exceed your body's daily needs (35 g of pork and beef, 35 g of fish, 75 g of chicken on average).
- We recommend minimising your intake of high-calorie but low-nutrition deep-fried and processed foods (white wheat flour products, french fries and fried potatoes, white pasta, and white rice).

How to ensure a high-fibre diet:

- Whole grains are a major source of fibre. As such, it is also important to consume cereal products when following a gluten-free diet. This is possible by opting for gluten-free cereals or pseudocereals such as quinoa, amaranth, buckwheat, millet, and oats.
- Additionally, it is important to eat a variety of vegetables, legumes, berries, fruits, nuts, and seeds.

Four more points to consider:

- Fibre is found only in plant-based food We recommend eating about 30 different plants a
- week (including various herbs). Ideally, at least 80% of the food you eat should be of plant
- origin. Nutritionists recommend consuming at least 25 g of fibre daily for women and 35 g for
- men.

References: 4, 22, 23, 24, 25, 45, 67

Detailed overview of your gut bacteria

Butyric acid-producing bacteria

22%
OPTIMAL

Butyric acid plays a key role in relieving inflammatory conditions.
It is an essential compound for maintaining the integrity of the intestinal barrier: butyric acid nourishes the epithelial cells lining the intestine, activates the production of protective mucus in intestinal cells, and supports intestinal function.

Also, butyric acid is involved in gut and brain communication (butyric acid-producing bacteria have been found to be low in individuals suffering from depression). Butyric acid is also involved in regulating blood sugar levels, thereby reducing the risk of metabolic disorders (e.g., type 2 diabetes, obesity).

Low abundance of butyric acid-producing bacteria weaken your immune system and can also weaken the intestinal barrier, contributing to inflammatory conditions in the gut and other areas of the body.

The growth of butyric acid-producing bacteria is driven by foods rich in fructooligosaccharides and resistant starch, i.e. whole grains (such as barley, multi-grain flakes, whole wheat and rye), Jerusalem artichokes, onions, potatoes*, rice*, and raw bananas**.

* Whole-grain rice and boiled potatoes cooled down to fridge temperature contain more resistant starch.
** Raw bananas, or green bananas, contain higher amounts of resistant starch.

References: 14, 15

Faecalibacterium

9.2%
OPTIMAL

One of the most common producers of butyric acid in the gut community. This bacterium is in high abun dance in healthy gut communities and is considered a health indicator. Also involved in immune system function (suppression of inflam - mation), producing anti-inflammatory compounds such as shikimic and salicylic acids. Low abundance of *Faecalibacterium* has been linked to bowel diseases (IBD). The prevalence of this bacterium can also be lower in the gut community of overweight in d ivid u als .

Diet: Abundance increases with consumption of citrus fruits. Eating foods that contain oligosaccharides (beans, lentils, chickpeas) can also increase the abundance of this bacterium.

References: 17, 18, 19

Chr i st e nse ne llac e ae

2.7%
OPTIMAL

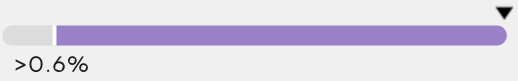
Bacteria of this genus can be considered an indicator of good health. They are associated with a fast metabolism and a low body mass index (BMI) – found in a higher abundance in the gut community of normal-weight individuals than in the microbiome of obese individuals. This bacterium disappears from the gut in the case of metabolic disorders.

The bacterium supports intestinal health and has been found to be lower in abundance in those suffering from inflammatory bowel disease (IBD).

The presence of *Christensenellaceae* in the microbial community is largely hereditary and the bacterium's links with diet are unclear.

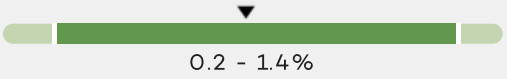
References: 16

Coprococcus



3.9%
OPTIMAL

Coprococcus comes



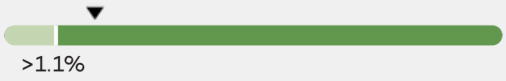
0.7%
OPTIMAL

Supports communication between the brain and the gut. Several studies have found that bacteria of the genus *Coprococcus* are missing in the gut community of those suffering from depression.

High abundance of the species *Coprococcus comes*, meanwhile, have been linked to low fibre intake (a diet that is low in vegetables and whole grains, but rich in refined wheat, i.e. white bread and white pasta).

References: 20

Roseburia



1.5%
OPTIMAL

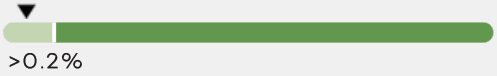
An important genus of butyric acid-producing bacteria. Found to have anti-inflammatory effects and to be in low abundance in individuals suffering from inflammatory bowel disease (IBD).

Diet: The growth of *Roseburia* is promoted by consuming walnuts, chilli pepper, arabinoxylans (especially whole-grain barley), and inulin (Jerusalem artichokes, onions, bananas*).

* Raw bananas, or green bananas, contain higher amounts of resistant starch, as it turns into rapidly digested starch during the ripening process.

References: 21

Eubacterium rectale



0.1%
IM PR OVABL E

Produces vitamin K2, or menaquinone. Also plays an important role in intestinal health, namely the abundance of this genus is low in those suffering from inflammatory bowel disease (IBD).

Diet: The growth of this bacterium is supported by a high-fibre diet, especially consumption of whole-grain barley, as well as potatoes and whole-grain rice boiled and cooled down to fridge temperature, which contain type III resistant starch (RS3).

References: 40, 41

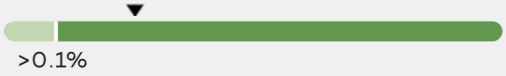
Probiotic bacteria

1.0%
OPTIMAL

Probiotic bacteria have health-promoting properties. They help maintain digestive health, support the immune system and metabolism, protect against inflammatory bacteria, produce vitamins (K2, B12, B9), promote nutrient uptake, and more besides.

References: 26, 27, 28

Bifidobacteria



1.0%
OPTIMAL

Bifidobacteria are beneficial gut bacteria that produce many of the organic acids needed by the body (such as acetic acid and lactic acid). In addition, they compete with harmful pathogenic bacteria for attachment to the intestinal mucosa.

Bifidobacteria are one of the most prevalent bacteria in the gut of infants. As we reach adulthood, the abundance of bifidobacteria in our gut drops, though they continue to play an important role in the health of our gut. Bifidobacteria include a number of probiotic strains, which are found in probiotic dietary supplements and added to probiotic dairy products such as kefir and yoghurt.

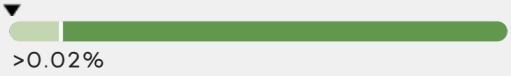
What can you do to promote the growth of bifi do ba ct e ria ?

The growth of bifidobacteria is promoted by foods rich in resistant starch and inulin, e.g., brown and wild rice (boiled and chilled), boiled and chilled potatoes, Jerusalem artichokes, asparagus, onions, and raw bananas.

They are also added to a number of probiotic dairy products (see packaging label).

References: 64, 65, 67

L ac t obac i lli



0%
IM PR OVABL E

Lactobacilli are beneficial gut bacteria that produce many of the compounds needed by our bodies (e.g., lactic acid, acetic acid, neurotransmitters).

Lactobacilli are a type of lactic acid bacteria, and their various strains are the most common bacteria in probiotics.

In addition, lactobacilli are used in the lactic starter of fermented products, including dairy products (fermented yoghurt) and pickled vegetables (pickled cucumbers and sauerkraut), or are added as probiotics to fortify dairy products (fortified yoghurts and kefir). Consuming lactobacilli is recommended in particular for those suffering from indigestion, e.g., antibiotic-associated diarrhoea.

Diet: Lactobacilli levels can be increased by eating

fermented vegetables such as kimchi, sauerkraut, and pickled cucumbers, as well as fermented dairy products such as fortified yoghurt, kefir, and sour m ilk.

It is recommended to consume 3–4 tablespoons of fermented foods daily. Fermented foods should be eaten raw, as exposure to heat is lethal to many b act e r ia.

References: 66, 67

Bacteria associated with gut inflammation

3.5%
IM PR OVABL E

Bacteria or pathogens that contribute to gut inflammation are largely covered by lipopolysaccharide (LPS) compounds and produce enterotoxins. In large quantities, they weaken the intestinal barrier and activate the body's immune system, causing an inflammatory reaction in both the gut and the rest of the body.

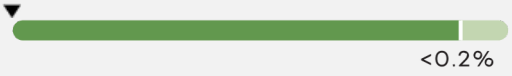
A normal microbial community plays a major role in reducing the harmful effects of inflammatory bacteria. A healthy, varied diet promotes the growth of beneficial bacteria that inhibit pathogenic b act e r ia.

Diet: To reduce the levels of bacteria associated with inflammation, it is recommended to reduce your intake of sweets, sweetened drinks, and other products containing added sugar. In addition, it is advisable to decrease your consumption of high-fat foods.

These should be replaced with a variety of high-fibre berries, fruits, and vegetables. In addition to fibre, they also contain a wealth of vitamins and minerals that bolster the immune system.

References: 10, 11, 60

Lahcnoclostridium gnavus



0%
OPTIMAL

This bacterium weakens the intestinal barrier by producing inflammatory compounds, and high abundance of this bacterium has been linked to inflammatory bowel disease (IBD), especially Crohn's disease.

Die t :

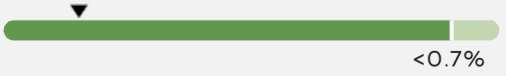
Higher fibre intake helps to suppress this bacterium.

We recommend that at least 80% of your diet consists of plant products and up to 20% animal products.

If your microbiome also contains the bacterium *Ruminococcus bromii*, you should avoid consuming foods that contain excessive amounts of resistant starch (whole grains such as whole-grain rice and oat flakes, potatoes, bananas – raw or boiled and cooled down to fridge temperature).

References: 41, 42, 56, 57

Lahcnoclostridium torques

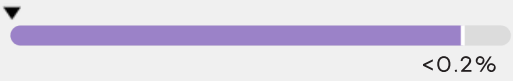


0.1%
OPTIMAL

Like *L. gnavus*, this bacterium has been linked to inflammatory bowel disease (IBD).

References: 41, 57

Fusobacterium (genus)

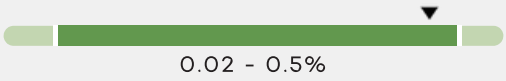


0%
OPTIMAL

High abundance of this genus of bacteria are associated with colon cancer and are considered a major biomarker in the assessment of colon cancer risk. The bacterium is further associated with the presence of inflammatory bowel processes and various forms of inflammatory bowel disease (IBD).

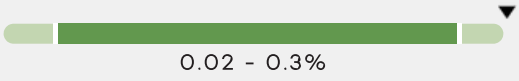
References: 41, 43

Enterobacteriaceae



0.5%
IM PR OVABL E

Escherichia



0.4%
IM PR OVABL E

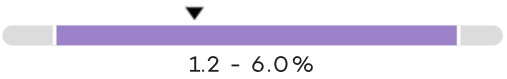
This family of bacteria has generally been associated with inflammatory processes in the gut and with inflammatory bowel disease, or IBD. Because of these inflammatory processes, a high abundance of *Enterobacteriaceae* also interferes with communication between the brain and the gut and has thus been linked to depression.

The family includes several pathogenic genera such as *Klebsiella*, *Salmonella*, *Campylobacter*, and others. The most widely studied bacterium *Escherichia coli*, which includes both probiotic strains (e.g., *Nissle*) and dangerous pathogens (e.g., O157), also belongs to this bacterial family.

Die t This family can be kept in check by a diet that is rich in fibre and low in fat.

References: 41, 44

Asaccharolytic bacteria, i.e. bacteria that don't metabolise fibre



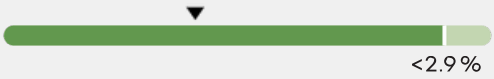
2.6%
OPTIMAL

Low fibre intake promotes the growth of asaccharolytic bacteria, i.e. bacteria that are incapable of metabolising carbohydrates. These bacteria begin to break down alternative nutrients such as amino acids and mucin, which can contribute to the development of inflammatory conditions in the gut.

A high abundance of asaccharolytic bacteria indicates a low intake of fibre and a diet that is rich in simple sugars.

If you have a high abundance of these bacteria, it is advisable to eat a higher amount of various vegetables, whole grains (oats, barley, millet, whole- grain rice, whole rye), and pseudocereals (buckwheat, quinoa, amaranth).

Colli nse Ila



1.2%
OPTIMAL

Dorea longicatena

0.7%
OPTIMAL

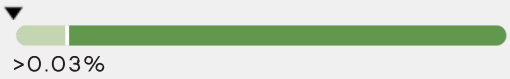
The abundance of these bacteria can be excessively high if your diet includes only a limited amount of fibre (especially whole grains and vegetables) and mainly consists of refined cereal products, such as white bread, white pasta, and white rice.

Although the links between these bacteria and diseases are not entirely clear, they have been found to be in higher abundance in the microbial communities of overweight individuals than in those of normal-weight individuals, and the abundance increases in the presence of metabolic diseases (such as obesity and type II diabetes).

Diet: These bacteria can be kept in check by eating high-fibre foods and avoiding refined cereals.

References: 22, 24, 45, 47

Phascolarctobacterium (genus)



0%
IM PR OVABL E

Although this bacterium is incapable of metabolising fibre, it can break down the succinate produced by other, fibre-metabolising bacteria (such as *Prevotella* and *Bacteroides*) into propionate, one of the three key short-chain fatty acids for intestinal health (the other two being butyric acid and acetate). As such, this bacterium is important for the protective capacity of the gut, and has been found to be in lower abundance in those suffering from inflammatory bowel disease.

References: 41, 48

Sulphur-reducing bacteria

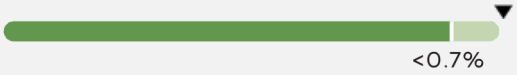
These bacteria break down sulphates, producing hydrogen sulphide (H2S), a toxic gas, which in large quantities can block the action of butyric acid, one of the most important gut-protecting compounds. This in turn contributes to the development of inflammatory conditions in the gut. In addition, probiotic lactic acid bacteria (*Lactobacillus*) are sensitive to hydrogen sulphide, which can lead to a decrease in beneficial probiotic bacteria.

Which foods are associated with the presence of these bacteria?

In the case of a high abundance, it is advisable to avoid excessive consumption of foods containing sulphur (e.g., fish and chicken) and to forgo foods containing sulphates (preservatives). We recommend replacing meat with a source of vegetable protein (e.g. tofu, beans, lentils, peas) in some of your meals, which also helps increase fibre intake.

References: 49, 50

Desulfovibrio (genus)



A major sulphur-reducing bacterium that contributes to inflammatory bowel disease (IBD) through the production of toxic hydrogen sulphide. This bacterium also has a detrimental effect on the growth of probiotic lactobacilli, thereby further reducing the protective capacity of the gut.

References: 49, 51

Bilophila (genus)

0.01%
OPTIMAL

This genus normally is found in very low abundance in the gut of healthy individuals. It is a bile-resistant bacterium, and in high abundance it is associated with a diet that is rich in animal products and saturated fatty acids.

What is more, the bacterium produces hydrogen sulphide, a toxic gas, from sulphate and cysteine, which in large quantities contributes to the development of inflammatory bowel disease (IBD).

Diet: In the case of a high abundance, it is advisable to reduce your consumption of foods that are high in fat and cysteine (e.g., red meat, eggs) and to reinforce your diet with fruits and vegetables.

References: 25, 41, 51

Alistipes (genus)

1.7%
OPTIMAL

A high abundance of this genus has been linked to constipation and slow intestinal transit. At the genus level, it is as yet unclear whether this bacterium is beneficial or not. Some species are associated with good health, weight loss, and a low body mass index, but there are also species for which the opposite has been observed.

References: 33, 53

Methanobrevibacter

1.0%
OPTIMAL

This genus of archea is one of the main producers of methane in the colon. Increased methane production is associated with colon cancer, which is often accompanied by a higher intestinal pH and constipation.

As it is a slow-growing bacterium, its higher abundance is indicative of slow intestinal transit.

Diet: The abundance of this bacterium can be reduced by consuming foods that speed up bowel movements (e.g., apples, plums, cabbage), water-absorbing fibre (e.g., beta-glucans from oats, pectins (currants, apples, plums), psyllium, and by drinking sufficient amounts of water.

References: 45

Ruminococcus bromii (species)

5.9%
OPTIMAL

A key species for the degradation of resistant starch (a type of fibre).

The absence or low abundance of this bacterium can result in ineffective degradation of resistant starch. Levels of Ruminococcus bromii drop in cases of inflammatory bowel disease (IBD).

Diet: The abundance of this bacterium can be increased by consuming foods that are rich in resistant starch (whole grains such as whole-grain rice and oat flakes, as well as potatoes and bananas – raw or boiled and cooled down to fridge temperature).

References: 24

Akkermansia (genus)

2.7%
IM PR OVABL E

A mucin-degrading bacterium that plays a major role in the regeneration of the intestinal mucus membrane. This bacterium has been linked to good gut health, weight loss, and a low body mass index (BMI) .

The genus *Akkermansia* is a key player in maintaining good health, as it has been shown to protect against becoming overweight and the harmful health effects associated with being overweight.

Although the bacterium has been found to have a multitude of health benefits, an excessively high abundance of *Akkermansia* can indicate problems with bowel function. High abundance of *Akkermansia* can result, for example, from constipation and slow intestinal transit. In addition, it has been observed that *Akkermansia* features widely in the intestinal communities of Parkinson's patients, though this may simply stem from constipation, which happens to be one of the most common problems in Parkinson's disease.

Diet: The growth of *Akkermansia* is promoted by polyphenols (an antioxidant found in cranberries, blueberries, raw cocoa, grapes, flaxseed, and green and black tea), omega-3 fatty acids (e.g., fish oil), and oligofructose (found in inulin-containing dietary supplements).

References: 31, 33, 54, 55

Prevotella (genus)

0%
IM PR OVABL E

Unequivocal associations with health outcomes have yet to be found for this bacterium, but there is a clear relationship between the abundance of of Prevotella and eating habits.

Long-term intake of fibre and complex carbohydrates is accompanied by a more diverse mix of *Prevotella* species, as well as better health outcomes owing to the consumption of fibre.
In the case of a Western diet rich in protein and fat, the abundance of *Prevotella* in the gut community is low. Bacteria of the genus *Prevotella* are sensitive to bile, which means that with a fat-rich diet, the intestinal environment is not conducive to their growth.

Diet: Abundance of this genus can be increased by long-term consumption of fibre-rich foods of plant origin. In the case of low abundance, it is advisable to limit your intake of meat and other animal products.

References: 4, 52, 59

Bacteroides (genus)

2.1%
OPTIMAL

Bacteroides is a common bacterium in the human gut. The genus includes species with diverse fibre degradation capabilities that also act as important producers of vitamins in the gut.

Despite being a major fibre metaboliser, high abundance of *Bacteroides* have been linked to the consumption of protein- and fat-rich foods of animal origin and the so-called Western diet.
When the body breaks down fats, it produces bile, which prevents many fibre-degrading bacteria from surviving. *Bacteroides*, however, is a bile-resistant genus of bacteria that can survive elevated levels of bile in the gut, which is why it is linked to a high-protein and high-fat diet.

Diet: In the case of a high abundance of *Bacteroides*, you should reduce your intake of protein- and fat-rich animal products and give preference to plant-based foods (by replacing meat with sources of plant protein such as legumes, tofu, etc. in some of your meals).

References: 4, 58, 59

Oxalobacter (genus)

NOT DETECTED - INCREASED RISK OF KIDNEY STONES

This genus includes the species *Oxalobacter formigenes*, a key oxalate-degrading bacterium.

Oxalates are formed when the oxalic acid found in plants binds with calcium in the body: the resulting compound crystallises, and when these solid compounds build up, kidney stones are formed.
Oxalobacter, as a metaboliser of oxalates, plays a major role in the prevention of kidney stones, as the human body is incapable of breaking down oxalates on its own. *Oxalobacter* has been found to be only half as widespread in people suffering from kidney stones as in healthy individuals, so this bacterium is a good indicator of predisposition to kidney stones.

Diet: In the absence of this bacterium, it is advisable to avoid excessive consumption of oxalate-containing foods (e.g., spinach, rhubarb, chard, sorrel, green beans, buckwheat, amaranth, almonds, cashews, sesame seeds, tahini, cocoa, dark chocolate, soy products).

As fatty foods promote the absorption of oxalates, in the absence of *Oxalobacter*, you should also reduce your intake of fatty foods and avoid consuming foods rich in oxalic acid in conjunction with fats.

References: 38, 39

Appendix 1
Dietaryfibercontent

●	<2 g/100g 2-
● ●	3.9 g/100g 4-
● ● ●	10 g/100g
● ● ● ●	>10 g/100g

	PR O DU CT	FIBER IN COOKED OR BAKED FOOD	FIBER IN RAW PRODUCT/DRY MATTER
CEREALS	whole-wheat pasta	● ● ●	● ● ● ●
	oat flakes	● ●	● ● ● ●
	rye bread	● ● ●	● ● ● ●
	white rice*	●	● ●
	brown rice	● ●	● ● ●
	white-wheat pasta	●	● ●
	bread graham	● ●	● ●
	bread (from multi-grain flour)	● ● ●	● ● ●
	buckwheat	●	● ● ●
VEGE TABLES	carrot	● ●	● ●
	cab b ag e	● ●	● ●
	potato*	●	●
	cucumber	●	●
	onion	● ●	●
	tomato	●	●
	av o cad o	● ● ●	● ● ●
LEGU MES	beans	● ● ●	● ● ● ●
	ch ick p e as	● ● ●	● ● ● ●
	le n t ils	● ●	● ● ●
FRUITS	b an an a**	●	●
	plum	●	●
	tropical fruits	●	●
	orange	●	●
	ap p le	● ●	● ●
B ERRIES	strawberry	● ●	● ●
	blackcurrant	● ● ●	● ● ●
	blueberries	● ●	● ●
NUTS & SEEDS	linseeds	● ● ● ●	● ● ● ●
	nuts sunflower	● ● ●	● ● ●
	seeds	● ● ●	● ● ●
OT H ER	psyllium	● ● ● ●	● ● ● ●
	mushrooms	● ●	●

* Boiled potato and rice, that is refrigerated contains more fiber, as some of the starch is converted into resistant starch.

** The fiber content in bananas depends on its ripeness. Raw (green) bananas have higher fiber content, as resistant starch partially degrades into digestible starch, when banana is ripened.

Appendix 2
Generalrecommendations for promoting (gut) health

Digestion

Your stool reflects the health of your digestive tract. Digestion can be assessed by the frequency and appearance of your stools. The recommended frequency of bowel movements is 3 times a week to 3 times a day. The Bristol stool scale developed for the assessment of the appearance of human faeces divides stool into seven types. Types 3 to 4 on the scale indicate good gut health. Lower values indicate constipation and higher values indicate diarrhoea. It has been found that in people suffering from constipation, the diversity of the microbiome can be higher because the bacteria have more time to grow, and, conversely, diarrhoea can lead to low diversity because the bacteria are flushed out of the gut too quickly.

Water

Water is necessary for transporting nutrients and oxygen to all cells in the body, for absorbing nutrients, for keeping the body temperature stable, and for expelling waste products from the body. In addition, drinking water is important in the case of a fibre-rich diet to ensure the smooth transit of food through the intestine.

RECOMMENDATION: The golden rule is to consume 28–35 ml of liquid per kilogram of body weight per day, including liquid from food of plant origin. If you get a lot of exercise and physical activity daily, you will also need to consume more water.

Coffee

There are many theories about the benefits and harms of coffee. In any case, when consuming coffee and other caffeinated beverages, it should be borne in mind that they increase fluid excretion from the body, especially if you are not a regular coffee drinker. In addition, coffee should be consumed on an empty stomach or as a meal replacement.

RECOMMENDATION: While the effects of caffeine are highly individual, we do not recommend drinking more than 1 cup of coffee a day. If you are a frequent coffee drinker, make sure to consume enough water.

Gastrointestinal health

If there is mucus or blood in your stool, it may be related to various diseases of the gastrointestinal tract (it is normal for women to have mucus in the stool depending on the menstrual cycle). In such a case, we recommend consulting a doctor for further tests.

Gastrointestinal symptoms

Bloating and flatulence are a normal part of everyday life. However, if they become too frequent and interfere with your daily activities, it is advisable to investigate the causes. Bloating and flatulence can depend on a number of factors, including diet and exercise. Symptoms can also occur if you change your diet too abruptly, which is why it is a good idea to do so gradually, in order to allow your body to adjust to the changes.

RECOMMENDATION: Bloating and flatulence can be caused by an irregular diet. As such, you should find a suitable daily routine, eat slowly and chew your food properly, and consume high-fibre products regularly to get your body to adapt. Also, monitor if any foods are causing more problems than others. Discomfort can also arise from irregular, one-time consumption of large amounts of fruit, vegetables, or legumes, or excessive intake of sugary foods, which can cause gas and bloating.

Meal times

It is important to have regular meal times to keep your blood sugar levels stable throughout the day and avoid excessive fluctuations. Blood sugar affects our energy levels and mood.

RECOMMENDATION: We recommend eating at least three times a day, in order to avoid overeating due to long breaks between meals. Your biggest meal of the day should ideally be lunch, with dinner being on the lighter side.

Consumption of added sugars

Our body does not need added sugars for any bodily function! Sweet, sugar-rich products are high in energy and fast carbohydrates, but often very low in fibre, vitamins, and minerals. Sugar-rich products can cause uncomfortable bloating and flatulence.

RECOMMENDATION: Added sugars in your food should not exceed 10% of the recommended daily calorie intake.

Alcohol

Alcohol slows down digestion. Besides other potential harmful effects, alcohol provides a large amount of extra energy to the body, which can lead to obesity.
In addition, overconsumption of alcohol prevents the absorption of nutrients in the body. Moreover, persistent and excessive alcohol consumption is a significant risk factor for a number of health problems.

RECOMMENDATION: It is recommended to abstain from consuming alcohol on at least three days per week. Additionally, average daily alcohol intake should not exceed 1 unit of alcohol for women and 2 units for men.

Exercise and workout

Exercise is positively related to mental health and quality of life as well as self-esteem and psychological well-being for all age groups, and also has a positive effect on your digestion.

RECOMMENDATION: It is recommended to walk for at least 30 minutes every day. The healthy amount of cardio is 150 minutes a week (medium intensity workout), or 75 minutes in the case of a more intensive workout. It is beneficial to do strength training 3 times a week. A good rule of thumb is to exercise all muscle groups over the course of the week.

Sleep

Sleep duration and quality affect a multitude of bodily functions, including eating behaviour. Lack of sleep increases cravings for food that is high in carbohydrates and calories and also causes you to eat larger amounts of food. Our diet, in turn, affects the quality of our sleep (e.g., eating late in the day can reduce the quality of deep sleep, which is essential for the body's recovery process).

RECOMMENDATION: The recommended sleep duration for adults is 7–9 hours per night.

Appendix 3

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