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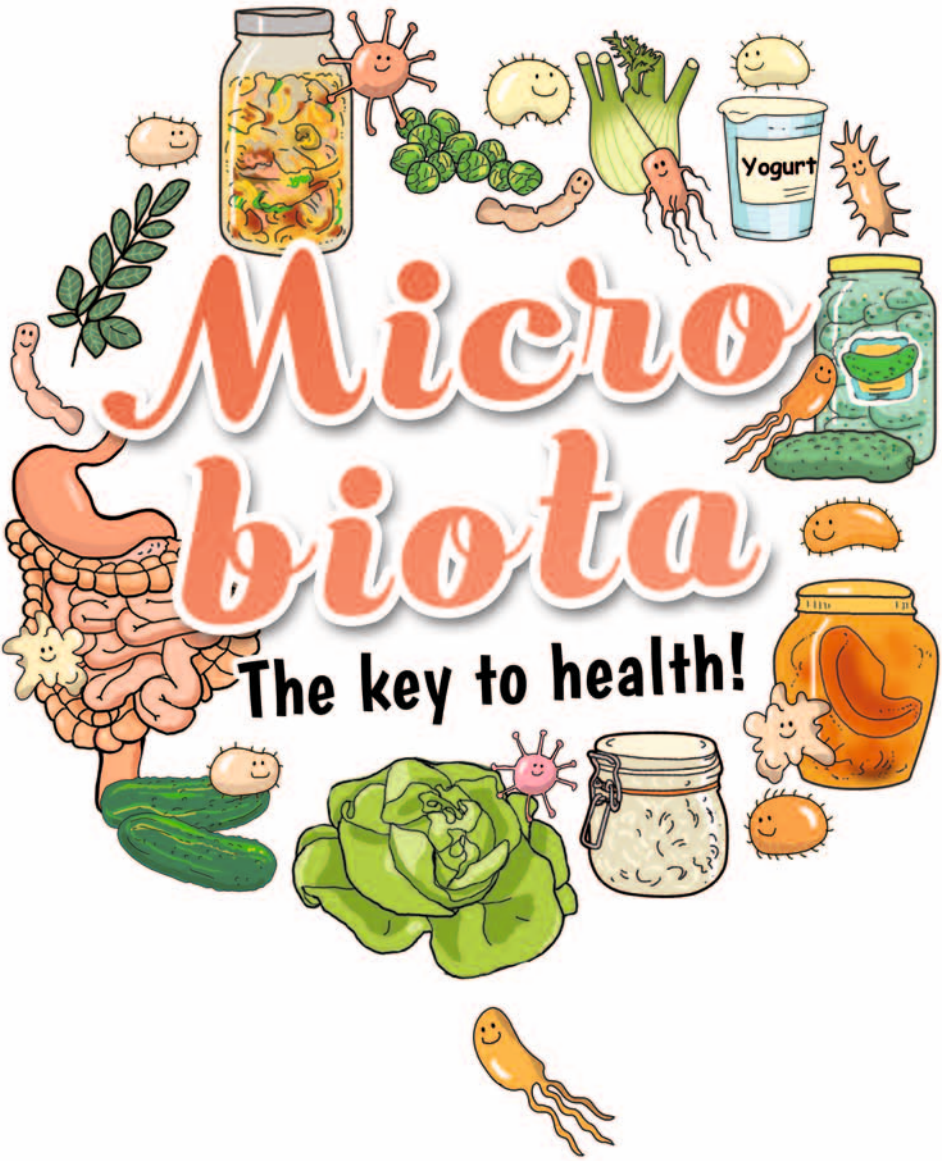


Microbiota

The key to health!

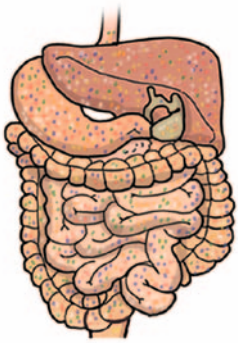
Your guide to understanding and selecting the right probiotics for health and well-being

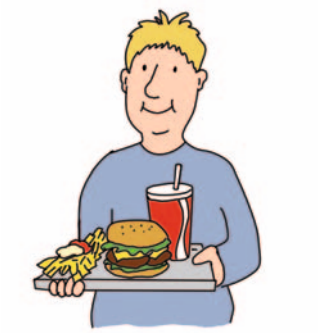
> *'The microbiota plays a major role in health and disease in humans; indeed, it is sometimes referred to as our forgotten organ.'*
>
> *A.M. O'Hara, F. Shanahan.*

Introduction

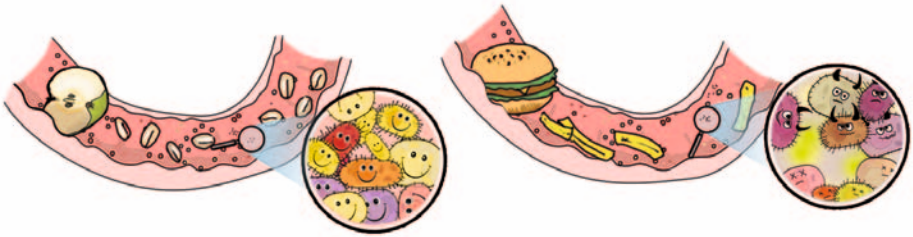
In all human cultures various fermented food products have been traditionally used as a method of preserving food. In addition to good taste, the naturally fermented foods containing live microorganisms have many health benefits. Today we have a better understanding of the important role played by various classes of microorganisms in our food and environment, as well as our bodies, in maintaining good health.

Our body contains tens of trillions of various bacteria, of which one third is common to most people, while two thirds are specific to each individual and largely dependent on food choices and lifestyles. This microbiota affects most metabolic functions in our bodies, protects against diseases, supports the immune system, and even can modulate our mood and behavior.



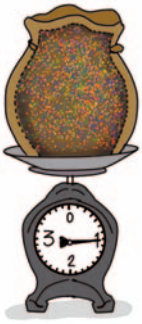


This close relationship between gut microbiota, health and disease has led to great interest in using probiotics (live microorganisms) and prebiotics (non-digestible substrates bacteria use to grow) to positively modify the gut microbial environment.

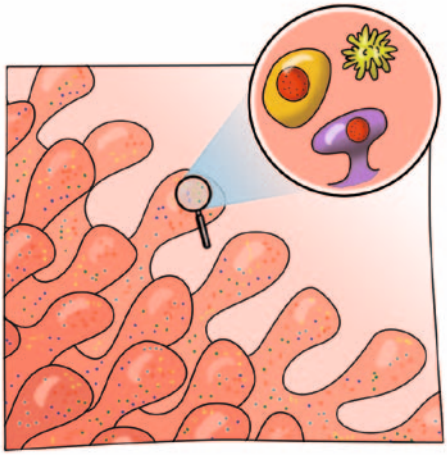


This guide will introduce you to friendly microorganisms inhabiting our body and discuss the practical aspects of using probiotics, their health benefits, safety, and how to choose the most effective probiotic supplements.

Microorganisms populating our gut

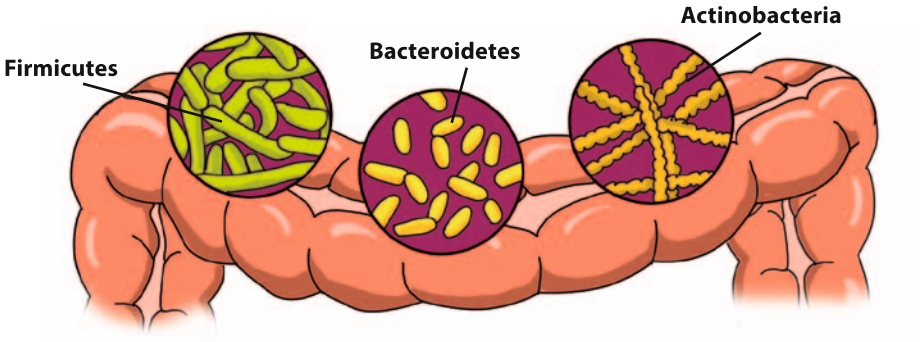


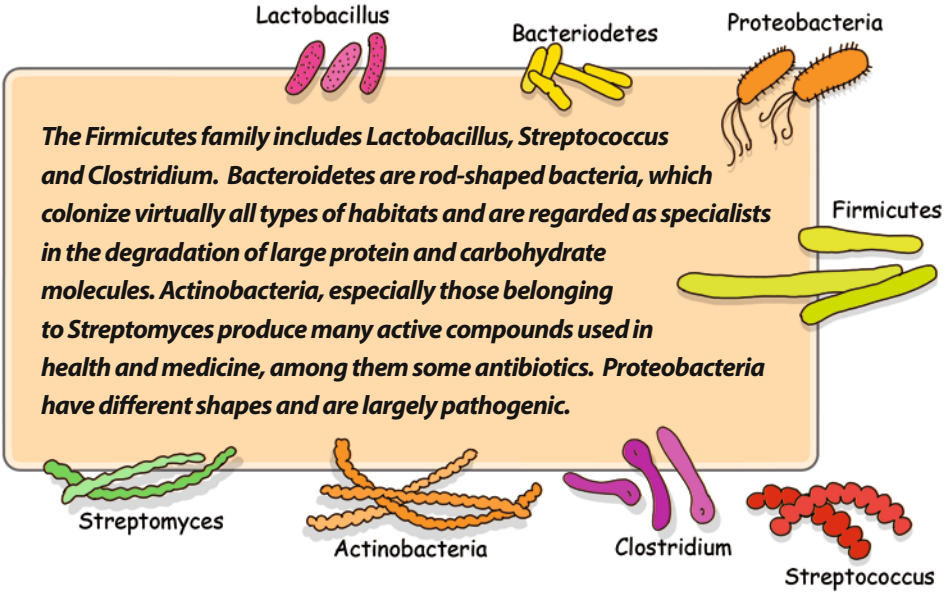
When we think about bacteria we often associate them with a disease, however our body is inhabited by trillions of friendly microorganisms that are essential to our health and well-being. For every single human cell there are about 10 microbes! Imagine, collectively they account for over 1 kg of our body weight!



The human gut harbors various combinations of bacteria, fungi and viruses. These organisms belong to distinct species. As such, all bacteria are prokaryotic organisms because they do not have a nucleus. Fungi, which are composed of cells with a nucleus, are eukaryotic organisms. However, viruses are not cells at all so they are neither prokaryotic nor eukaryotic. They can only multiply when they invade a living cell.

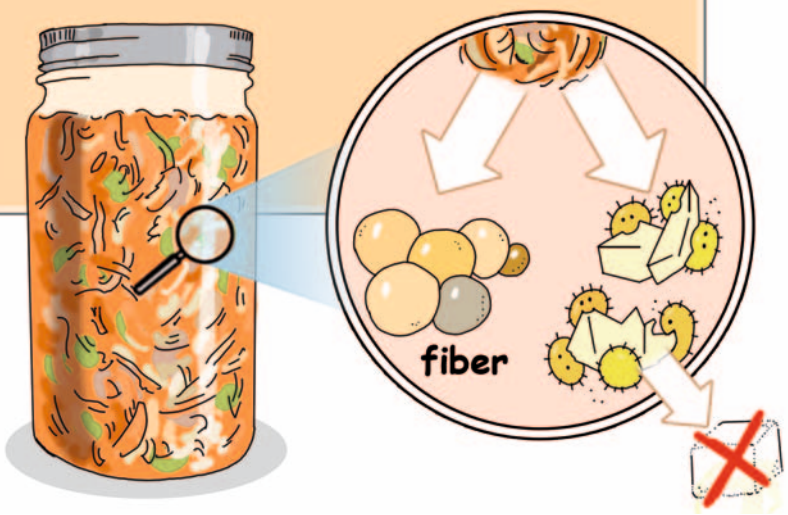
Our gut hosts between 400 to 1000 bacterial species distributed among nine main classes. The most dominant bacteria found in the human microbiota include the classes Firmicutes, Bacteroidetes, Actinobacteria, and Proteobacteria with Firmicutes and Bacteroidetes representing around 75% of the diversity.





The Firmicutes family includes Lactobacillus, Streptococcus and Clostridium. Bacteroidetes are rod-shaped bacteria, which colonize virtually all types of habitats and are regarded as specialists in the degradation of large protein and carbohydrate molecules. Actinobacteria, especially those belonging to Streptomyces produce many active compounds used in health and medicine, among them some antibiotics. Proteobacteria have different shapes and are largely pathogenic.

Natural probiotics found in sauerkraut and kimchi are an integral part of a process called 'fermentation', which involves the decomposition of fiber and sugars in the absence of oxygen. The fermentation's quality depends on microbe numbers and species.



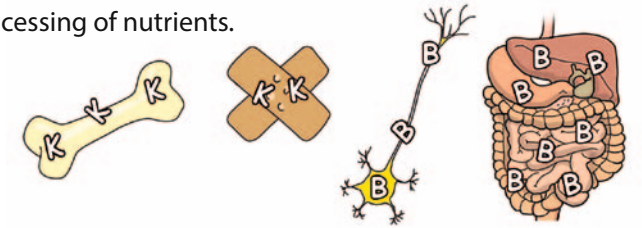
Bloating tells that intestinal bacteria are working

The many bacteria that inhabit the large intestine decompose fibers and sugars in the absence of oxygen, producing organic gases among other products. Depending on the type of food consumed more or less gas can be created in this process. It is known that cabbage and beans are gas-causing foods and may cause bloating in some individuals.

Useful hint: Cumin and fennel seeds added to cabbage, beans or other food will reduce bloating significantly!

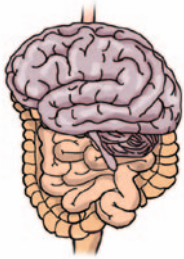
Microbial activity generates Vitamin K and B vitamins

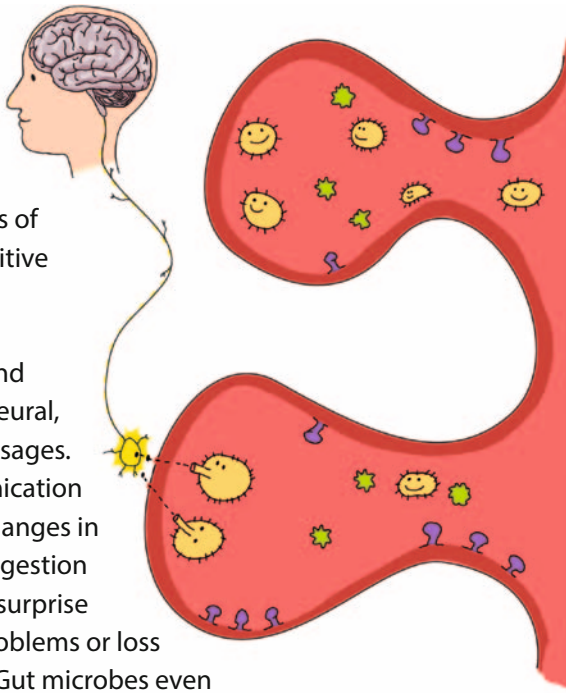
The microbiome of the large intestine provides some important substances that your body needs to stay healthy. Bacteria produce vitamin K, which is important in blood clotting and bone health and also some B vitamins needed in many metabolic reactions as well as in the processing of nutrients.



Intestinal bacteria communicate with other organs in the body

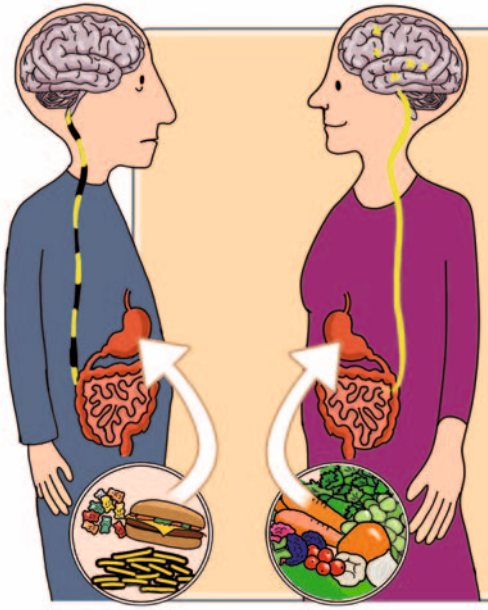
Today we know that the gut microbiota heavily contributes not only to how we digest food, but also our ability to fight disease and can even determine our mood and psychological status.





Small molecules released by the activity of the gut bacteria can stimulate nerves in the gastrointestinal tract that have a direct connection to the nerve cells of the brain. The gut's effect on cognitive functions has even acquired it the nickname of the 'second brain.' The constant interaction of the brain and gut occurs through a network of neural, hormonal and immunological messages. In the event of stress, this communication can be easily disturbed, causing changes in the microbiota, which can affect digestion and micronutrient absorption. No surprise then that we develop digestion problems or loss of appetite during times of stress. Gut microbes even send signals to the brain, affecting whether we feel hungry or full.

The microbiota also supports the immune system, and the immune system in turn supports the microbiota. Their communication occurs through nerve transmission, which involves many different classes of molecules and extends beyond the immune system.



Research has shown that the enteric nervous system (consisting of the vagus nerve, and the brain, as well as the endocrine routes) build pathways by which gut microbes communicate with their host.

Unhealthy food choices, like a cheeseburger with a coke, can stress the entire system badly, resulting in bloating, exhaustion, mood swings or tiredness which is the body's way of communicating that something is not right.

You can support friendly bacteria by choosing the right diet

Plant-based nutrition, rich in fibers and complex carbohydrates, forms a natural foundation to support the growth of useful bacteria. These so-called 'prebiotics' are present in most fruits and vegetables such as chicory, dandelion, artichoke, garlic, onions, leeks, asparagus, bananas, barley, oats, apples, flaxseeds and seaweed.

Our first microbiota comes from the mother

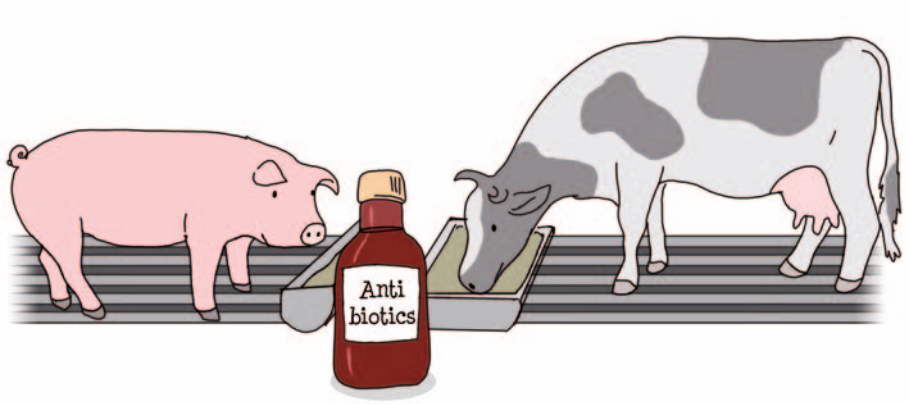
Animals developing in the womb immediately start building their own microbiome. However humans are different. We acquire our first microbes at the entrance of the mother's cervix as we are born. With these early microbial bacteria adaptive immunity starts, protecting the newborn's body from damaging, disease-causing organisms. Babies born by C-section delivery suffer a lack of exposure to this microflora, which has been associated with abnormal microbial seeding of the gastrointestinal tract and consequently impaired development of effective immunity.

Our microbiota can malfunction for a variety of reasons

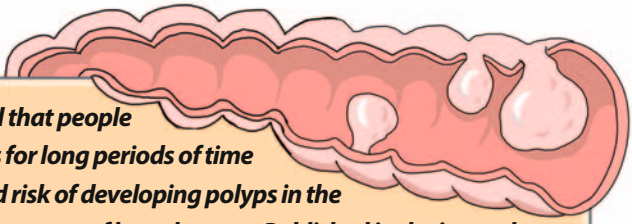
The entire bacteria population can be damaged by the wrong dietary habits, such as processed food, excess meat, excess salt, sugar, alcohol, soft drinks, fast food, and saturated fats. Also, environmental toxins have a detrimental impact on our bacteria population. Besides colorants, preservatives and other toxic food additives, the worst group of environmental toxins include triclosan (used in antiseptic products), pesticides, BPAs (in plastics), phthalates used in hundreds of products – such as vinyl flooring, detergents, plastic clothes (raincoats), and personal-care products (soaps, shampoos, hair sprays, and nail polishes) – and heavy metals found in soil, food, water and the environment. Unfortunately, we are exposed to these daily.

Pharmaceutical drugs and antibiotics kill disease-causing bacteria, but at the same time disrupt our healthy microbiome.

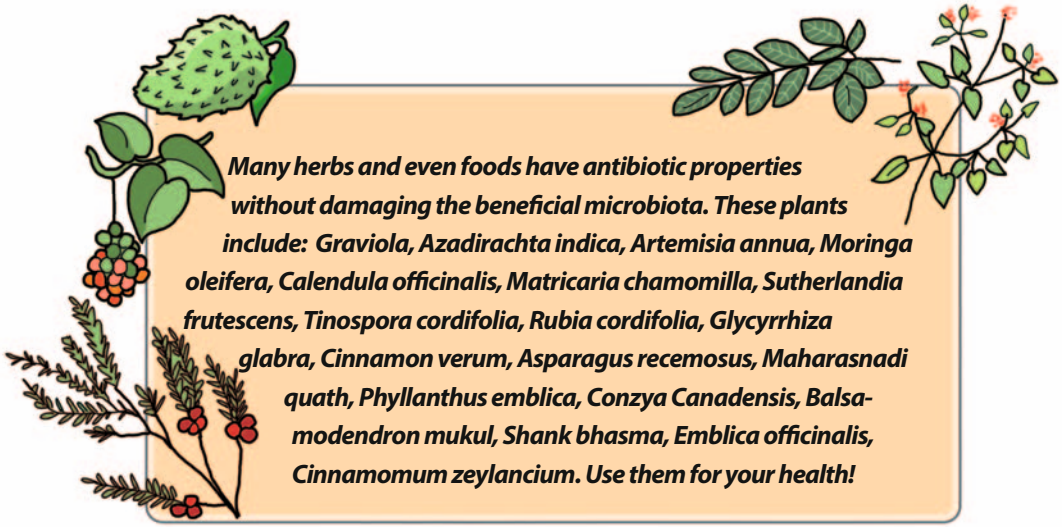
Antibiotics: A 2018 study found out that global antibiotic consumption had increased by 65% over the 15-year period studied [1]. Antibiotics are a huge market for the pharmaceutical industry, comprising drugs used not only for humans, but also in large part for industrial meat production in order to grow bigger animals or to prevent illness as a result of cramped and unhealthy environments. In 2011, about 80% of all antibiotics sold in the United States were consumed by livestock. You should be aware that the meat you buy at the store may contain traces of antibiotics unless the label reads "grown without added antibiotics".



Since antibiotics can severely destroy the healthy microbiota, they create the foundation for other diseases to develop, and hence give pharmacology the opportunity to promote new treatments, which further expand the global drug marketplace.

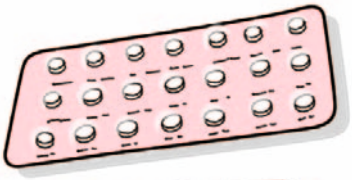


A study has found that people taking antibiotics for long periods of time have an increased risk of developing polyps in the colon, a known precursor of bowel cancer. Published in the journal Gut, the research adds further weight to growing evidence that maintaining a healthy intestinal microbiota may play a key role in the prevention of cancer [2, 3].



Many herbs and even foods have antibiotic properties without damaging the beneficial microbiota. These plants include: Graviola, Azadirachta indica, Artemisia annua, Moringa oleifera, Calendula officinalis, Matricaria chamomilla, Sutherlandia frutescens, Tinospora cordifolia, Rubia cordifolia, Glycyrrhiza glabra, Cinnamon verum, Asparagus recemosus, Maharasnadi quath, Phyllanthus emblica, Conzya Canadensis, Balsamodendron mukul, Shank bhasma, Emblica officinalis, Cinnamomum zeylancium. Use them for your health!

Birth control pills: The synthetic form of estrogen in the birth control pills can increase the risk of developing Crohn's disease and ulcerative colitis.



Antacids and proton pump inhibitors (PPI): These widely used stomach acid suppressants sold under the names Prevacid and others, also can dramatically change gut microflora.

This would explain why people who regularly take antacids are prone to developing intestinal infections caused by bacteria, such as Salmonella and Clostridium difficile.

Interestingly, a study on this topic was published by the researchers from University Medical Center Groningen and Maastricht University Medical Center. They collected stool samples from 1,815 study participants. The bacterial communities in these stool samples were then studied in the laboratory using microbial DNA-sequencing techniques. The results showed that in participants using PPIs approximately 20 % of gut flora was altered – a substantial change. Some groups of bacteria were present in much larger numbers, while the numbers of other groups were clearly reduced. Researchers also examined the bacterial composition in some of the participants' saliva. They observed that the weaker gastric juice in the antacids users allowed many bacteria populating our mouth that would normally be killed by gastric acid, to pass through the stomach and end up in the lower portions of the gut [4].

Other drugs: Metformin, nonsteroidal anti-inflammatory drugs (NSAIDs), opioids, statins and antipsychotics also have various damaging impacts on the microbiota, as reported in various studies [5].

Many clinical symptoms and diseases can be linked to changes in microbiota

Many people do not realize that an unhealthy microbial status can bring an array of different symptoms, such as bloating, gas, diarrhea, bad breath, but also skin problems (acne) or induce sugar cravings. Various changes in microbial population can also manifest themselves in the form of frequent mood swings, anxiety and

depression, in specific food allergies and even result in low immunity and diabetes.

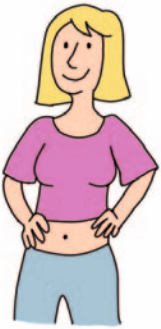
Numerous studies have uncovered strong connections between altered gut microbiota and health problems.

Diarrhea

Illnesses resulting in diarrhea have different causes, but all disrupt normal intestinal function. Consumption of high levels of probiotics may shorten the duration and severity of many diarrheal diseases. Probiotics containing Lactobacillus have been shown to be safe and effective even in children with acute infectious diarrhea. They can also decrease traveller's diarrhea and recurring colitis due to Clostridium difficile.

Constipation

Studies show that taking Lactobacillus probiotics for 4-8 weeks can reduce symptoms of constipation including stomach pain and discomfort, bloating, and incomplete bowel movements. It might also increase the number of bowel movements in some people. Similar encouraging results come from the use of other probiotic strains [6].

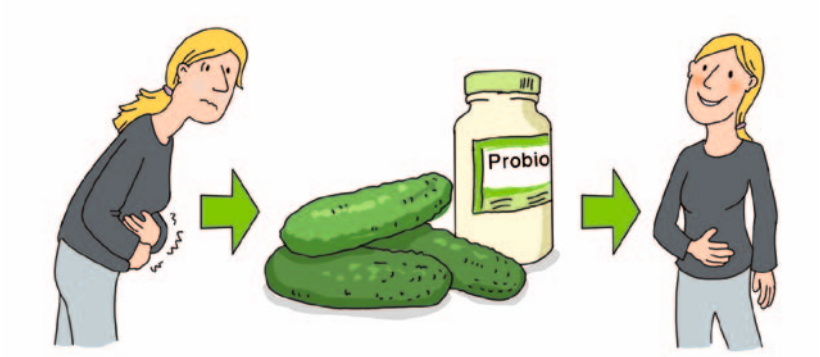


Irritable Bowel Syndrome (IBS)

A double-blind placebo controlled study over 4 weeks concluded that L. Plantarum 299v provided relief from abdominal pain and bloating in patients with Irritable Bowel Syndrome [7].

Inflammatory Bowel Disease (IBDs)

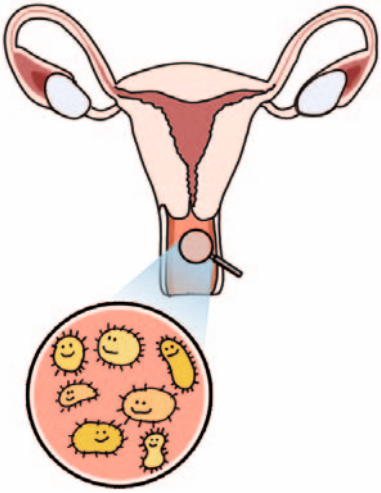
Inflammatory bowel diseases are a group of different chronic disorders that result from a malfunctioning interaction of the intestinal immune system with the gut microbiota [8].
Various studies indicate that most IBDs develop as a response to chemical antibiotics administered in early childhood and resulting damage to microbiota [9, 10].



According to a large study from the UK, exposure to antibiotics during childhood, particularly to anaerobic antibiotics, can increase the development of IBD by a staggering 84% [11].

By assessing microbial profiles in individual patients and optimizing the conditions for the growth of beneficial microbes, there is great potential for an effective IBD therapy [12].

Vaginosis

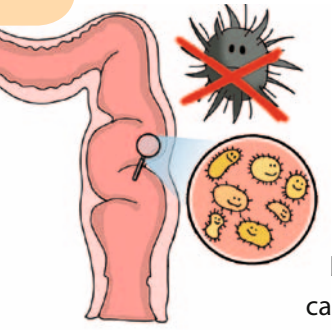


The vagina and its microflora form a finely balanced ecosystem, disruption of which can lead to symptoms of vaginosis. This paves the way for serious conditions, including pelvic inflammatory disease and pregnancy-related complications (low birth weight babies). In a healthy vagina the predominant bacteria is Lactobacilli, which is involved in maintaining the right acidity to inhibit pathogens through the production of hydrogen peroxide.

Cancer

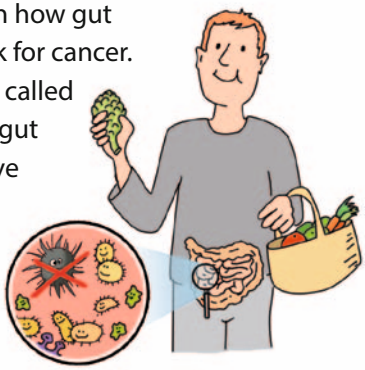
Cancer involves uncontrolled cell division caused by the mutation or activation of abnormal genes through exposure to various chemical carcinogens. It has been proposed that probiotics may decrease the metabolic impact of chemical carcinogens by supporting their detoxification or producing specific metabolites (i.e. butyrate) which promote the death of abnormal cells (apoptosis). Probiotics can also help produce compounds that inhibit tumor cell growth and stimulate the immune system to effectively scavenge and eliminate abnormal cancer cells.

Scientific evidence indicates that we should take care of the microbial communities in our bodies, as they are beneficial to our overall health and help reduce cancer risk, saving millions of lives [13].



In relation to this, an increasing number of studies support the connection between gut microbiota and the risk for colorectal cancer and infections. They indicate that some of the gut anaerobic bacteria are significantly higher in colon cancer patients [14].

A recent study conducted by Dr. Patrick Varga-Weisz (Babraham Institute, Cambridge) and his team shed light on how gut bacteria can affect genes which increase the risk for cancer. The researchers showed that specific molecules called short-chain fatty acids, generated by beneficial gut bacteria when digesting healthy foods, can move into our own cells and trigger processes that change gene activity and cell behavior [15].



Inflammation

It has been shown that L. Plantarum can help regulate immunity and control inflammation in the gastrointestinal tract. There is also an indication that probiotics can be used in sepsis, which affects around 30 million people worldwide and causes 6–9 million deaths. Sepsis is the leading cause of hospital deaths and it arises when the body's immune response to infection becomes overwhelming. In sepsis, the immune response leads to the release of chemicals into the blood, which result in widespread inflammation, leakage of blood vessels and formation of blood clots. This chain of events results in organ damage and even multiple organ failure. A 2017 study conducted by research team at the University of Nebraska Medical Center, College of Public Health has shown that a special mixture of good bacteria in the body reduced the incidence of sepsis in infants in India by a staggering 40 percent [16].

Metabolic Syndrome (MetS)

Metabolic syndrome is a complex disorder caused by a cluster of interrelated factors such as obesity, hypertension and changes in the fat and carbohydrate metabolism that increases the risk of cardiovascular diseases and type 2 diabetes. There is a strong connection between diet, gut microbiota, and metabolic syndrome. Scientific evidence has been growing in support of using pro- and prebiotics as a successful natural measure for MetS [17].

Obesity

The main precursor of metabolic syndrome is obesity. WHO statistics show that in 2016 more than 1.9 billion adults were overweight, out of which 650 million were obese [18].
An evaluation of fifteen studies comprising 957 obese patients (63% women) showed that a 3-12 week supplementation with probiotics resulted in a significantly larger reduction in body weight than in the control group without any treatment [19].

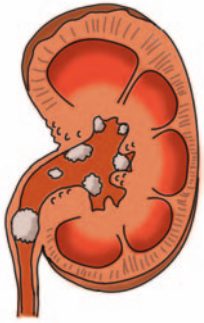
Besides healthy nutrition, proper supplementation with beneficial gut microbiota should be a good strategy to fight obesity. This approach is safe and well-tolerated for long-term use.
Modulation of gut microbiota by probiotics would not only influence glucose and fat metabolism, but also improve insulin sensitivity in order to prevent diabetes and reduce chronic inflammation [20].

Diabetes Type 2

Type 2 diabetes is a serious global public health problem. Worldwide the diabetic population is now 382 million and will reach 592 million by 2035. The disease results in an enormous cost for health care.

The central role of gut bacteria in insulin resistance was first demonstrated in 2007 by Cani and his team [21].
Recently published meta-analysis of 12 clinical studies conducted in type 2 diabetes patients demonstrated that taking probiotics was associated with a significant lowering of HbA1c (glycated hemoglobin which reflects the average glucose levels in the past 3 months) and also fasting insulin [22].

Positive changes in the gut microbiota and improved glucose metabolism could also be obtained by healthy dietary interventions with lots of micronutrients and fiber, based on 8 studies assessing the effects of diet in adults with type 2 diabetes [23].



Kidney Stones

Most kidney stones are composed of oxalate salts. There is an indication that a probiotic formula that contains bacteria able to degrade oxalate and as such, decrease its secretion in feces. This suggests that through the positive impact of bacteria on oxalate levels in the intestines, certain probiotics may decrease oxalate absorption, and consequently, the formation of kidney stones.

Autism

Metabolic microbial products released into the bloodstreams of mammals including humans, can cross the blood-brain barrier and influence neurodevelopment. They can either promote or alleviate neurological disorders including autism spectrum disorders (ASD). Autism is characterized by impaired social interactions and communication and leads to restricted, repetitive, and non-neurotypical patterns of behavior, interests, and activities. The causes of these disorders remain poorly understood, but gut microbiota, the 1013 bacteria in the human intestines, have been implicated because children with ASD often suffer gastrointestinal problems that correlate with ASD severity. Several studies have reported abnormal gut bacteria in children with ASD.

A small open-label clinical trial evaluated the impact of Microbiota Transfer Therapy on gut microbiota composition and gastrointestinal and ASD symptoms of 18 children diagnosed with this problem. After eight weeks of treatment there was a significant (80%) reduction of gastrointestinal symptoms and improvement of behavioral ASD-related symptoms that persisted for up to 8 weeks after the treatment ended, in addition to positive changes in the gut environment [24].

The gut microbiome-ASD connection has been also tested in a mouse model of ASD, where the microbiome was mechanistically linked to abnormal metabolites and behavior [25]. Researchers from the Baylor College of Medicine studied the impact of maternal diet and gut bacteria on the social traits of ASD mice. Their findings provide strong evidence for probiotic interventions into a number of

neurological disorders. In this particular study 60 pregnant female mice were put on a diet that was the equivalent to eating fast food. The resultant pups stayed for three weeks with their mothers before being introduced to a normal diet. During this time autism-like behaviors were noted in the pups as they spent little time with other mice and did not initiate social interactions.

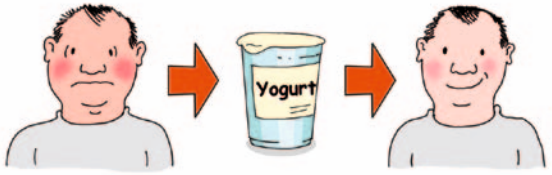
Next, the researchers examined the microbiome of the mice from the fast food-fed mothers and compared it to another group of mice whose mothers were fed a normal diet. They found that the two groups had completely different gut microflora populations.

From examining the microbiome of an individual mouse, the researchers could predict whether it was from the fast food group or the one fed a normal diet. The next step was to find out whether these changes in gut bacteria really were the cause of the differences in social behavior. In order to answer this question, the researchers took advantage of the fact that mice frequently eat each other's feces. They put mice from different diets in one cage together, so that the microbiome would be spread among them. Within 4 weeks the behavior patterns returned to normal.

Overall conclusion: Yes, your diet matters!

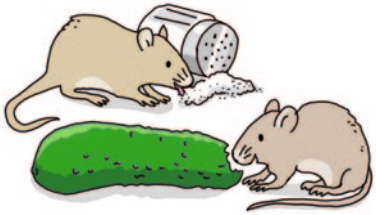
Hypertension

The estimated total number of adults with hypertension worldwide during the year 2000 was 1 billion and predicted to rise to 1.58 billion by the year 2025.



A systematic analysis of randomized, controlled trials in patients with hypertension demonstrated positive effects of probiotic consumption on blood pressure, especially when using multiple compared to single species probiotics [26].

Certain probiotic strains such as Lactobacilli and bifidobacteria can effectively produce various metabolites and angiotensin-converting-enzyme (ACE) inhibitory peptides, which have hypotensive effects [27]. A pilot study in humans also demonstrated positive effects of the consumption of fermented milk on blood pressure [28].



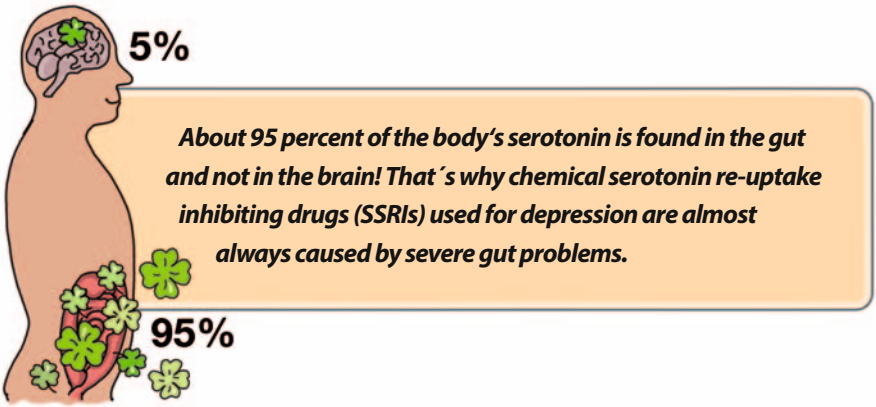
Since many studies link a high intake of salt to high blood pressure researchers examined the effect of a high-salt diet on certain healthy gut bacteria in mice. The study showed that a high sodium diet caused depletion of the beneficial bacteria called Lactobacillus murinus in the gut, as well as an increase in blood pressure. Administration of probiotics reversed this change [29].

The animal study results were replicated in a pilot study in twelve human subjects, which found that a high-salt diet created the same changes in the human microbiome as it did in mice: higher blood pressure and depletion of the beneficial Lactobacillus murinus bacteria. Interestingly, when this study participants took a probiotic for one week before starting their high-sodium diet, both their hypertension and the Lactobacillus levels remained within normal limits. This indicates that probiotics can fix some of the effects of a high-salt diet, but this should not be used as a means for consuming lots of salt in processed food.

Anxiety and Depression

Gut bacteria can alter the chemical activity of nervous system messenger molecules (such as serotonin) which are important factors in mood disorders, including depression [30]. Studies show that the microbiota is important to normal healthy brain function and that friendly microbes consumed as a nutritional supplement may improve symptoms of anxiety and depression in mice and humans. Gut microbes can influence the wiring of nerves in the stress system from early on and may therefore impact our response to stress for the rest of our lives.

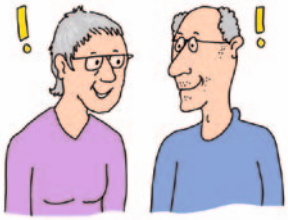
A 2016 study states that there is also evidence—albeit preliminary and mostly from animal models—for a potential role for the microbiome in neuropsychiatric conditions, including depression and anxiety, autism spectrum disorder, schizophrenia, Parkinson's and Alzheimer's disease [31, 32].



Parkinson's Disease

There is a biological link between Parkinson's disease and the microbiota. This neurodegenerative disease has its origins in the gut and not in the brain. Research using a Parkinson's mouse model indicates that changes in the gut microbiome lead to brain abnormalities and motor deficits. Mice transplanted with gut microbes from Parkinson's patients start getting disease symptoms. They display motor problems and inflammation, while mice that receive gut microbes from healthy humans show no such symptoms [33].

Studies have shown that patients with Parkinson's disease have an altered gut microbiome and they often experience constipation and other gastrointestinal conditions years before the onset of motor disturbances.



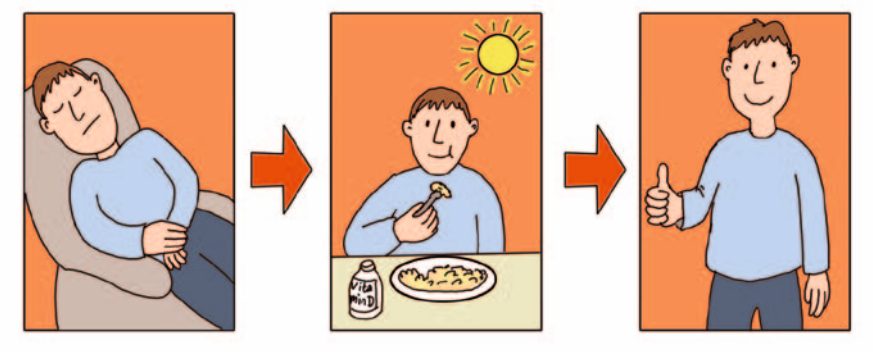
Alzheimer's disease (AD)

A research team from Iran demonstrated the beneficial effect of probiotics given to Alzheimer's patients for 3 months. Their memory and thinking abilities improved significantly [34]. Another study evaluated the effects of probiotics on the cognitive functioning of 52 Alzheimer's diagnosed men and women, aged 60-95. The patients were randomized to two groups; one group drank 200 milliliters of normal milk every day for 12 weeks, while the patients in other group were given 200 milliliters of milk that contained four probiotic bacteria: Lactobacillus acidophilus, Lactobacillus caseii, Lactobacillus fermentum, and Bifidobacterium bifidum. The results showed that patients who consumed the probiotic-enriched milk had significant improvements in cognitive functioning. These findings are the first to show that probiotics lead to cognitive improvements.

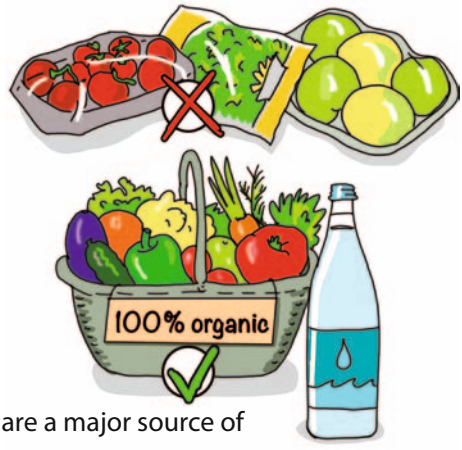
There is strong support that AD may begin in the gut and is closely related to an imbalance of gut microbiota. This is a promising area for therapeutic intervention.
It appears that modulation of gut microbiota through personalized diet or beneficial microbiota intervention can alter microbial composition and their byproducts (such as amyloid protein) and will become a new treatment for AD [35].

Multiple Sclerosis (MS)

Researchers have found that multiple sclerosis patients have a specific microbial pattern in their gut microbiota that could impact disease pathogenesis [36]. Changes in the gut microbiome of MS patients have been reported in many studies which also showed that probiotics have a beneficial effect on the immune system [37]. Among other benefits, the use of probiotics in combination with Vitamin D showed beneficial effects on the patient's microbiota [38].



How to protect and maintain healthy microbiota



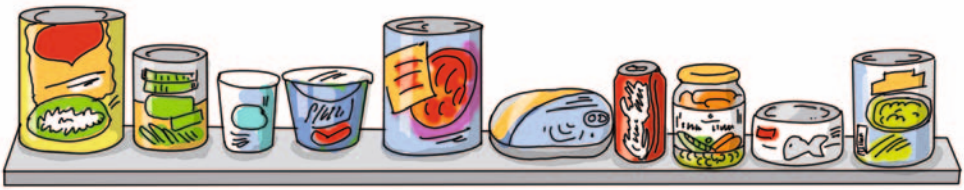
There are some basic recommendations to start with:

Pay attention to your diet.

Eat a healthy fiber-rich plant-based diet and drink plenty of fresh spring water.

Since supermarket fruits and vegetables are a major source of microbiome-disrupting pesticides, choose organic produce where possible.

Select food rich in beneficial microbes. Besides the vegetables mentioned earlier, include food rich in probiotics, such as kefir, kimchi (a fermented Korean vegetable dish), sauerkraut, tempeh (fermented soybeans), miso (fermented soybean paste), fresh and raw olives, and kombucha (a fermented tea drink). Goat's cheese contains probiotics, too. Avoid all processed and non-organic foods and limit your toxin exposure as much as you can.



Choose the water you drink wisely since tap water contains traces of pesticides, heavy metals, bad bacteria, BPAs, and pharmaceutical drug residues. It is good to use a strong water filter to minimize contaminants.

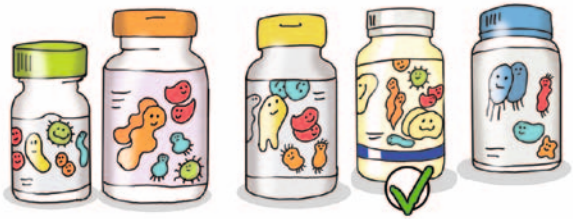
Reduce your exposure to microbiota-disrupting toxins.

Do not use conventional cleaning products, which often contain triclosan. Rather choose plant-based brands you can find in your natural health store. Also, beware of commercial body care products. These are loaded with triclosan, phthalates, and parabens. Absorption of these chemicals through your skin will damage your gut microbes badly.

Avoid plastics and plastic food containers and all bisphenol A-containing household products (BPAs).

Use probiotic supplements to add beneficial bacteria to your gut and help metabolize toxins.

Not all probiotic products you find on the shelves in health food stores or pharmacies are alike, since they may have different nutritional and therapeutic properties. They do not always contain the right strains in the right amounts and in the right combination or condition (viable bacteria) for the intended use.

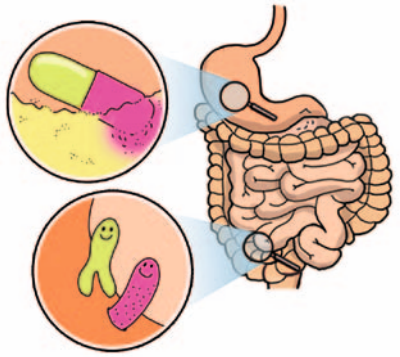


Here are some important aspects to consider when choosing a probiotic:

Selecting bacteria strains: Strains of bacteria should be properly selected and identified for the desired effects. The most commonly used are Lactobacillus and Bifidum species. Others such as Streptococcus, Pediococcus, Endococcus and the yeast-like

Saccharomyces, and Aspergillus are also used. Some products contain various strains and species of probiotics and it is important that they are compatible and work synergistically. It is important that the formula should not contain probiotic strains with inhibitory properties (i.e. production of hydrogen peroxide).

Probiotic must be alive and active: In order to work, the probiotic must survive in the gastrointestinal tract. Some strains like Bifidobacteria and L. acidophilus can pass through the whole gut when used at very high concentrations, while other strains can be killed in the stomach due to its high acidity (pH 1.2-1.5). The probiotic must also be resistant to bile acids. Bile acids are synthesized from cholesterol in the liver and secreted from the gallbladder into the duodenum. They undergo extensive chemical modifications in the colon as a result of which microbial activity there ceases. The Lactobacillus and Bifidobacterium strains have been extensively tested for their resistance to bile. The viability of probiotics can be protected by microencapsulation, especially in time-release form, in order to bypass stomach acids and reach your intestinal tract intact. It is also important that you use them before the expiration date.



Probiotics must adhere to the intestinal wall and colonize. This prevents them from being washed out and ensures that they work. For human use the probiotic should contain strains of bacteria isolated from human microflora (human gut or breast milk) because they are more likely to adhere to the intestinal wall and more likely to be safe. Until now, commercial probiotics were not able to

permanently colonize the gut. However, one study shows that L.rhamnosus GG can persist after oral consumption. [39]

The amount of bacteria is important: To achieve health benefits probiotic bacteria must be viable and available at high concentration, typically 105 or 107CFU/g of product.
CFU stands for Colony Forming Unit, which simply refers to the number of live and active microorganisms that can be found in each serving of the probiotic you are taking.

Storage: Probiotic supplements should be stored at 4 to 5^{0}C to maintain the viability of the microorganisms. Some manufacturers offer products which may be shelf-stable which makes them convenient for travel, but it is always better to keep them in your fridge.

Protect yourself against contacts with pathogens.

Certain viruses and bad bacteria are transmitted through close contact between people, which is unavoidable in family and work life. Here is some important advice: always keep your hands clean. Avoid touching your nose, eyes and mouth, as these are entry points for harmful viruses and bacteria of all kind. Avoid contact with people who are sick as they may be contagious and try not to get close to them. Don`t touch objects they might have used. In public areas, wash your hands often with a skin-friendly soap.

Keep your surroundings clean, but not sterile. Some bacteria are necessary. Just regularly wash the appliances you use and the kitchen counters, sinks, toilets and other surfaces that are touched often. Only use organic cleaning materials and soaps.

However, life in "sterile" conditions is not so "healthy"!

The more we are exposed to soil and nature, the better it is for our microbiome. Microorganisms living in the soil are important for plants to grow and many of these bacteria are beneficial for us too. You don't need to live in filth, but the excessive cleanliness with chemicals that our culture promotes is not such a good thing. Studies show that a variety of microbes from the environment helps us to build a strong immune system, especially during childhood.

Animals are great in so many ways!

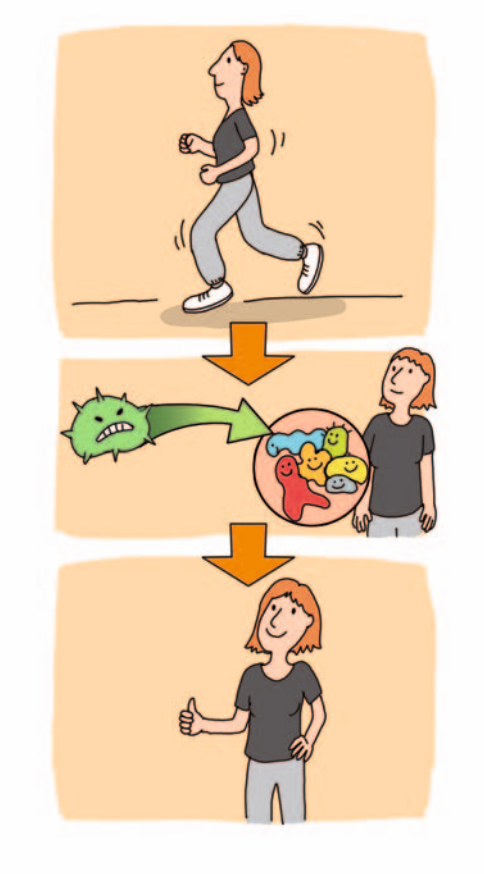
Studies have shown that dogs and cats bring several benefits, particularly for children: Early-life exposure to furry animals may reduce the risk of developing allergies and obesity [40]. Children up to 3 months of age who were exposed to dogs, cats, and other pets, experienced significant increases in the two beneficial gut bacteria Ruminococcus (reduces the risk of childhood allergies) and Oscillospira (linked with a decreased obesity risk) [41, 42]. It has been shown that contact with dogs and exposure to common household allergens in the first year of a child's life have been

associated with a significantly decreased risk of asthma later in childhood [43].

So digging in the dirt, camping, horse riding, dog walking, hiking, swimming in lakes or simply being outside is very healthy.

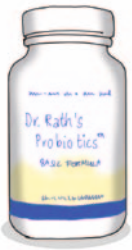
Exercise alters the composition of gut microbiota.

In mouse and human experiments, researchers found that physical activity alters the composition of gut microbiota in a way that increases the production of short-chain fatty acids that are beneficial for health and for treating cardiovascular disease [44, 45].



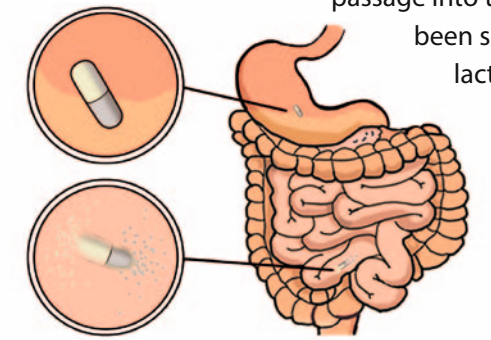
Having great microbiota is the key to long-term health!

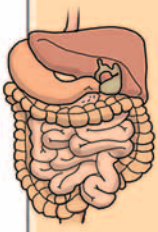
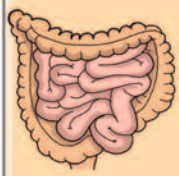
Here is our recommendation for the best supplements containing multiple strains of bacteria:

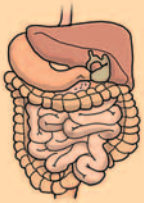
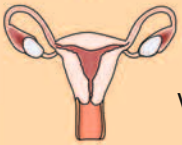


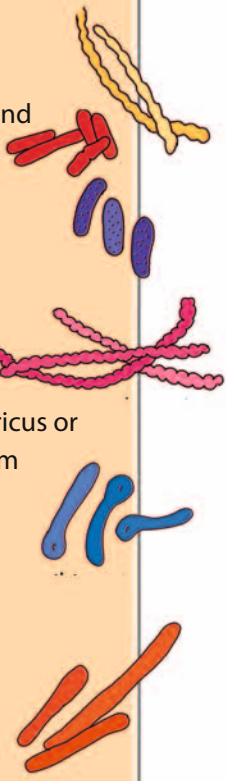
Dr. Rath´s Probiotics™ Basic Formula combines selected lactic acid bacteria from eight different bacterial strains. These include bifidobacteria, bacteria from the genus Lactobacillus, and the special subspecies Streptococcus thermophilus of the genus Streptococci. The formula also contains inulin, a complex sugar and prebiotic that is used by the lactic acid bacteria as a food source and stimulates the growth of the supplied bacterial strains in the intestine. Inulin cannot be digested in the human intestinal tract.

The capsule used for the formula is resistant to gastric juice. This is an important factor in protecting the lactic acid bacteria during their passage into the intestine. The formula has also been selected for its number of viable lactic acid cultures.



Health Concern	Bacteria showing health benefits
 Constipation	Bifidobacterium Longum, B.breve, B. Lactis, S. cerevisiae, a combination of L. acidophilus, L. reuteri, L. plantarum, L. rhamnosus and B. animalis
 Diarrhea	L.acidophilus, L.casei. Lactobacillus rhamnosus GG, Lactobacillus bulgaricus
 Brain health	Bifidobacterium longum, Bifidobacterium breve, Bifidobacterium infantis, Lactobacillus helveticus , Lactobacillus rhamnosus, L.casei
 Digestive health	B. bifidum, B.breve, L.rhamnosus, L. acidophilus, L. casei, S. thermophilus
 Immunity	Lactobacillus GG, Lactobacillus crispatus, Lactobacillus gasseri, Bifidobacterium bifidum and Bifidobacterium longum.

	Health Concern	Bacteria showing health benefits
	Inflammation	Lactobacillus gasseri, Bifidobacterium bifidum and Bifidobacterium longum, L. plantarum
	Vaginal health	L.acidophilus
	Acne	L.acidophilus and L.bulgaricus or L.acidophilus and B.bifidum
	Eczema	L. Rhamnosus
	Skin support	S. thermophilus, B.breve



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