

PROBIOTICS RESEARCH REPORT - version 2 – QWBI

Science has discovered what might just be the #1 most powerful factor for a long, healthy life. That factor is the ecosystem of microbes in your gut – your **microbiome**.

A balanced microbial environment inside your digestive system not only affects digestive health. It also connects to almost every other function throughout your body [1,2]. Surprisingly, this even includes your brain [3].

There can be no doubt whatsoever - *your life depends on your microbiome*.

Specifically, lifelong well-being lies in a balance among trillions of bacterial cells living throughout your GI tract, from your mouth all the way through your colon. Scientists estimate that your microbiome consists of more cells than those of your own body. The latest research puts the number of microbes in your gut at just under 40 trillion cells. Your own cells number closer to 30 trillion [4].

When your microbiome is healthy and in balance, it is also extremely diverse. It consists of as many as 1,000 different species [5], together called your **microflora**. They are mostly bacteria, with a few fungi (mostly yeasts), viruses and other microbes in the mix.

The bacteria are running the show, though. Their health is the secret weapon for your own health and longevity.

Unfortunately, the health of your microflora – and you – is constantly being challenged by many aspects of modern living.

The good news is that you can renew many of the key species of bacteria in your gut simply by consuming them. This is what people used to do, before the advent of modern processed foods. For centuries we ate plenty of foods that were preserved through fermentation. Those fermented foods provided living cultures of what are now called probiotic bacteria, or simply probiotics.

Eating friendly bacteria every day has always been crucial for good health. Unfortunately, modern processed foods lack them. Even cultured commercial foods, such as yogurt or kefir, are mostly deficient in what we need for keeping our microbiome healthy.

This is why probiotic supplements have become so important for healthy living in modern times.

How Probiotics Make Your Life Better

Supplementing with good bacteria was traditionally viewed as a defense against intestinal conditions. A short list of such conditions included inflammatory bowel disease

(IBD), irritable bowel syndrome (IBS), ulcerative colitis, and even colon cancer. Scientists now know that probiotics help prevent a much wider variety of health problems than ever before, including many of the diseases of aging [6,7].

Clearly, restoring your body's natural *intestine-based defenses* also shields you against a host of *non-intestinal diseases*. These include some of the most challenging chronic conditions that face modern medicine today. Besides digestive problems, those of most concern are autoimmune disorders, metabolic syndrome, diabetes, obesity, chronic fatigue syndrome and non-alcoholic fatty liver disease.

How does an imbalance in your microbiome affect so many areas of your body outside of your GI tract? The answer lies in a sophisticated chemical signaling system that begins in your gut and communicates with cells throughout your entire body.

A healthy balance of good bacteria keeps this system running smoothly. In contrast, a damaged or otherwise imbalanced microbiome disrupts the signaling system. The result is all of the chronic diseases mentioned above, plus many more.

Let's take a brief look at what probiotics can do for you.

Aiding Digestion

First and foremost, your overall wellness depends not necessarily on what you eat. Instead it depends on what you *absorb, retain, and utilize* from your food. Bacteria are the engines that drive this digestive process.

When your gut bacteria thrive, they produce digestive enzymes that break down whatever food you eat so you can get as much energy out of it as possible. These are a complete set of enzymes for digesting fats, proteins and carbohydrates. They even help break down hard to digest fibers that can otherwise inhibit nutrient absorption [8].

Good digestion is much more significant than it may seem at first. Poor digestion leads to constipation and diarrhea. It also adds to your body's inflammation when undigested food particles escape through your intestinal walls and into your bloodstream.

Absorbing Nutrients

Bacteria also enhance the nutritional value of your food by aiding the absorption of nutrients, which is a key to good health [9].

As you age, you gradually lose your ability to absorb vitamins and minerals from food. Nutritionists have found that nutrient absorption can be as low as 10% as efficient at age 50 as it was at age 25. Bacteria are therefore crucial for getting the maximum

nutritional value out of your diet. Moreover, whatever nutritional supplements you take will also be of greater value to you when your microflora is balanced and healthy.

Boosting the Effectiveness of Calcium

Nutritional scientists have discovered that the absorption of calcium increases when it is taken as part of or as a supplement to food. The explanation is that food stimulates the stomach to secrete acid and enzymes for digestion. Probiotic bacteria add their own acid to the mix, thereby further increasing stomach acidity. As a consequence, you absorb calcium more efficiently. In other words, you get a greater bone-building impact from the calcium in your diet when your gut bacteria are healthy.

By making dietary or supplemental calcium more effective, your gut bacteria just might be your best natural defense against osteoporosis [10].

Producing Essential Vitamins

Essential vitamins – those our bodies don't make – must come from our diet. Certain ones can also come from our intestinal bacteria. Different species of gut bacteria, for example, synthesize several B vitamins: folate, biotin, niacin, pantothenic acid, and vitamins B-6 and B-12 [11-13].

The bacterial production of B vitamins, especially vitamin B-12, is especially important for vegetarians. Fruits and vegetables do not contain vitamin B-12.

Another key vitamin produced by gut bacteria is vitamin K [14,15]. This vitamin is well-known for its role as a blood clotting factor for the prevention of excessive bleeding. More recently it was also discovered to work with a hormone called osteocalcin. Osteocalcin is needed for binding calcium to bones.

Probiotic bacteria therefore have a role in promoting bone health by producing vitamin K.

Enhancing Your Immune System

Your immune system is the best defense you have against infectious diseases of all kinds. You may be surprised to learn that about 70% of the immune cells that your body produces come from the small intestine [16].

Your intestinal bacteria influence how those cells work in at least two main ways. One is that they strengthen certain kinds of immune cells, called lymphocytes. Lymphocytes are part of the GI tract. Plenty of active lymphocytes, backed by friendly bacteria, continually suppress the growth of infectious bacteria.

The second way that our friendly bacteria help our immune system is more complicated. It seems that bacteria have a communication system that tells immune cells outside the GI tract when to get busy. They do this without even leaving the GI tract. Their signaling molecules go straight to specific immune cells with directions on where the cells are to go and what they are to do when they get there.

This communication system partly explains why our head-to-toe immunity against disease, toxins, and allergens begins with a healthy and vigorous population of friendly bacteria in our GI tract.

Eliminating Toxins

A primary function of your GI tract is eliminating digestive waste. A microbiome in balance keeps this waste removal system in working order [17].

When your waste removal system slows down, waste material gets backed up and becomes reabsorbed. Left unchecked, it will eventually push through the intestinal wall and be sent back into your bloodstream. When it goes into circulation, toxic waste overtaxes your immune system's ability to detoxify it.

Friendly gut bacteria keep your own digestive residues from poisoning you.

In addition, probiotics are known to detoxify or remove many environmental toxins. A few examples include such widespread toxins as bisphenol-A in plastics [18], heavy metals [19], pesticides [20] and carcinogenic food additives [21].

Protecting You Against Lethal Diseases

Probiotics can defend you against a wide variety of the diseases whose incidence is increasing at an alarming rate. Some of the most lethal ones include:

Cancer. Gut bacteria battle this dreaded disease on many fronts [22,23].

So far research has discovered that they...

- Suppress other bacteria that can convert pro-carcinogens into active carcinogens
- Bind to potential carcinogens, enabling you to excrete them before they do any harm
- Inhibit certain enzymes that drive the formation of carcinogens
- Raise populations of immune cells that can inhibit tumor growth
- Boost levels of immune system hormones that fight cancer in its early stages
- Quash the inflammation that is associated with cancer as it fades
- Reduce the formation of chemicals that cause breakage in DNA strands

By now most people have heard of the bacterium, *Helicobacter pylori* (“H. pylori”). It is infamous for being the “bad bug” that causes peptic ulcers when it blooms in your stomach. It is now considered to be a risk factor for stomach cancer.

The growth of H. pylori indicates an out of balance microbiome. Probiotics restore the balance in our gut bacteria [24,25].

A balanced microbiome inhibits colonization by H. pylori in the stomach and interferes with the attachment of H. pylori cells to the stomach lining. Together all of these activities reduce or eliminate this cancer risk.

Cardiovascular disease. In studies conducted on both animals and humans, the use of probiotics decreased total cholesterol and LDL cholesterol and increased HDL cholesterol. In addition, research shows that probiotics can reduce cholesterol absorption and inflammation due to excess stored fat [26].

These changes contribute to a significant decrease in the formation of inflammatory, cholesterol-laden plaques that form in the early stages of atherosclerosis.

Diabetes. Probiotics can lower insulin resistance and blood sugar levels. They also improve levels of hemoglobin A1c, which is a measure of long-term blood sugar control [27].

Obesity. Studies of probiotic supplementation have shown how gut bacteria can help regulate body weight and the accumulation of abdominal fat [28].

In addition, prenatal and immediately postnatal probiotics can reduce excessive weight gain in new mothers and in their offspring for at least 10 years after birth [29].

Respiratory infections. Probiotics can significantly suppress respiratory infections such as the common cold and the flu [30]. They are especially effective when supplementation begins prior to cold and flu season. Subjects on a daily regime of probiotic supplementation had milder symptoms and a reduced duration of infection over those who were not taking probiotics.

Probiotic supplements also significantly reduce the incidence of sinus infections by directly reducing the number of infectious bacteria that live in the nasal passage [31].

Colon diseases. Ulcerative colitis, irritable bowel syndrome and inflammatory bowel disease are all associated with an imbalanced microbiome. They all respond to probiotic supplementation without side effects [32].

Crohn’s disease is an especially difficult chronic health issue for modern medicine. It is characterized by an imbalanced microbiome. Crohn’s sufferers harbor a type of bacterium, *Mycobacterium avium paratuberculosis* (MAP), which leads to poor colon health. Probiotics restore the colon’s balance against this infection [33].

Allergies. Probiotics reverse intestinal destruction that leads to the leakage of toxins into the bloodstream. This reduces levels of toxins that cause the overreaction of the immune response that characterizes allergies. Probiotic bacteria directly remove allergenic toxins, thereby reducing the allergic response to them [34-36].

Arthritis and other autoimmune disorders. Rheumatoid arthritis, lupus, multiple sclerosis, and several other health issues are lumped into a category called autoimmune disorders. They occur when the immune system attacks its own body. Scientists now view the use of probiotics as a valuable approach for preventing such diseases [37].

One suspected cause of autoimmunity is candidiasis, or candida yeast overgrowth. The successful treatment of candidiasis with probiotics has a curative effect on autoimmunity by tamping down yeast overgrowth [38].

Yeast overgrowth. Candidiasis has reached epidemic levels. It is much worse than the traditional view of vaginal yeast infections as a woman's problem. Men now have an equivalent yeast infection of the prostate.

In fact, candidiasis is now associated with all of the following:

- Depression
- Anxiety
- Irritability
- Fatigue
- Heartburn
- Bloating
- Constipation
- Mental fog
- Allergies
- Migraines
- Acne
- Rheumatoid arthritis
- Lupus
- Multiple sclerosis
- Type 1 diabetes
- Cancer
- Cardiovascular disease

Yeast overgrowth that starts in the GI tract influences your whole body. Fortunately, probiotics restore the balance of your microbiome to directly control the yeast blooms that undermine good health in so many ways [39].

Flu. Every year flu season seems to hit children and the elderly harder than before. Flu vaccines are usually less than 50% effective. Probiotics are already well-known to stimulate the immune system, to boost the effects of flu vaccines, and to provide a good defense against viral infections of all kinds [40].

Preliminary studies indicate that probiotics represent an excellent addition to any flu-fighting arsenal.

Traveler's diarrhea. Many kinds of microbes cause infectious diarrhea, including viruses and bacteria. The name "traveler's diarrhea" is associated with such infections, although people suffer from them regardless of whether they are traveling.

Children and the elderly are especially susceptible to traveler's diarrhea. It can even be fatal.

The good news is that several studies have shown how probiotics can prevent or alleviate this malady [41].

Running Your Second Brain

Your GI tract has its own nerve system – essentially like a "second brain." It communicates directly with your brain. Scientists call them, together, the gut-brain axis (GBA). The GBA controls how your body functions in many ways. This control explains how your GI tract tells the brain what to do with hormone levels, emotions, and even thinking. It is not the other way around, as you might suspect.

Studies now show the influence that your microbiome can have through the GBA on anxiety, depression, and overall mood [42]. Your friendly bacteria actually secrete chemicals that mimic brain chemistry. In other words, a healthy GBA relies on a balanced microbiome [43].

Some clinicians are now proposing that specific mixtures of probiotics can be tailored to treat psychological disorders.

It is certainly becoming crystal clear that the health of your microbiome invigorates your second brain for your mental and emotional well-being.

What Causes Imbalance in the Microbiome?

Unfortunately, we destroy our microbiome in many ways. Some of the worst ones are as follows.

Antibiotics. The biggest enemy of our normal microflora is antibiotics. Antibiotics, meaning "against life," are chemicals that kill bacteria. They have saved millions of lives

from what used to be killer infections. However, their rampant overuse destroys the microbiome.

Antacids. One of the most common health problems today is an upset stomach. Stomach upset doesn't get a lot of notice in the media because it is not a killer. Nevertheless, over-the-counter antacids disrupt the acidity of the stomach, which ruins the gastric environment that your friendly bacteria require.

Drugs. Our intestinal bacteria are adversely affected by drugs of all kinds, regardless of whether they are prescription or non-prescription. Besides antibiotics and antacids, other drugs that harm the microbiome include anti-inflammatories, ulcer medications, immunosuppressants, steroid hormones, and drugs used for cancer chemotherapy. In general, you can expect that synthetic medications will harm your friendly gut bacteria.

Other synthetic chemicals. It should come as no surprise that we are now surrounded by tens of thousands of synthetic chemicals that people were not exposed to as little as a century ago. We are sensitive to them, in part, because our bacteria are harmed by them. A short list of the kinds of chemicals that are harmful to our normal microflora includes the following:

- Food additives (colorings, "natural flavors")
- Preservatives
- Chlorinated and fluoridated water
- Herbicides
- Hormones
- Oral contraceptives
- Pesticides
- Refined carbohydrates, especially sugar
- Steroids
- Artificial sweeteners
- Air pollution
- Household cleaners
- Toxic metals

The health of our normal intestinal bacteria is continually challenged by these and newer chemicals that appear constantly in our foods, new buildings, clothing, cars, and just about everywhere that we live and breathe.

Excessive hygiene. Our modern obsession with hygiene has drastically decreased our exposure to environmental bacteria that contribute the health of our own gut bacteria. Disinfectant soaps and gels have made matters worse by selecting for new kinds of "superbugs" that replace the friendly bacteria that we depend on.

Western diet. A high-fat, high-sugar Western diet can adversely shift the balance of our gut bacteria within a single day. Consuming refined carbohydrates in particular

damages the bacterial balance in the upper part of the GI tract. Consumption of processed, nutrient-poor foods significantly reduces the diversity of our microbiome.

Age. Recent research shows that the bacterial diversity of the gut drops as we age.

Hospital infections. Antibiotic-resistant “super-bugs” are a common danger during visits to the hospital. In addition, since your immune system is already in trouble when you are hospitalized, you are also more susceptible to infection by your own normal bacteria. Common infections include your own staph (*Staphylococcus aureus*), E. coli, and C-diff (*Clostridium difficile*) bacteria.

Restoring Your Microbiome

Probiotic foods are less available for restoring your microbiome than they were more than a century ago. Furthermore, nowadays most commercialized foods that provide friendly bacteria are deficient as a dependable source of probiotics.

Probiotic supplements now represent the simplest and most convenient source of friendly bacteria for restoring and maintaining your microbiome.

The two most important keys to supplementing with probiotics are: 1) bacterial diversity – i.e., the number of different species; and, 2) dosage, expressed as the number of colony-forming units (CFU).

Changing the entire ecosystem of your gut bacteria, in the face of all the ways that your microbiome comes to harm in modern times, depends on consistent and substantial dosing of multiple species.

Dosage. First off, probiotic supplements seem to have no upper limit for toxicity. The highest doses, for example, are prescription medical probiotics that can reach 900 billion CFUs per dose. Research using as much as four doses per day (i.e., 3.6 trillion CFU daily!) revealed no side effects [44].

At the other extreme, many supplements and live-culture foods offer 1 billion CFUs or fewer.

Adequate dosages are somewhere in between. Studies typically show that the well-known benefits to your digestive and immune systems accrue with a daily dose in the tens of billions of CFUs. Typical probiotic supplements range from 15 to 50 billion.

The high end daily dose of 50 billion CFUs ensures that your microbiome is healthy enough to provide all the benefits that you can expect from your gut bacteria.

How many species? Supplementing with multiple species of bacteria is absolutely necessary. No single species will do all by itself. Altering the entire ratio of gut bacteria demands consistent high-potency dosing with a diversity of bacterial species [45,46].

The two most important groups of bacterial species according to studies over the past several decades are the Lactobacillus group and the Bifidobacterium group. These groups are complemented by a handful of other types of bacteria, as listed below [47].

Probiotics also include a non-bacterial microbe that is classified as a yeast [48].

Each of these microbes works in different and yet complementary ways to restore and maintain your microbiome.

The benefits that you can expect from them are as follows:

Lactobacillus acidophilus

- Reduce diarrhea and improve bowel function from radiation-induced GI inflammation
- Increase HDL (good) cholesterol
- Improve markers for metabolic syndrome, inflammation, and heart disease
- Improve allergy-driven immune response
- Improve markers for ulcerative colitis and irritable bowel disease
- Increase control of blood sugar
- Decrease DNA damage that can trigger malignant cell development

Lactobacillus rhamnosus

- Reduce diarrhea and improve bowel function from radiation-induced GI inflammation
- Improve markers for metabolic syndrome, inflammation, and heart disease
- Reduce allergic response to milk in milk-sensitive patients
- Improve markers for ulcerative colitis, irritable bowel disease and Crohn's disease

Lactobacillus paracasei

- Enhance therapeutic management of Minimal Hepatic Encephalopathy (MHE), which is poor mental function due to liver failure
- Improve markers for metabolic syndrome, inflammation, and heart disease in elderly patients
- Improve markers for ulcerative colitis and irritable bowel disease

Lactobacillus plantarum

- Protect from candida yeast overgrowth)

- Support detoxification
- Enhance nutrient absorption

Lactobacillus casei

- Improve immunity
- Reduce allergies, especially in newborns
- Lower LDL cholesterol levels and raise HDL cholesterol levels
- Reduce triglyceride levels
- Reduce diarrhea and constipation
- Maintain remission of diverticular disease
- Reduce occurrence, risk and symptoms of IBS
- Inhibit H. pylori infection
- Decrease milk intolerance
- Prevent colorectal tumor growth
- Inhibit tumor growth of stomach cancer
- Inhibit candida yeast overgrowth
- Inhibit infections by viruses and pathogenic bacteria
- Inhibit blooms by *Clostridium difficile* (C-diff)

Lactobacillus brevis

- Boost immune system health
- Support heart health
- Prevent replication of harmful bacteria
- Help fight side effects of repeated antibiotic treatment
- Combat ulcers
- Help the health and condition of the gums
- Boost the effectiveness of antibiotics

Lactobacillus salivarius

- Improve digestive health
- Improve immunity
- Improve dental health
- Help fight bad bacteria, especially E. coli and Salmonella
- Aid in the digestion of proteins
- Inhibit candida yeast overgrowth
- Help prevent strep throat
- Reduce ulcerative colitis and IBS

Lactobacillus gasseri

- Reduce belly fat
- Inhibit fat production

- Speed up metabolism
- Reduce allergies
- Reduce asthma
- Reduce constipation and diarrhea
- Inhibit H. pylori infection
- Reduce high cholesterol
- Reduce menstrual pain

Lactobacillus bulgaricus

- Promote liver health
- Reduce symptoms of the common cold
- Fight diarrhea caused by antibiotics
- Diminish IBS
- Reverse atopic dermatitis (eczema)
- Help against hay fever
- Prevent tooth decay

Bifidobacterium lactis

- Improve immune function in healthy, elderly individuals.
- Boost weight gain and reduce gut inflammation in preterm infants
- Improve immune response and respiratory symptoms from pollen allergies in children.
- Increase control of blood sugar

Bifidobacterium bifidum

- Improve markers for liver inflammation and damage in alcohol-related liver disease
- Improved inflammation profiles in ulcerative colitis and irritable bowel disease

Bifidobacterium longum

- Reduce diarrhea and improve bowel function from radiation-induced GI inflammation
- Increase HDL cholesterol
- Reduce ulcerative colitis, IBS and Crohn's disease

Bifidobacterium breve

- Improve skin tone
- Reduce allergies
- Reduce asthma
- Combat obesity

- Alleviate constipation and diarrhea
- Reduce symptoms of celiac disease
- Fight infections
- Boost BDNF (brain-derived neurotrophic factor for brain function)

Bifidobacterium adolescentis

- Inhibit cervical cancer virus (human papillomavirus)
- Synthesize various B vitamins
- Prevent immune system aging in the elderly

Streptococcus thermophilus

- Improve digestion
- Reduce antibiotic associated diarrhea
- Improve lactose digestion
- Decrease IBS symptoms
- Prevent ulcers caused by H. pylori
- Fight Clostridium difficile infections
- Increase HDL (good cholesterol)

Streptococcus salivarius

- Reduce incidence of sore throats
- Decrease occurrence of ear infections
- Inhibit formation of dental plaque
- Lessen levels of sulfur-based compounds that cause bad breath
- Promote healthy inflammatory response in the gums

Bacillus coagulans

- Boost lactic acid levels for working muscles
- Improve absorption of nutrients from food
- Protect against mercury toxicity
- Enhance immune system

Saccharomyces boulardii (yeast)

- Reduce symptoms of Crohn's disease
- Decrease diarrhea
- Inhibit irritable bowel syndrome
- Help against ulcerative colitis
- Fight Clostridium difficile infections

A good probiotic supplement should offer many of the above bacterial species. The exception is yeast-based probiotics. Typically, *S. boulardii* is offered by itself, not mixed together with probiotic bacteria.

Summary

Science clearly shows that a chronic imbalance in intestinal bacteria does more than just harm digestion. It also triggers numerous chronic diseases, both inside and outside the GI tract. Today's diet, lifestyle, medical practices and many other factors drive this imbalance.

Fortunately, supplementing with a sufficient dose of several key bacterial species can reverse the effects of these destructive influences.

Probiotic supplements are a critical source of helpful bacteria that can restore your body's natural protection against a host of intestine-based and non-intestinal modern diseases.

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