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Report

The Overlooked Role of Probiotics in Human Health

By Joyce Killian



Probiotics have formed a vital part of Mediterranean and Middle Eastern diets for thousands of years, in the form of fermented milk and vegetable products such as yogurt and pickles.^{1,2} They are credited, in part, for the relatively low rates of chronic, age-related diseases that prevail in those regions.²

Now, research is catching up with this traditional wisdom in the form of accelerated scientific investigations into the broad spectrum health benefits of **probiotics**. This new science, known as **pharmabiotics**, uses probiotic organisms as natural pharmaceutical agents in the treatment and prevention of disease along with promoting longevity. Pharmabiotics provides an almost limitless source of biologically active materials which can influence human health.³

What is Pharmabiotics?

The science of pharmabiotics is based on an explosion of data about the so-called human **microbiome**, which is made up of the trillions of bacteria that live in our bodies. These bacteria are so intimately involved with our lives and health that they are considered a part of the human organism.^{4,5,6} With advancing technology, scientists are now able to select specific strains of organisms to accomplish precise tasks.⁷

What Are Probiotics?

Probiotics are beneficial organisms, most of which are normally found in the healthy human gastrointestinal tract. Many different strains of probiotic organisms are in use, which have different but overlapping benefits. Probiotic organisms work through several interrelated mechanisms to promote health at the molecular level.⁸ They conquer potentially dangerous organisms in the intestine, reducing the risk of infection or toxin-mediated diseases. They regulate immune responses which enhance healthy reactions to dangerous infectious organisms, and they suppress excessive inflammation. Additionally, probiotics promote the function of the intestinal inner lining, enhancing its ability to act as a barrier to the entry of potentially dangerous organisms and chemicals.⁹⁻¹²

All of these actions depend on a system of biochemical signals between your intestinal bacteria and the human cells that comprise the rest of your body (See sidebar).^{8,13}

When things go wrong in the balance of intestinal organisms, the consequences can be tremendous.³ Negative changes in the intestinal microbiome are firmly associated with chronic diseases that include inflammatory bowel disease, cancer, cardiovascular disease, and the metabolic syndrome.^{5,15,16} We now recognize that allergic disorders, asthma, and even obesity are also related to an unhealthy population of intestinal bacteria.^{5,11}

Due to modern diets and lifestyle, as well as environmental factors such as pollution and the irresponsible overuse of

antibiotics, the beneficial bacteria in your microbiome is at risk which can lead to an increased incidence in metabolic and inflammatory chronic diseases.⁶ Even simple aging gradually shifts your intestinal bacterial population towards a disease-promoting, rather than a disease-preventing, state.¹⁷⁻²¹

The good news is that probiotics can help restore balance and cellular communications with regard to the body's healthy bacterial population.⁵ In the digestive tract, probiotic therapy has been used to prevent or treat lactose intolerance, intestinal infections and diarrhea, gastritis and ulcers caused by the bacterium *Helicobacter pylori*, colitis caused by excessive antibiotic use, inflammatory bowel diseases, and irritable bowel syndrome.^{10,22-26} They are also proving instrumental in preventing colon cancer.^{22,27-30}

INTESTINAL BACTERIA MODULATE KEY SIGNALING SYSTEMS WITH YOUR BODY

The lining of your gastrointestinal tract is the largest interface between your body and the external environment – it has even more surface area than your skin.¹⁴ At that interface your body has three types of chemical detectors: nerve cells, endocrine cells, and immune cells. Signals from those detectors affect tissues and organs throughout your body.



Those detector systems are more extensive than those of any other organ: there are nearly a billion neurons in the intestinal nervous system, the intestinal endocrine system uses more than 20 identified hormones, and the gut immune system contains **70 to 80%** of the body's immune cells.¹⁴

All of those detectors are profoundly influenced by the composition of your intestinal microbial population. When you use probiotics to maintain or restore a healthy balance in your intestinal tract, you are directly and indirectly promoting health in many of your body's most vital systems.

All of those benefits within the intestine might be expected. But probiotics also have profound beneficial effects throughout the body, especially on metabolic and inflammatory conditions.¹⁵

Overweight people have lower levels of beneficial bacteria than do slender people, and chronic exposure to unhealthy bacterial cell walls can trigger system-wide inflammation.³¹⁻³³ Together these effects contribute to development of the metabolic syndrome, with its pathological disturbances in lipid and glucose metabolism.^{31,34}

Probiotics can favorably alter the composition and activities of the intestinal bacterial community, potentially reversing major contributors to chronic disease.³⁵

Studies show that probiotics can improve hypertension, lower total and LDL-cholesterol, and improve insulin sensitivity, all components of the human metabolic syndrome.³⁶⁻³⁸ Human and animal studies show that probiotics also attenuate non-alcoholic fatty liver disease (NAFLD) due to obesity and a high-fat diet.^{35,39-43} Probiotics may also have a major role in preventing cancers outside of the gastrointestinal tract, by several different mechanisms. Probiotic organisms can bind to potential carcinogens, promoting their excretion.⁴⁴ They also suppress growth of bacteria that convert harmless procarcinogen molecules into carcinogens.^{44,45} Finally, probiotics stimulate expression of liver enzymes that detoxify carcinogens, while down-regulating those that convert harmless molecules into carcinogens.⁴⁴ Together these effects have been shown to reduce the risk, incidence, and number of tumors in the colon, liver, and bladder.⁴⁴

Probiotics also modulate your immune system, an effect that has impact not only on cancer but also on your overall health status, as we'll now see.

Probiotics Boost Immunity

In recent years the enormous importance of the gastrointestinal tract in modulating the immune system has been increasingly

recognized. Not only does more than **70%** of the human immune system reside in the gut, but the intestinal immune system produces more antibodies than the rest of the body put together.⁴⁶ As a result, gastrointestinal secretions are as rich as breast milk in health-supporting and disease-preventing factors.⁴⁷

A poorly functioning immune system is at the root of many chronic degenerative diseases. Too little response makes us vulnerable to the infections that claim the lives of so many older adults. But inappropriate overactivation can produce chronic inflammation that contributes to the litany of age-related disorders such as cardiovascular disease, diabetes, cancer, and the metabolic syndrome.

THE ROLE OF PROBIOTICS

- Your intestinal organisms form an integral part of who you are (there are 10 times as many of their cells as there are of yours).
- Beneficial members of your intestinal bacterial community promote critical cellular signaling that influences the health of your intestine and your whole body.
- Aging, lifestyle, and environmental influences threaten to perturb the balance of your intestinal organisms, leaving you vulnerable to immune disturbances and chronic, age-related conditions.
- You can strengthen your intestinal organisms by supplementing with probiotics, cultures of beneficial organisms that exert multiple favorable effects.
- Bifidobacteria in particular have been shown to protect humans against inflammation, infection, cardiovascular disease, and cancer.
- A clinically validated strain of bifidobacteria, BB536, arrives in the colon largely intact and ready to boost your intestinal microbial population.
- BB536 has demonstrated potent immune modulatory effects, reducing inflammation while protecting against infections and promoting cardiovascular health.



Bifidobacteria are used as a probiotic to improve intestinal flora balance, inhibit harmful bacteria, promote good digestion, boost immune function, and increase resistance to infection.

Probiotics can restore and rebalance your gut microbiome, strengthening its ability to interact with your immune system in many ways.⁵ These friendly bacteria stimulate healthy immune surveillance, boosting populations of cells that seek out and destroy infecting organisms and cancers.^{25,45,48} They upregulate inflammatory cytokines during the acute stage of an infection, cancer, or other threat to your body's integrity, but they also contribute to suppression of the inflammatory response as the threat fades.^{45,49}

Bifidobacteria – Powerful Probiotic Protection

Bifidobacteria are one of the most popular and best-studied probiotic organisms. The bifidobacteria are a large group of normal intestinal organisms with a host of overlapping benefits.

Bifidobacteria probiotics have long been used as dietary supplements in Japan, to achieve and maintain high levels of healthy bifidobacteria in the colon. Breastfed infants develop a simple microbial population dominated by bifidobacteria, helping the growing child to fend off multiple challenges to the immune system.⁵⁰ As we age, the numbers of bifidobacteria in our intestines drop, while less beneficial and more harmful organisms multiply. Experts now recommend high bifidobacteria levels at all ages.⁵⁰ Supplementing with bifidobacteria produces a wide range of health benefits. Bifidobacteria supplements are shown to raise protective HDL cholesterol levels in humans and animals, and lower total and LDL cholesterol levels.^{37,51-53} The corresponding reduction in the ratio of LDL to HDL cholesterol represents an important reduction in cardiovascular disease risk.

Bifidobacteria supplementation also suppressed inflammatory cytokine production by the intestines of elderly volunteers, reducing the burden of inflammation that contributes to cardiovascular, cancer, and metabolic disease risk, and thereby early death.⁵⁴ Intriguingly, animal studies demonstrated a significant increase in longevity in supplemented mice.⁵⁵ Similar studies in humans are eagerly awaited, offering as they do a means for selecting specific probiotics to prolong human lifespans.⁵⁶

The most prominent effects of bifidobacteria supplementation are on the health of the intestinal tract itself. Supplementation reduced episodes of acute diarrhea by **34%**, and those of antibiotic-associated diarrhea (a major cause of illness and death in older people) by **52%**, while reducing traveler's diarrhea episodes by **8%**.⁵⁷ Bifidobacteria supplementation for two weeks also shows promise in improving diarrheal illness in people with lactose intolerance.⁵⁸

People with **irritable bowel syndrome** suffer from alternating bouts of diarrhea and constipation, often suffering painful abdominal bloating and gas production. Bifidobacteria supplementation produced a significant reduction in abdominal distension and improved symptom scores along with faster bowel transit times (which reduces cancer risk).^{59,60}

Many people have frequent minor digestive symptoms such as bloating, gas, and periodic constipation, all of which, while not dangerous, appreciably reduce comfort and quality of life. Several recent studies demonstrate significant improvements in measures of gastrointestinal wellbeing, decreases in digestive symptom scores and bloating, and increases in health related quality of life during bifidobacteria supplementation.^{61,62}

The much more dangerous inflammatory bowel diseases ulcerative colitis and Crohn's disease are the source of untold misery and a major risk for colon cancer. Because of their ability to fight inflammation, bifidobacteria supplements have received special attention in managing these conditions.²⁶

Bifidobacteria supplements enhance the "tight junctions" between intestinal cells that allow leakage of dangerous organisms and their products into the bloodstream in ulcerative colitis.⁶³ They also alter the intestinal environment, making it unfavorable for organisms that trigger episodes of colitis.⁶⁴ Clinical studies show marked improvements in symptoms of inflammatory bowel diseases with bifidobacteria supplements.⁶⁵⁻⁶⁷

Bowel inflammation is a major risk for colon cancer, the third most common cancer in the world. Bifidobacteria supplementation lowers levels of a number of biological markers of colon cancer risk in patients with colitis.⁶⁸ It also blocks development of new tumors in an animal model of toxin-induced colon cancer.²⁸ More definitive human studies remain to be conducted, but indications are bright for bifidobacteria as potent cancer-preventing pharmabiotic agents.

BB536® Strain of Bifidobacteria Confers Special Benefits



There are many strains of beneficial bifidobacteria, all of which have related, overlapping benefits. One challenge to development of effective supplements has been to keep cultures of the organism stable, and to deliver them alive to the colon after surviving the extreme conditions of the stomach and small intestine.⁶⁹

A strain of bifidobacteria, called BB536®, appears to meet that challenge, and to have unique benefits throughout the body.

The BB536® strain of bifidobacterium logum has been shown to increase the numbers of bifidobacteria living in the colon.^{69,70} That increase allows BB536® cultures to produce marked effects on intestinal, and whole body, immune responses, with potentially far-reaching impact.

BB536® has been most extensively studied in Japan, where subjects with reactions to cedar pollen experience typical allergic symptoms of sneezing, runny nose, and itchy eyes. This condition, Japanese cedar polinosis, is far from deadly, but offers insight into the ability of BB536® to modulate immune responses by multiple pathways.

This strain BB536® reduces production of the special antibody, IgE, which is produced in response to allergens, parasitic infections, and certain other common human conditions.⁷¹ BB536® also suppress cellular immune responses that contribute to allergic symptoms and inflammation.⁷² Finally, BB536® reduces production of inflammatory cytokines that closely correlate with symptom development.^{73,74}

Human studies with BB536® repeatedly demonstrate its ability to alleviate allergic symptoms of Japanese cedar polinosis, with decreases in runny nose, nasal congestion, eye symptoms, and composite symptom scores.^{75,76}

While BB536® suppresses overactive immune responses in allergic patients, exciting new studies are showing that it can enhance the immune response to infections.

In older adults, BB536® reduced the incidence of influenza infection and fever in one at-risk population, compared with placebo recipients.⁷⁷ Flu symptoms and death from influenza are largely caused by excessive inflammatory responses. An example of excess inflammatory response is **pneumonia** that can be induced by influenza viruses. These **excessive inflammatory responses** were reduced in animals exposed to influenza virus that were supplemented with BB536®.⁷⁸

Studies show that BB536® can prevent infection with the deadly *Pseudomonas* organism in mice with weakened immune systems.⁷⁹ And humans who supplemented with BB536® showed a reduction in numbers of a dangerous strain of the bacterium *Bacteroides fragilis* in their intestines.⁸⁰

BB536® may also reduce cardiovascular risk factors, though data are preliminary to date. Supplements were effective at lowering plasma LDL cholesterol in women with elevated lipid levels in an early trial.⁸¹

Summary

Age and the modern environment pose grave threats to the balance of favorable organisms in your intestine indicating a benefit to those who supplement with healthy probiotic cultures. The bifidobacteria are an especially active group of probiotic organisms, with beneficial effects on the immune system and chronic disease.

A clinically-validated strain of bifidobacteria, BB536®, shows great promise in overcoming challenges to stability, storage, and delivery of this probiotic species. BB536® exerts powerful immune modulatory, infection-preventing, and cardiovascular health-promoting activities.

If you have any questions on the scientific content of this article, please call a Life Extension® Health Advisor at 1-866-864-3027.

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