**Intestinal Flora**

INTRODUCTION

Intestinal flora are harmless microorganisms such as bacteria, yeasts, and fungi that inhabit and grow in the intestines. These microorganisms are essential to the normal functioning of the digestive tract, and certain species of intestinal flora are beneficial to the human body. These “good” bacteria often have a symbiotic relationship with the human body as both derive benefit from one another. For example, “The normal [intestinal] flora derive from their host a steady supply of nutrients, a stable environment, and protection and transport. The host obtains from the normal [intestinal] flora certain nutritional and digestive benefits, stimulation of the development and activity of immune system, and protection against colonization and infection by pathogenic microbes.”(1) Beneficial bacteria such as intestinal flora are often referred to a probiotics. “Probiotics...is an umbrella term given to any live microorganism that is beneficial to its host.”(2)

SMALL INTESTINE
The intestinal flora of the small intestine is comprised mainly of microorganisms known as lactobacilli, which are a type of bacteria found in the digestive tract that produce lactic acid. “Lactobacilli are one of the most important types of friendly bacteria found in the digestive tract. They play a key role in producing fermented foods, fermented milk, yogurt, and cheeses [and] are often referred to as “probiotic” since they are positive or supportive microorganisms.”(3) Lactobacilli include bacteria such as Lactobacillus caseii, Lactobacillus bulgaricus, Lactobacillus acidophilus, and Lactobacillus helveticus just to name a few. Each of these types of bacteria provide various benefits to the human body. For example, Lactobacillus caseii (L. casei) “exhibit[s] immune-enhancing effects by producing “bacteriocins”, [which are] compounds that restrict [the]growth of pathogens in the small intestine.”(3) Lactobacillus bulgaricus (L. bulgaricus) “aids [in the] digestion of dairy products, helps reduce cholesterol levels, breaks down complex proteins for easy assimilation, and alleviates acid reflux.”(3)

LARGE INTESTINE (COLON)
While lactobacilli can be found in the large intestine as well, one of the most “predominant species [that inhabit the large intestine is]...anaerobic lactic acid bacteria in the genus Bifidobacterium (Bifidobacterium bifidum)”(1) “Lactobacilli and Bifidobacteria maintain a healthy balance of intestinal flora by producing organic compounds. These organic compounds include lactic acid, hydrogen peroxide, and acetic acid that increase the acidity of the intestine and curb the reproduction of many harmful bacteria.”(4) Furthermore, “Bifidobacterium bifidum has been used to maintain or restore a normal, healthy condition in the intestines.”(5) The various type of Bifidobacterium include but are not limited to: Bifidobacterium adolescentis, Bifidobacterium breve, Bifidobacterium infantis, and Bifidobacterium longum. Each of these bacteria are beneficial to the human body as “bacteria in the human GI tract have been shown to produce vitamins and may otherwise contribute to nutrition and digestion. But their most important effects are in their ability to protect their host from establishment and infection by alien microbes and their ability to stimulate the development and the activity of the immunological tissues.”(1)

INTESTINAL FLORA STUDIES
Probiotics were first discovered sometime during the 19th century, and since that time many studies have been conducted to determine the benefits of probiotics. In the last couple of decades researchers have been able to gain a better understanding of the many benefits of probiotics thanks to various scientific and technological advances. Today researchers understand that "certain bacterial strains, especially the Lactobacillus and Bifidobacterium genus have high mucus membrane chemical affinity and play important roles in human health."(7)

Essentially, probiotics such as Bifidobacterium and Lactobacillus help enhance the growth of beneficial bacteria or intestinal flora thereby furthering the health and well-being of the individual. The following studies show the various types of probiotics studied and the effects they have on the human body in relation to various diseases. By promoting the growth of intestinal flora these probiotics assist in disease reduction and prevention.

BIFIDOBACTERIUM
A study conducted in 2009 hoped to provide evidence of the ability of the probiotic Bifidobacterium breve (B. breve) strain Yakulton to prevent infection, fecal micro flora, and intestinal environments in cancer patients on chemotherapy.(8) Results of the test showed that “the frequency of fever and the use of intravenous antibiotics were lower in the probiotic group than the placebo group.”(8) The study concluded that “administration of B. breve strain Yakult could be an effective approach for achieving clinical benefits in immunocompromised hosts by improving their intestinal environments.”(8)

“A new study published in the July issue of the American Journal of Gastroenterology found that Bifantis (Bifidobacterium infantis 35624) may help relieve many of the symptoms associated with irritable bowel syndrome (IBS) in women, including diarrhea and constipation.”(9) This randomized study was conducted with a group of women suffering from irritable bowel syndrome (IBS). These women reported experiencing symptoms such as abdominal pain and discomfort, bloating and distension, sense of incomplete evacuation, straining at stool, urgency of bowel movement, and passage of gas.(9) The results of the study indicated that at the end of the 4-week period these women experienced an overall improvement in symptoms after taking Bifantis. As a conclusion to this research it would be fair to say that “Bifantis may be especially helpful for people who experience one or more of the symptoms commonly associated with IBS, including diarrhea, constipation, bloating, gas, urgency and abdominal discomfort.”(9)

Lactic acid producing bacteria, such as Bifidobacterium longum (B. longum), help support immune system functions. Bacterial supplements such as B. longum have been administered to patients who take antibiotics, suffer from bacterial, viral or fungal infections or have various digestive problems.(10) B. longum has been described as “one of the most important residents in the human gastrointestinal tract [because it] keeps the digestive system running smoothly, blocks the growth of harmful bacteria, and boosts the immune system.”(10)

LACTOBACILLUS
“Lactobacillus acidophilus is generally considered to be beneficial because it produces vitamin K, lactase, and anti-microbial substances such as acidolin, acidolphilin, lactocidin, and bacteriocin. Multiple human trials report benefits of L. acidophilus for bacterial vaginosis.”(11)

A study conducted in 2007 using milk fermented with Lactobacillus helveticus (L. helveticus) provided evidence that milk fermented with this probiotic significantly improved the arterial stiffness of those involved in the study. Other studies conducted using milk fermented with L. helveticus indicates that this probiotic not only helps with arterial stiffness but also supports bone mineral density and increases calcium absorption in postmenopausal women.(12)

CONCLUSION
“A stable, healthy intestinal microflora is thought to contribute to overall health by excluding foreign, potentially harmful bacteria.”(6) Scientific studies indicate the multiple benefits that various types of intestinal flora offer the human body. Whether ingested through foods containing these bacteria or taken in supplement form, these probiotics aid in the proliferation of “good” bacteria in the body and help reduce and/or prevent infection and disease.

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**Acidophilus**

**Introduction**

Acidophilus is an “umbrella” name for a category of probiotics. These probiotics, as defined by the Food and Agricultural Organization of the United Nations, are “live microorganisms which, when administered in adequate amounts, confer a health benefit on the host.” (1) One of the main functions of probiotics in the acidophilus group is to provide aid in the digestion process. Some of these bacteria include: Lactobacillus (L.) acidophilus, L. bulgaricus and L. fermentum.

Lactobacillus acidophilus is found naturally in humans in the mouth, the intestines and the vagina. Classified as “healthy” bacteria, L. acidophilus helps guard against infections and disease. There are a number of ways in which L. acidophilus performs. It assists in the breakdown of foods and thereby produces hydrogen peroxide, lactic acid and other substances that create an acidic, unfriendly environment for harmful organisms. L. acidophilus also creates lactase, which is an enzyme that converts lactose (milk sugar) into a simple sugar. Because of this latter capability, ingestion of L. acidophilus may be useful for people who suffer from lactose intolerance.

Scientists began to use Lactobacillus acidophilus for its probiotic benefits as far back as the early 20th century. Russian scientist and Nobel laureate Elie Metchnikoff, studying the helpful properties of yogurt, speculated that the lactic acid produced during yogurt fermentation could conquer decaying gut microbes. Metchnikoff proposed that when the probiotics found their way into the intestines, they would prevent the formation of the harmful microbes. While investigating the diets of people living in the Balkans and the Near East, Metchnikoff came to believe in a connection between long-term consumption of yogurt and longevity.(2)

In the 1920s, acidophilus milk was administered to treat diarrhea as well as constipation. (3) Dannon, a leading manufacturer of yogurt products, began producing yogurt for delivery to pharmacies in the early 1920s. In the 1970s, the company produced a television commercial (the first ever filmed in the then-Soviet Union) that featured a purportedly 89-year-old man from Soviet Georgia eating his yogurt with his mother, allegedly 114 years old, smiling in the background. The campaign sparked sales of Dannon yogurt, and helped create awareness of yogurt among a new generation of users.

In addition to being present in yogurt, lactobacillus acidophilus is available as a supplement, in the form of tablets, liquids and powders.

**Lactobacillus Acidophilus Benefits**

Helps Prevent Yeast Infections
Urogenital infections such as bacterial vaginosis, yeast vaginitis and urinary tract infections affect millions of women. In many instances, the affliction recurs, particularly due to a buildup in resistance to certain antimicrobial therapies. L. acidophilus may prove to be effective in inhibiting the growth of candida albicans, which is the fungus responsible for many of these infections. An abstract from a 2003 article in the Post Graduate Medical Journal of the British Medical Journal states: “daily oral intake of probiotic strains Lactobacillus rhamnosus GR-1 and Lactobacillus fermentum RC-14, resulted in some asymptomatic bacterial vaginosis patients reverting to a normal lactobacilli dominated vaginal microflora.” (4, 5) “When lactobacilli are introduced vaginally … there will be an impact on the subject’s microflora. If this is dominated by yeast, Gram-negative coliforms and anaerobes, or gram-positive cocci, then the outcome might significantly benefit the patient.” (6)

**Assists in the Absorption of Nutrients**
Microflora such as Lactobacillus acidophilus are also necessary for the body’s assimilation of nutrients. They assist in the production of key enzymes, and increase the rate at which vitamins are absorbed. Some of the nutrients best absorbed with L. acidophilus are the vitamins K and B, calcium, lactase and fatty acids.

**Helps Reduce Lactose Intolerance**
A 1984 study demonstrated that lactose is absorbed more effectively in yogurt and products containing L. acidophilus than in milk, and the other items sampled, which include sweet acidophilus milk, pasteurized yogurt and cultured milk. (7) The study also showed that pasteurization greatly inhibited the body’s ability to digest lactose and significantly decreased yogurt’s natural lactase activity.

**Decreases Antibiotic Side Effects**
Antibiotics kill bacteria in the body, both the good and the bad. While antibiotics are a crucial therapy for many illnesses, they can cause the demise of “friendly” flora. They can also produce unpleasant side effects such as diarrhea. Ingestion of L. acidophilus can reduce the likelihood of these side effects. A study conducted among healthy volunteers taking 400 mg of erythromycin showed that those who ate yogurt containing Lactobacillus probiotics exhibited fewer instances of diarrhea than those who ingested pasteurized yogurt. (8) Diarrhea is sometimes reported as a side effect among infants and young children who have been administered antibiotics for respiratory infections. L. acidophilus, when used as a prophylactic, decreases the likelihood of diarrhea among these young subjects. (9)

**Safety of Acidophilus**
Few negative effects have been reported with appropriate use of this probiotic. During initial use, there may be a period of excessive gassiness and flatulence. These conditions will decrease in frequency as the body becomes accustomed to the presence of Lactobacillus acidophilus.

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**Bacillus**

If the digesting of food is a job assignment, then the microflora that lives in the human gut is like a toolbox to achieve this task. When the human body is weakened by digestive problems, it is quite possible that your "toolbox" needs encouragement via a probiotic supplement. The genus bacillus, which is more specific than the broad class known as bacilli, contains several specific species of bacteria that can be useful in breaking down digestive toxins. The natural layer of mucus in the lower digestive system is sometimes prone to weakness, which can create digestive discomfort. Some species of bacillus are helpful in maintaining the health of this important mucus layer. Think of bacillus as a friendly bacteria that acts as a guardian against interlopers, and you will have a good parallel in picturing your body's interactions; these internal interactions help to preserve a healthy intestinal system.

According to a study produced by Ilse J. Broekaert and W. Allan Walker in Mar 2006, several findings on the potency of the genus bacillus were found. The majority of probiotics naturally inhabit the human intestinal microflora, or bacteria that normally occur in the digestive system. Clinical research has proven that probiotics offer preventive and curative features. To quote this study directly, "Positive, strain-specific effects of probiotics have been shown in diarrheal diseases, inflammatory bowel diseases, irritable bowel syndrome, and Helicobacter pylori-induced gastritis, and in atopic diseases and in the prevention of cancer." Although they suggest that additional study is necessary on the effectiveness of specific bacterial strains, they cite many foods that already contain beneficial bacillus probiotics, such as yogurt and infant formula.

A 2006 article on probiotics and neonatal intestinal infection by Hammerman and Kaplan revealed that the use of bacillus probiotics was simpler and less invasive than drugs in helping to normalize the microflora in the gut. Because bacillus helped to bolster natural host defenses, it was considered a safer course of treatment. As a food supplement, bacillus was considered less aggressive, more natural, and effective as a prophylactic or "disease prevention" measure. These are powerful statements that show how legitimate medical uses of the probiotic bacillus have expanded in the past decade.

In the June 2006 publication, "Journal of Applied Microbiology," Parvez and Malik revealed the following findings:

"Most probiotics fall into the group of organisms known as lactic acid-producing bacteria and are normally consumed in the form of yogurt, fermented milks or other fermented foods. Some of the beneficial effect of lactic acid bacteria consumption include: (i) improving intestinal tract health; (ii) enhancing the immune system, synthesizing and enhancing the bioavailability of nutrients; (iii) reducing symptoms of lactose intolerance, decreasing the prevalence of allergy in susceptible individuals; and (iv) reducing risk of certain cancers."

Bacillus is one of the primary bacteria associated with fermented milk products. As the article continues, the mechanisms by which probiotics exert their effects are described. They may involve modifying gut pH, antagonizing pathogens through production of antimicrobial compounds, competing for pathogen-binding and receptor sites, as well as for available nutrients and growth factors, stimulating immunomodulatory cells, and producing lactase. The article reviews health maintenance and disease prevention aspects of several strains in the probiotic array of helpful bacteria, and praises the cost-effectiveness of this food supplement. A bacillus supplement is described as one of the possible helpful products in creating a barrier against microbial infection. This description fits our earlier parallel of bacillus as a useful tool or guardian of the proper-functioning intestine.

Sylvia Santosa, Edward Farnworth, and Peter Jones produced a study on probiotics in 2006 with the following conclusion:

"The strongest evidence is related to the use of Lactobacillus rhamnosus GG in the prevention and treatment of rotavirus-associated diarrhea. Further examination of the literature also shows promise in the treatment of some forms of irritative bowel syndrome (IBS) with probiotics." Although the article makes very general claims, it does recommend more studies of bacillus so that specific strains which might be beneficial to particular diseases can be fully explored. The article draws on a variety of human and animal studies that have shown how bacillus supplements were effective in benefitting digestive health.

In their 2006 article entitled "Recommendations for probiotic use," Martin Floch and Karen Madsen made the following recommendation: "[Probiotics] may be helpful in the prevention and treatment of acute diarrhea in adults and children and the prevention of antibiotic-associated diarrhea in adults and children....early results indicate that probiotics may also be useful in immunologic modulation to prevent atrophy, treatment of radiation intestinal disease, vaginosis, ulcerative colitis, and irritable bowel syndrome..." Comparative and dose-ranging trials are recommended as further studies in this article. It is reassuring for users of our bacillus supplement that our company has gone further into such dose-ranging trials and laboratory studies in order to better define the efficacy of certain bacillus strains, especially those which are human-derived.

In a dramatic 2005 study, mice with colitis who were fed Lactobacillus showed a better reaction than those without it, according to Peter Lange Moller and Anders Paerregaard. The mice in the study who were fed the Lactobacillus in their water supply had a tendency to produce higher interferon-gamma, indicating a significant boost to the immune system, perhaps due to the microbial "guardian" function of bacillus that was discussed above. The harmful microbial interactions that typify colitis discomfort, such as interleukin-4 secretion, were found at lower levels in the mice that received bacillus supplements.

Bacillus has been held up as a useful therapeutic strain in other studies: De Luis and Santamaria studied the influence of dietary yogurt with positive results in 2005. This was a Spanish study of 44 allergic patients who were affected in a beneficial manner by the microbial aspects of bacillus. By comparison, the human-derived bacillus in our own company's supplements has similar benefits as yogurt bacillus. Our own studies have indicated superior performance of the human-derived over the dairy-derived probiotics. For customers with dairy allergies, a totally non-dairy form of bacillus may offer greater comfort than the risk of trusting a very generalized food label.

Since yogurt labeling can be misleading in the claims of how many grams of "live probiotic cultures" are present, we believe that a completely non-dairy source of bacillus may be safer than asking a lactose-intolerant individual to assess the scientific merits of a yogurt label. Many people exhibit varying levels of lactose intolerance, sometimes with occasional mild symptoms, and sometimes in the form of an extreme allergy. Yogurt with a low level of active cultures is prevalent in grocery stores, and those products can cause stomach irritation when their significant lactose levels are unmitigated by real probiotic cultures. The human-derived bacillus in our supplements can legitimately boast the dietary and therapeutic benefits shown in multiple studies cited above. For lactose intolerant individuals, non-dairy sources can even more compatible with human digestion, in comparison to dairy sources of bacillus. Your digestive toolbox will thank you for the addition of bacillus in the form of a probiotic supplement.

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**Bacillus Subtilis**

Bacillus subtilis, as with many in the Bacillus genus, is an extremely common bacterium. It is found in soil, water, air, and decomposing plant matter. Bacteria in the Bacillus genus are spore-forming, which means that they create a thick wall which surrounds their DNA and other internal cell structures. In this way, they are very hardy and impervious to extreme temperatures, chemicals, environmental factors, even some types of radiation. This makes them excellent for use in industrial processes.

Bacillus subtilis is widely used for laboratory studies, but more for genetic research as opposed to health research. The bacteria is highly responsive to genetic mutation, giving it a many experimental uses in a laboratory setting.

Though Bacillus subtilis presents some risk to humans, the instances of this are incredibly rare. Part of the problem with its sometimes shady reputation can actually be attributed to other members of its genus. The Bacillus genus encompasses a large number of species. At one time all aerobic, spore-forming bacilli were named part of the subtilis species. Many of the species are closely related, making it very difficult to tell them apart.

However, the disease-causing Bacillus species are now easily distinguishable from the helpful strains such as Bacillus subtilis. The subtilis species is not to be confused with Bacillus cereus, which is a common cause of food poisoning, and Bacillus anthracis, which is pathogenic to humans and other animals.

Bacillus subtilis is beneficial is many ways, including industrial applications. It is used to produce a variety of enzymes, including amylase, which is helpful in the de-sizing of textiles and starch modification for the sizing of paper. Bacillus subtilis also produces the enzyme protease, including subtilisin, which is used in detergents and the leather industry.

Perhaps more notably, Bacillus subtilis is used to produce many antibiotics, such as difficidin, oxydifficidin, bacilli, bacillomyin B, and Bacitracin, which is helpful in treating bacterial skin infections and preventing infection in minor cuts and burns.

Bacillus subtilis is also used as a fungicide. The bacteria colonize the root system, leaving no room for fungal disease organisms. It is used on agricultural seeds of vegetables, soybeans, cotton, and peanuts and on flower and ornamental seeds. It is also being used to produce insect toxins, including one to kill malarial mosquito larvae.

According to a Toxic Substances Control Act report from the Environmental Protection Agency, Bacillus subtilis “is considered a benign organism as it does not possess traits that cause disease. It is not considered pathogenic or toxigenic to humans, animals, or plants. The potential risk associated with the use of this bacterium in fermentation facilities is low.”

A 2009 report published in the Journal of Hepatology referenced a report by Swiss researchers and showed a possible different aspect of Bacillus subtilis. Liver injury occurred to two patients after taking an Herbalife product “contaminated” with Bacillus subtilis. They concluded that because liver damage resulted after use of the product, Bacillus subtilis possesses “potential hepatoxicity.”

Though the incidence of distress related to Bacillus subtilis is quite low, perhaps the best advice for its use comes from Gary Huffnagle, a Ph.D. and author of The Probiotics Revolution. Because of certain probiotic species’ similarity to disease-causing strains, Huffnagle recommends consulting a healthcare professional before using supplements containing strains of E. coli, Enterococcus faecium, and Bacillus subtilis.

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**Bifidus**

Everyone occasionally has the sensation of a traffic jam in the digestive system. The human gastrointestinal tract, although hardy, can be stalled by a variety of conditions. Sometimes our metabolism slows down with age, and foods that we used to enjoy become irritating. Various illnesses and medications can also contribute to digestive upset. In the field of microbiology, where probiotics such as Bifidobacteria are studied, many discoveries about the microflora of the colon have helped to explain how food is broken down within the human body. With the assistance of Bifidobacteria or Bifidus and other similar micro-organisms, our bodies are able to metabolize sugars and regulate the acid versus alkali balance or pH factor of the GI tract. By encouraging helpful microflora to colonize the GI tract, a mechanism for boosting digestive functionality has been confirmed by many scientific studies.

Bifidus is a genus or group of species, with 32 species currently known in this group. Several of the species are better-known due to their frequent use in foods such as dairy and bakery products; Bifidobacteria Breve (B Breve), B Longum, B Dentium, B Lactis and B Infantis are a few of the species in this group. Bifidus or Bifidobacteria at the microscopic level look like small trees with spatulas or rods for branches. These microflora contribute to the degradation of undigested polysaccharides in the human colon; in other words, they act as decomposers along the roadway of the digestive system. Without the healthy functioning of Bifidus bacteria, irritation and irregularity can become more than an occasional problem. Moreover, the metabolism of the host is somewhat dependent on the metabolism of the microflora in the intestines and colon. Without their ability to break down partially-digested food, our bodies would lack the necessary tools to achieve this task.

According to a 2006 study at the University of Belgium, Bifidobacteria have been found to contain genes that encode enzymes involved in the production of acids from carbohydrates. This is one of the major functions of the human digestive system, which happens to be conducted through a symbiotic relationship with bacteria. From sugars in the intestine and colon, Bifidus bacteria produce metabolytes including acetic acid, lactic acid, succinic acid, formic acid, and ethanol. Changes in the bacteria's end product formation can be related to the specific rate of sugar consumption, according the the Belgian study. Bifidobacteria preferentially use the short fractions of oligofructose rapidly. However, other microflora prefer to break down different types of sugar. In this manner, a combination of bacteria residing within the human gut zooms in on their various preferred fuel types in order to keep things moving along the roadways of the digestive system.

By adding acid to the GI tract as an endproduct of their metabolism, helpful bacteria appear to reduce the opportunities for pathogens to take hold and exploit this environment. Many pathogens prefer a lower acid (or higher pH) environment. With an increase in the Bifidus bacteria's metabolic activity, a decrease in harmful bacteria appears to occur. Therefore, diet additives that encourage the diversity of microflora in the colon are also helpful in eliminating toxins efficiently, thanks to the impressive metabolism of certain bacterial strains.

The metabolism of Bifidus bacteria was first discovered in 1966 by a scientist named Chiappini. Since that time, genome projects have isolated particular genes and enzymes within bacteria that may be helpful to human digestion and metabolism (Duncan, et al, 2002 and 2004). More recent studies where Bifidus bacteria are deliberately encouraged to overpopulate by fermentation have isolated some of their strengths and weaknesses in metabolizing certain types of sugars. With this type of research generating new discoveries daily, opportunities are exploding for therapeutic and preventative food supplements to be found among the various strains of Bifidus or Bifidobacteria.

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**Bifidobacterium**

Bifidobacteria are one variety of “good” bacteria that live in a healthy intestinal tract. Since bifidobacteria exist naturally in your gastrointestinal system, you might guess that nature intends bifidobactera to serve a specific purpose there, and your guess would be correct. Along with many of the other gut flora, which is the collective term for the bacteria that occur naturally in your intestines, bifidobacteria aid in the food digestion process.

Unfortunately, not every person has a perfectly functioning intestinal tract. In a 1992 study, the National Center for Health Statistics (NCHS), a division of the Center for Disease Control, reported that 5.9 percent of respondents to an National Health Interview Survey (NHIS) questionnaire on digestive disorders had experienced functional colon issues at one time or another. (1) Because bifidobacteria keep healthy digestive systems working properly, researchers have taken an interest in the possibility that supplemental bifidobacteria might help boost the digestive systems of those suffering functional colon issues.

As with all probiotics, the bifidobacterium microbe is only classified as a probiotic when it is: administered live; capable of surviving the administering process and subsequently growing; and administered in an amount proven to provide health benefits to the recipient.(2)

WHAT ARE THE BENEFITS OF PROBIOTIC BIFIDOBACTERIUM?

Only in the last decade or so have researchers begun to actively pursue the probiotic benefits of bifidobacterium. Historically, most available information about bifidobacterium came from the study of feces, animals, and post-mortem subjects.(3) Finding successful ways to administer bifidobacterium such that it survives its shelf life and your gastric fluids has also been tricky.

Researchers know that bifidobacteria exist in healthy digestive systems, but the performance of individual sub-strains has not been thoroughly identified. In 2006, researchers from the University of Manchester School of Medicine conducted a study on the effects of B. infantis on female Irritable Bowel Syndrome (IBS) patients. The researchers identified a probiotic dosage level for B. infantis that could be administered in a stable, convenient capsule, and which improved abdominal pain, bloating, bowel dysfunction, incomplete evacuation, straining during bowel movements, and the passage of gas. (4) Another ongoing clinical trial is studying the effects of B. breve on IBS patients. (5)

An additional ongoing clinical trial is evaluating the effects of B. infantis and B. animalis on premature infants. The researchers noted higher levels of bifidobacteria in healthy breast-fed term babies versus formula-fed babies. (6)  While researchers have proven B. infantis an effective treatment for IBS in women, another University of Manchester study has shown that B. pseudocatenulatum is associated with atopic eczema in infants. The study also demonstrated higher levels of B. bifidum in breast-fed infants, and higher levels of B. pseudocatenulatum in formula-fed infants. (7)

WHAT ARE THE SUB-STRAINS OF BIFIDOBACTERIUM?

So far, you have heard of studies involving B. infantis, B. bifidum, B. pseudocatenulatum, B. breve, and B. animalis. These five sub-strains make up a very small portion of the bifidobacterium sub-strains that scientists have identified. Frederic Krzewinski compiled the following comprehensive list of bifidobacterium sub-strains for a Universite des Sciences at Techniques de Lille PhD Thesis in 1997, which was revised by Francoise Gavini in 2001 (8):

Human origin:
\* B. adolescentis
\* B. angulatum
\* B. bifidum
\* B. breve
\*B. catenulatum
\* B. denticolens
\* B. dentium
\*B. gallicum
\* B. infantis (also known as B. liberorum and B. lactentis)
\* B. inopinatum
\* B. longum
\* B. pseudocatenulatum

Environmental and food origin:
\* B. lactis
\* B. minimum
\* B. subtile
\* B. thermacidophilum

Animal origin:
\* B. animalis
\* B. asteroides
\* B. boum
\*B. choerium
\* B. coryneforme
\* B. cuniculi
\* B. gallinarum
\* B. indicum
\* B. magnum
\*B. merycicum
\* B. pseudolongum subsp. Pseudolongum
\* B. pseudolongum subsp. Globosum
\* B. pullorum
\* B. ruminatium
\*B. saeculare
\* B. suis
\* B thermophilum (also known as B. ruminale)

THE FUTURE OF BIFIDOBACTERIUM

Bifidobacterium is already a solid contributor to the commercial probiotic population. Dannon has seen marketing success with its Activia line of yogurts, featuring B. animalis. Nestle has launched a probiotic line of infant formula called Good Start Natural Cultures, featuring B. lactis.(9) As researchers discover ways to successfully administer and harvest the health benefits of additional sub-strains of bifidobacterium, you can expect that food and drug companies will continue to find new and innovative ways to bring bifidobacterium to your retail shelf.

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**Bifidobacterium Bifidum**

While bacteria can cause serious infections, the vast majority of them are not only helpful, but necessary for good health. As long as the good bacteria in our bodies win the war of numbers against those which are harmful, both our immune systems and digestive tracts will benefit.

Among the most ferocious warriors in this army of advantageous microbes is a type of probiotic called bifidobacterium bifidum, which inhabits the colon and vagina. Its job is to maintain the micro flora balance within the intestines, control the increase of detrimental bacteria, bolster the immune system, and aid in the digestive process.[1] Research is currently ongoing to clarify the role of bifidobacterium bifidum in treating certain health conditions and the best way to increase the production of helpful colonies of this probiotic within the human body.

Several of these studies center on infant nutrition and the role that bifidobacterium bifidum can play in increasing the immune response of premature or weakened digestive systems in the tiniest among us. A study done concerning the effects of bifidobacterium bifidus on neonatal necrotizing entercolitis (NEC), one of the chief causes of death in premature babies, showed some promising results. The study was done on a premature rat population, who were placed under conditions which caused the development of NEC. In this controlled study, bifidobacterium bifidus caused a reduction in NEC occurrence from fifty-seven percent in the control group to seventeen percent in the study group. This suggests that bifidobacterium bifidus, which is prevalent in breast milk, might reduce inflammation and regulate the mucus layer to improve digestion in infants.[2]

Another intriguing study, concerning the effect of bifidobacterium bifidus in controlling allergic diseases, involved newborns of families with a history of eczema. A probiotic compound including bifidobacterium bifidus was given to a group of mothers before delivery and to their babies for a year afterwards. The control group received no probiotic treatment. The prevalence of eczema in the placebo group was much higher than that of the intervention group until the babies were three months old, and the preventive effects lasted in the intervention group until their second birthday.[3]

Current research has also shown that bifidobacterium bifidum might be useful in managing allergic reactions. When researchers gave mice an oral dose of this probiotic to test its effect on the production of immunoglobulin E in mice, they discovered that there was a strong suppressive action. They concluded that bifidobacterium bifidum could be a great weapon in controlling diseases caused by allergic response.[4]

As the scientific community continues to investigate this probiotic powerhouse, it is important to note that oral bifidobacterium bifidum has not been approved by the Food and Drug Administration. Currently, some in the medical community do recommend it specifically for intestinal regularity and maintenance. Those with severe digestive system disorders or blood in the stool should discuss these with their physician before using this probiotic. Although no side effects have been reported, bifidobacterium bifidum pregnant and lactating women will need to consult with their physicians, who may not recommend any use of this probiotic during these phases, as it could possibly be passed through the breast milk of the mother to her infant.[5]

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**Bifidobacterium Infantis**

INTRODUCTION

Consumers today have become increasingly aware of the number of natural, dietary supplements available on the market that contain “good” bacteria known as probiotics. These products are becoming more desirable as consumers learn of the health benefits associated with these types of supplements. Recent reports indicate that probiotic supplements containing Bifidobacterium infantis may help reduce the symptoms of irritable bowel syndrome in women (IBS).(1)

BIFIDOBACTERIUM INFANTIS

Bifidobacterium infantis is a probiotic bacterium that inhabits the intestines of both infants and adults. This type of bacteria is considered beneficial because of the acids it produces. The acids produced by Bifidobacterium infantis may help impede the growth or colonization of harmful bacteria within the colon.(3) According to Medical News Today, Bifidobacterium infantis is “normal, friendly bacteria [that] play an important role in basic digestion, proper metabolism and overall well-being. [Bifidobacterium infantis] works within the digestive system to restore intestinal balance and maintain normal digestive health.”(1) According to to a study sponsored by P&G Health Sciences Institute and published in the American Journal of Gastroenterology, Bifidobacterium infantis may be beneficial to those that suffer from symptoms of irritable bowel syndrome (IBS) including bloating, gas, diarrhea, constipation, urgency and abdominal discomfort.(2)

The digestive process begins when an individual chews food, thereby breaking it down into smaller food particles that are more susceptible to digestive enzymes. This breakdown not only makes the food more susceptible to digestive enzymes but it also allows the food particles to travel more easily through the digestive tract.(4) The large intestine has a high number of microbes present that help complete the process of food digestion. Microbes are tiny, living organisms usually too small to be seen with the naked eye and are also commonly referred to as microorganisms. These microbes or microorganisms include bacteria, viruses, fungi, algae, and protozoa.(5) Bifidobatcerium infantis, which is a bacteria, falls into the microbe or microorganism category. Bifidobacterium infantis is considered a “good” or beneficial bacterial. According to some research “there are advantages in skewing the balance of bacteria toward beneficial ones...[because] the metabolic end products of their growth are organic acids (lactic and acetic acids) that tend to lower the pH of the intestinal contents, creating conditions less desirable for harmful bacteria.”(4) For these reasons, Bifidobacterium infantis may help provide relief to individuals suffering from IBS symptoms.

IRRITABLE BOWEL SYNDROME

According to the National Digestive Diseases Information Clearinghouse (NDDIC) approximately one in five adults living in the U.S. experience symptoms of irritable bowel syndrome (IBS), which makes this condition one of the most commonly diagnosed disorders.(6) Some doctors have theorized that IBS is caused by “a colon, or large intestine, that is particularly sensitive and reactive to certain foods and stress. The immune system, which fights infection, may also be involved.”(6) An increased presence of “good” bacteria can assist the body's immune system in fighting infection and illness. Because Bifidobacterium infantis is a beneficial bacteria, also known as a probiotic, it could be theorized that increasing the amount of Bifidobacterium infantis may help build the body's natural defense mechanisms. In this way, an increase in the amount of Bifidobacterium infantis in the large intestine may help relieve the symptoms of IBS.

CONCLUSION

“It has been established through controlled scientific investigations that probiotics ingested in certain numbers exert health affects beyond inherent basic nutrition.”(1) Therefore, individual's suffering from IBS and other types of digestive disorders may want to include in their diet a regimen of Bifidobacterium infantis. While “research still is being conducted on how probiotic cultures may influence a wide-range of health conditions,”(1) a body of scientific evidence does exist to provide proof of the potential health benefits of Bifidobacterium infantis and other supplemental probiotics.

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**Bifidobacterium Longum**

INTRODUCTION

Bifidobacterium longum, also commonly referred to a B. longum, is a non-pathogenic probiotic that is found naturally in the gastrointestinal tract (GIT) and the vagina. As a probiotic, B. longum may provide health benefits to individuals as B. longum works to prevent disease. Probiotics and B. longum by extension are “dietary supplements or foods that contain beneficial, or 'good,' bacteria that are similar to those normally found in your body. Although you don't need probiotics to be healthy, these microorganisms may provide some of the same health benefits that the bacteria already existing in your body do — such as assisting with digestion and helping protect against harmful bacteria.”(1)

BIFIDOBACTERIUM LONGUM

Bifidobacterium Longum has been described as one of the most significant and important types of “good” bacteria that inhabits the human body. Bifidobacterium longum or B. longum is “very helpful because it maintains a normal digestive tract, inhibits the growth of harmful bacteria, and also boosts the immune system.”(2) Other benefits of B. longum include, “diarrhea prevention in antibiotic treated patients, cholesterol reduction, alleviation of lactose intolerance symptoms, immune stimulation, and cancer prevention.”(2). There are several types of food sources in which B. longum can be found and these food sources include: yogurt, various types of fermented dairy foods, and cultured vegetables such as sauerkraut. Additionally, B. longum may be taken in supplement form. B. longum, as well as other types of “good” bacteria, have what is considered a symbiotic relationship with human beings. This means that the relationship between B. longum and human begins is mutually beneficial. B. longum ferments sugars into lactic acid thereby lowering pH levels in the intestine (2). Therefore, it assists the body in “maintain[ing] a healthy balance of intestinal flora by producing organic compounds—such as lactic acid, hydrogen peroxide, and acetic acid—that increase the acidity of the intestine and inhibit the reproduction of many harmful bacteria.”(3)

Several studies involving the benefits of B. longum have been conducted on both humans and animals with positive outcomes. One such study suggested that B. longum contained both antimutagenic and anticarcinogenic properties as asserted that the lactic acid produced by B. longum may have an affect on tumor cells.(4) The study that was conducted to test this hypothesis involved rats and concluded that the “dietary administration of lyophilized cultures of B. longum resulted in significant suppression of colon tumor incidence and tumor multiplicity and also reduced tumor volume.”(4) In other words, this “study on rats with colon cancer showed that Bifidobacterium longum prevented the cancer from spreading and stopped tumors from growing.”(5). In addition to this research various studies have been conducted regarding the health effects of B. longum, and researchers have concluded from these studies that B. longum may minimize the effects of or prevent the following: constipation associated with weight loss, various types of allergies and allergic diseases, cancer, inflammation associated with Crohn's disease or colitis, or high levels of cholesterol.

CONCLUSION

Bifidobacterim longum is a probiotic that may be beneficial to individuals suffering from illnesses or diseases ranging from high cholesterol to colon cancer. “Supplements of Bifidobacterium longum, especially in combination with other beneficial organisms, hold the best hope for preventing colon cancer and other types of digestive malignancies.”(5). While all of the benefits of B. longum have yet to be identified, a wealth of scientific data does exist which suggests numerous ways in which B. longum can be beneficial to the overall health of an individual.

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Bifidobacterium Animalis

Of the millions of bacteria living in the human body, most are harmless, including those rendered harmless by the immune system. Some, however, are actually good for the body. These are called probiotics. The World Health Organization defines probiotics as, "Live microorganisms which, when administered in adequate amounts, confer a health benefit on the host."

Bifidobacterium animalis is one such probiotic. Bifidobacterium lives in the large intestines of most mammals, including humans, and is essential for healthy digestion. Bifidobacteria help maintain the body's digestive balance in several ways. In the large intestines, they compete for food and space. To do so, they attach themselves to the intestinal wall. A body with a flourishing colony of bifidobacteria has little room and few nutrients to spare for the harmful bacteria that may try to invade. Bifidobacteria are also excellent producers of acids that reduce pH. In this way, they prevent illness-causing bacteria that prefer an alkaline environment.

Bifidobacteria also has an important role in cancer prevention. Nitrates enter the body in food and water. Some types of harmful bacteria can change nitrates into nitrites, a cancer-causing substance. Bifidobacteria reduce the existence of these harmful bacteria and their ability to feed. When these bad bacteria have no place to attach themselves and no food, they simply continue through the digestive tract and pass out of the body.

Bifidobacteria are anaerobic, meaning they do not need oxygen to survive. Many forms of harmful bacteria do require oxygen. Because the bifidobacteria produce an environment that is acidic and lacking oxygen, these harmful bacteria are unable to survive passage through this area.

In addition to these vital functions, bifidobacteria produce important B-complex vitamins. They also contribute to successful dietary management of some liver conditions.

The specific strain Bifidobacterium animalis is one of over thirty strains of bifidobacteria, which is one of the most common groups of bacteria found in the intestines of humans and other animals. Bifidobacteria animalis encompasses two types which were once thought to be completely separate strains. Bifidobacterium animalis and Bificobacterium lactis are so similar at the subspecies level that they are now denoted as Bifidobacterium animalis subsp. animalis and Bifidobacterium animalis subsp. lactis.

Yogurt giant Dannon used Bifidobacterium animalis in their Activia brand of yogurt. Not only do they use it, but they market Activia as yogurt with a unique probiotic culture that helps naturally regulate the digestive system.  Studies conducted by Dannon have shown that Bifidobacterium animalis survives the trip through the digestive tract and significantly reduces colonic transit time.

In 2005, a related study by scientist Chr. Hansen demonstrated positive effects when using probiotics, including Bifidobacteria animalis, in dealing with intestinal inflammation and harmful bacteria. In this study, a high percentage of those treated with Bifidobacteria animalis showed a reduction in bowel frequency, a reduction in liquid stools per week, and an increase in solid stools per week. The study concluded that probiotic treatment may potentially influence the disease course of collagenous colitis, an inflammatory condition of the colon that causes chronic diarrhea.

In a different type of study, Italian scientists investigated the effects of Bifidobacterium animalis in rats with an induced zinc deficiency. Though zinc deficiency caused ulcerations, edema, inflammatory cell infiltration, and dilation of blood vessels, the mucosa of the rats which received Bifidobacterium animalis was well-preserved. In addition, most of the symptoms in the treated rats normalized. A high concentration of Bifidobacterium animalis was present in rats waste, meaning that it survived and even thrived in spite of the zinc deficiency. This suggests that treatment with Bifidobacterium animalis can help protect the intestines from zinc deficiency.

Another exciting study, this one conducted in Japan in 2006, suggested that an effective Bifidobacterium animalis oral vaccination could be used to prevent types of Salmonella.
The affects of Bifidobacterium animalis are still undergoing study, but this helpful bacteria seems to have multiple benefits that help humans and animals maintain a healthy digestive system.

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**Bifidobacterium Breve**

If you think of your lower digestive tract as a pathway through a forest, then the trees along that path would be the various bacteria to which the human body plays host. One of the most useful and friendly bacteria in this environment is the species called "bifidobacterium breve." Also known as B breve, this bacteria is anaerobic and non-motile. Its branches are rod-shaped, looking almost like a cactus in the microscopic view. Once established, B breve is unique in its ability to compete with other bacteria, due to the large variety of molecules it can digest. Some people have a great deal of this helpful bacteria, but others may need a supplement to encourage its presence.

The symbiotic relationship that humans have with bacteria is particularly important in the functioning of the colon. In medical studies, ailments such as antibiotic-associated diarrhea, allergies, gas, and irritable bowel syndrome have been linked to a patient's shortage of the B breve bacteria. The presence of B breve appears to inhibit E coli. B breve is also present in the vagina, where it helps to inhibit overproduction of candida albicans, also known as the primary cause of yeast infections in women.

In young babies who are breast-fed, B breve has been found to make up a majority of the colon's bacteria. It appears that as we age, many people lose a large number of the B breve bacteria until it makes up less than ten percent of the digestive-related bacteria count. Less helpful bacteria which do not have the same immune benefits as B breve may over-colonize the human body during times of illness or stress, but you can change the odds of being a "good host" to B breve. By encouraging the robust workers such as B breve, digestive-related illnesses and their associated discomfort may be discouraged or significantly reduced.

The job of B breve in the digestive tract is to ferment sugars and produce lactic acid as well as acetic acid. B breve is like a champion among probiotic bacteria due to its superior ability to break down many types of food, even plant fibers that are normally considered non-digestible.

Supplementing B breve where it has become a "minority partner" can help to recapture the digestive benefits found in a healthy baby. If B breve can be encouraged in the digestive tract, the occurrence of gas, diarrhea, and bowel irritations may be reduced. Some doctors have referred to these supplements as a way of "promoting your gut health." As a partner in the digestive process, B breve comes to the table as a highly recommended worker.

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**Lactobacillus**

The human gastrointestinal tract, or GI tract, is like a food-processing factory. If you picture the inner workings of your body like an assembly line, then the helpful bacteria act as the workers in this factory. Your body's intestinal microflora include probiotic bacteria such as Lactobacillus Bulgaricus and Lactobacillus Acidophilus, which often work as a team to take in raw materials, both helping to sort the useful versus harmful substances that you eat. Lactobacillus also serves your internal digestive factory as an agent that converts lactose to lactase, competes with harmful bacteria for nutrients, and produces as a byproduct some helpful antibacterial substances that promote a healthy environment for the GI tract. If Lactobacillus populations within your gut are present at suboptimal levels, a probiotic supplement is beneficial to beef up the labor pool and sorting of nutrients versus toxins in your "internal factory."

Many studies have teamed multiple strains of Lactobacillus together to administer a probiotic supplement which appears to have beneficial toxin-fighting effects in humans and animals. Microbial members of the Lactobacillus group are typically present in natural yogurt and fermented dairy products. Some studies of Lactobacillus have additionally sought out non-dairy sources of Lactobacillus. Our company's Lactobacillus probiotic supplement uses a non-dairy source that reduces any potential for milk-related allergies. Our own laboratory studies of dosing levels and reactions to the Lactobacillus supplement have indicated that the supplement form is far superior, better tolerated, and more effective than simply adding yogurt to the diet. For lactose intolerant customers, we take the guesswork out of which product might produce a dairy-related allergy. In this way, the many benefits of Lactobacillus can be fortified and strengthened by adding it to your diet as a supplement without ingesting dairy products.

In the March 2005 issue of "American Journal of Physiology," Fergus Shanahan reports that the intestinal flora is a positive asset to a host's immune system defense. He describes strategies to enhance assets or offset microbial liabilities and shows how these options represent therapeutic possibilities. He discusses a justifiable rationale for manipulation of the flora involved in irritable bowel syndrome. Shanahan suggests that the the diversity of messages or signals sent between the cells and microbes of the human gut presents an untapped reservoir of potential future therapies. Analysis of signaling and natural regulatory functions among the flora and host epithelium, lymphoid tissue, and neuromuscular apparatus is a field of study that is quickly gaining ground in medical journals. To quote this study directly, Shanahan concludes that "the capacity to engineer food-grade or commensal bacteria to deliver therapeutic molecules to the intestinal mucosa promises to extend the scope of microbial manipulation for the benefit of mankind."

Robin Spiller noted in 2005 that irritable bowel syndrome or IBS can go into remission spontaneously, implying that a cure is possible. Several predictors of good prognosis are analyzed in this study. She reports that possible disease-modifying treatments with long-lasting effects include probiotics, which may have a benefit in altering bacterial microflora and as anti-inflammatory agents.

In their study of GI infections for the British Journal of Nutrition, Gibson and McCartney study whether or not probiotics can elicit inhibitory effects against pathogens. They conclude that an increase in certain microflora does prove effective at repressing the spread of infectious agents when they enter the GI tract. In this study, they recommend a fortification of Lactobacillus microbes by the use of prebiotics or probiotics for improved protection. They cite a number of potential mechanisms for Lactobacillus bacteria to reduce intestinal infections. Firstly, metabolic end products such as acids excreted by these micro-organisms may lower the gut pH (i.e., increase acidity) to levels at which pathogens cannot compete. Also, many lactobacilli species are able to excrete natural antibiotics, which can have a broad spectrum of activity. Other helpful probiotic mechanisms include an improved immune stimulation, competition for nutrients, and blocking of pathogen adhesion sites in the gut.

Many intestinal pathogens like E coli and salmonellae use receptor sites in the gut to establish themselves. Then these toxins can cause gastroenteritis through their invasive properties. One way that prebiotics and probiotics appear to work, according to the British study, is by simulating such receptor sites in the human GI tract, at the microscopic level. Through the action of Lactobacilli probiotics, pathogens appear to be "decoyed" into not binding to the host's intestinal mucosa.

The British study cited above calls to mind the parallel of the assembly line in the body's internal factory. Lactobacillus microflora appear to grab (or attract) and sort toxins, guiding them away from the lining of the GI tract by use of the decoy action described in the Gibson and McCartney study. The British study also concludes that the combined effects of probiotics on intestinal microflora, as well as their unique anti-adhesive strategies, may lead to new dietary interventions against toxins.

In the publication "Proceeding of the Nutrition Society," Elizabeth Furrie points out that allergies are caused by an immune reaction that is out of proportion to other functions in the digestive system. The physiological outcome is inflammation commonly displayed by rhinitis, skin irritation, vomiting, and diarrhea, depending on the route of allergen entry. In extreme reactions, anaphylactic shock can result from allergies. Chronic allergic responses most commonly present themselves as asthma and eczema. All these symptoms are the consequence of an imbalanced immune system making an unsuitable response to an environmental or food antigen. In this study, a harmful reduction of GI tract microflora is seen more frequently among bottle-fed infants and children, in comparison to breast-fed babies. Furrie found that the use of probiotic therapy to boost intestinal microflora and prevent allergic disease has been demonstrated in two studies using a probiotic Lactobacillus combination in infants. A long-term reduction in allergy has been shown in the test group, with various Lactobacillus strains reducing the incidence of atopic eczema. Management of allergy through probiotics has also been demonstrated in infants, using Lactobacillus strains to control atopic eczema and cow's milk allergy.

In their 2005 study, Szajewska and Mrukowics found that probiotics, defined as microbial cell preparations or components of microbial cells, do have a beneficial effect on the health and well being of the GI tract. Beneficial effects of probiotics in children's acute infectious diarrhea seem to be more evident when treatment with probiotics is initiated early in the course of the disease, or prior to the stomach upset as a preventive course of action. In this study, three large, randomly controlled trials provide evidence of a statistically significant effect of Lactobacillus probiotics on the prevention of community-acquired diarrhea. They noted that the effects of different probiotic micro-organisms are not equal, but many results of random trials have shown promising results for Lactobacillus.

As a single probiotic supplement, or combined with other microbial flora, Lactobacillus has acquired a solid scientific following, as shown in the studies cited above. As a tool for supporting digestive health, our company offers the Lactobacillus microbe in several forms. To increase the efficiency of the toxin-blocking function within your own "digestive factory," we highly recommend Lactobacillus as a probiotic supplement with proven results. Whether you are interested in reducing digestive problems, or preventing the onset of an intestinal upset, our products derived from Lactobacillus have shown a documented advantage in the toxin-blocking function of this helpful microflora.

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**Lactobacillus Brevis**

Lactobacillus brevis is the binomial name denoting a strain of lactic acid bacteria. Food manufacturers rely on these bacteria’s ability to ferment carbohydrates and contribute to the creation of desirable foods. Tasty results of the process include yogurt and sauerkraut. It was not until recent years that Lactobacillus brevis was recognized as a crucial member of the probiotic microorganisms that actively promote the health of the human gut. Yet did you know that Lactobacillus brevis can quite possibly save your life?

**What is Lactobacillus Brevis and Where Can I Find It?**
Lactobacillus brevi, also known as l. brevis, s is one of the beta bacteria (1) most commonly associated with the fermentation of vegetation, dairy and even sourdough. Its subsequent introduction into the human digestive system underwent close scrutiny and resulted in Lactobacillus brevis’ addition to the group of probiotics.

**Benefits Associated with Lactobacillus Brevis**
Continuous clinical studies acknowledge that Lactobacillus brevis provides anti-inflammatory benefits to the human digestive system. A 2006 study (2) offered such convincing proof that oral ulcers associated with Behcet's syndrome could be controlled with the targeted supplementation of L. brevis, researchers strongly urged larger trials.

A 2009 publication (3) decisively ranks lactic acid bacteria – of which l. brevis is one – into the group of probiotics that evidence not only anti-inflammatory properties but also show anti-cancer activities. Digestion of these beneficial bacteria by test animals resulted in a marked suppression of colonic tumor formation and reduction of DNA damage.

**Not All Lactobacillus Brevis Is Created Equal**
Getting your daily dose of probiotics in general -- and Lactobacillus brevis in particular -- might lead you past the yogurt shelf of the dairy aisle. After all, with the potential benefits ranging from help with constipation over inflammatory bowel disease to even colon cancer, it stands to reason that ingestion of lactobacillus containing probiotics is a crucial aspect of continued health and wellbeing.

The trick to reaping all of the benefits probiotics have to offer is buying them when they are supplied as live cultures. Back in 1996, a study researching the effect of oral supplementation of Lactobacillus brevis (4) factored in live and also heat treated preparations. Consistent evaluation proved that heat treated cultures failed to provide any statistically significant beneficial outcomes, while live Lactobacillus brevis offered a statistically considerable benefit to human test subjects.

This of course significantly impacts the availability of beneficial Lactobacillus brevis to the consumer. If yogurt is not your passion and the sheer amount you would have to ingest for maximum health is more than you are willing to eat, oral supplementation is an attractive option. Utilizing the kind that contains live cultures of the probiotic is a key element. Another important consideration is the storage of the supplements. Unlike vitamins that generally do well on any pantry shelf, probiotics should be stored in a controlled cool environment that is dry and out of direct sunlight.

**Is Lactobacillus Brevis Really Worth the Trouble?**
You may be tempted to think that your overall dietary habits make supplementation with L. brevis unnecessary. Nothing could be further from the truth! Physicians recognize that following an antibiotics treatment for deadly Clostridium difficile infections with lactobacillus supplementation greatly increases the treatment’s effectiveness and also prevents a disease specific setback. (5)

There are of course some potential contraindications that can make the supplementation with lactobacillus problematic. If you currently take medications – especially immunosuppressive drugs – make sure you discuss your intent to use Lactobacillus brevis ahead of time with your physician. The same holds true if you suffer from cancer, HIV or other diseases that greatly impact the immune system.

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**Lactobacillus Bulgaricus**

Most people don't think of their digestive system as a battlefield, but the comparison is apt when you consider how many potentially invasive toxins are trying to invade the GI tract on a daily basis. As harmful bacteria such as E coli move through the human intestine, your natural defense system is alerted and helpful bacteria are called into play. These helpful bacteria consist of microflora such as Lactobacillus Bulgaricus, or L Bulgaricus. Although most commonly found in Bulgarian yogurt and Swiss cheese, Bulgaricus can also be taken as a dietary supplement in a capsule form. Bulgaricus in the dairy industry is identified as a "starter culture" that encourages the growth of other probiotic microbes during the production of cheese and yogurt. This function as an early adapter in harsh environments may offer a glimpse into the prominence of Bulgaricus in the role of a beneficial probiotic.

L Bulgaricus is one of the symbiotic micro-organisms that can shrink or multiply within the environment of the mucous lining in the gastro-intestinal tract, also called the "intestinal mucosa." This environment is described in medical journals as an interface between the absorption of needed nutrients and the diversion of harmful microbes and toxins. When the balance of beneficial microflora is weakened at this interface, infectious diseases are more likely to take a foothold. Conversely, when helpful microflora are flourishing, many germs and infections are prevented from adhering to the host by an amazing system of signals and decoy strategies employed by the digestive system in partnership with the intestinal microflora.

L Bulgaricus appears to play several important roles as a soldier in this battlefield of the digestive tract. These mechanisms include reducing intestinal infections by excreting metabolic end products-- such as acids --that change the pH of the GI tract. At lower pH ranges, or higher acidic levels, it appears that many pathogens simply give up the fight to survive. Also, Lactobacillus Bulgaricus excretes natural antibiotics, which can have a broad spectrum of immune-boosting functions. Other helpful probiotic mechanisms include the blocking of pathogen adhesion sites within the mucous layer of the intestine.

L Bulgaricus shows a proven ability to draw away toxins and defeat harmful bacteria, while colonizing the intestinal mucosa in a beneficial symbiosis. L Bulgaricus appears to be a particularly rugged strain of microbial flora, and has been shown to withstand the low pH levels within the stomach during its digestive journey. Many probiotic products cannot withstand the high acid environment of the stomach, nor the bile salts of the duodenum, thus not reaching their designated work station within the intestine.  L Bulgaricus supplements have been compared to a spore, in that it can be stored like a seed but once digested, blooms and grows into the appropriate function within the human GI tract.

In the field of microbiology, an often-quoted study on the effects of Lactobacillus Bulgaricus was produced by L. Baricault in 1995. Baricault showed that L Bulgaricus appeared to demonstrate anti-tumor qualities in his study of rats and hamsters. Many scientific discussions on the effectiveness of Bulgaricus as a possible anti-cancer agent or barrier against disease began with this study, long before the term "probiotic" became a household word.

University studies in Korea and South Carolina have subjected certain Bulgaricus strains of bacteria to freeze-drying and exposure to various chemical sprays. Lactobacillus Bulgaricus showed in these tests that it posesses an unusually hardy tolerance to harsh environments and resistance to toxins. L Bulgaricus fed to mini-pigs during a 2001 university study in Germany also found that Bulgaricus was able to survive the full transit of the mammals' upper digestive system, unlike many other probiotics. This German study noted that the Bulgaricus yogurt cultures which were fed to the test subjects appeared to enhance the growth of other helpful microflora when two or three bacterial strains were introduced in combination.

In their 2005 study of GI infections for the British Journal of Nutrition, Gibson and McCartney studied the signalling patterns used by probiotics and prebiotics to inhibit the spread of pathogens in the intestinal mucosa. In this study, one mechanism cited to describe the workings of these microflora is by decoying and rerouting toxins so that they do not bind to the host's intestinal mucosa. This British study calls to mind the parallel of a battlefield within the GI tract.

Bulgaricus microflora appear to set up a defensive line wherein harmful bacteria are guided away from the important area of interface, the intestinal mucosa. The several studies cited here have led to discoveries hinting that the combined effects of probiotics on intestinal microflora, as well as their unique anti-adhesive strategies, may lead to new dietary interventions against toxins. Lactobacillus Bulgaricus offers adaptability to harsh environments and a boost to help other microflora become established. This helpful supplement has shown its effectiveness in guarding the health of the GI tract.

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**Lactobacillus Casei**

INTRODUCTION

Lactobacillus casei, more commonly referred to as L. casei, is a harmless, nonpathogenic microorganism that has been widely recognized for the attributes and properties it possesses that have been found to be beneficial to the human body. L. casei is a type of bacteria that helps protect the human body from disease and illness by restricting the growth of various types of harmful bacteria that cause infection and be detrimental to an individual's health. According to the World Health Organization and the Food and Agriculture Organization of the United Nations probiotics are "live microorganisms, which, when administered in adequate amounts, confer a health benefit on the host."(1) Because of the benefits L. casei offers it is typically categorized as a probiotic.

LACTOBACILLUS CASEI

Lactobacillus casei is a beneficial bacteria that is found naturally in both the mouth and intestines of human beings. It produces lactic acid which helps lower pH levels in the digestive system and impedes the growth of harmful bacteria. L. casei may be found in “raw or fermented dairy and fresh or fermented plant products.”(2) These sources may include yogurt, cheese, and other types of food sources such as fermented green olives.(3) According to some reports, “Scientists have found [Lactobacillus casei] to possess beneficial properties that support human health. It is able to improve and promote digestion. Some strains of the bacteria help control diarrhea, while other strains have an anti-inflammatory effect on the gut. Other advantageous effects include reducing lactose intolerance, alleviating constipation, and even modulation of the immune system.”(3) Because “friendly bacteria are vital to proper development of the immune system, to protection against microorganisms that could cause disease, and to the digestion and absorption of food and nutrients”(1) ensuring that the body has an appropriate amount of L. casei inhabiting the body is important. This may especially true for individuals suffering from Crohn's disease and critically ill children suffering from diarrhea.

CROHN'S DISEASE

Crohn's disease is a type of IBD and can affect any part of the gastrointestinal tract (GIT), but the area of the GIT most commonly affected by Crohn's disease is the color or small intestine.(5) The symptoms of Crohn's disease generally include abdominal pain, diarrhea, weight loss, and vomiting. When an individuals has Crohn's disease their body reacts inappropriately to good bacteria for harmful bacteria and the body begins to attack the good bacteria. When this occurs “the body sends white blood cells into the lining of the intestines, where they produce chronic inflammation. These cells then generate harmful products that ultimately lead to ulcerations and bowel injury.”(5) This process leads to Crohn's disease.

Doctors understand that “the interaction of commensal bacteria with the intestinal immune system is an essential factor in the development of inflammatory bowel disease (IBD).”(4) Therefore, a study was conducted to determine if Lactobacillus casei had any affect on the symptoms of Crohn's disease. The conclusions of the study indicate that “live L. casei can counteract the pro-inflammatory effects of E. coli on [Crohn's disease].”(4)

DIARRHEA IN CRITICALLY ILL CHILDREN

According to a 2006 study, “there is increasing evidence that probiotics decrease the incidence of acute infectious and nosocomial and antibiotic induced diarrhea among children hospitalized in non-intensive care settings.”(6) Furthermore, “L. casei has been used safely and with positive effects for when given to critically ill children suffering form diarrhea.”(6)

CONCLUSION

Lactobacillus casei is described as a “beneficial microorganism [that] helps to promote other beneficial bacteria [growth] and prevents the overgrowth of pathogenic bacteria in the human body. In particular it helps with the growth of beneficial bacteria such as Lactobacillus acidophilus, which can help prevent conditions such as constipation and irritable bowel syndrome.”(6)

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**Lactobacillus Helveticus**

INTRODUCTION

Lactobacillus helveticus is a lactic-acid producing bacteria that often used in the production of various cheeses including mozzarella, cheddar, Parmesan, and Swiss. This bacteria helps enhance the flavor of the cheeses and can help reduce or prevent bitterness. Lactobacillus helveticus, also known as L. helveticus, is a considered “good” bacteria that is beneficial to the health of the human body. For this reason, L. helveticus is often referred to as a probiotic. This bacteria is not only found in certain types of cheeses but may also be found in certain types of fermented milk. It may also be found in the form of a dietary supplement. L. helveticus “has been well studied and several probiotic effects are reported in the literature [such as the] ability to survive in the stomach and to reach the intestine alive, exerting antimicrobial activities against pathogens, alleviating symptoms of lactose intolerance, helping to prevent and reduce the duration of diarrhea, possibly reducing the cholesterol level, and helping the natural defenses.”(1)

LACTOBACILLUS HELVETICUS

Lactobacillus helveticus is a probiotic that provides its host with potential health benefits such as: the inhibition of potential pathogens, anti-mutagenic and anti-tumorigenic activity, anti-hypertensive activity, and immunomodulatory activity.(2) It has been reported that L. helveticus “stimulates the immune & digestive system, controls diarrhea, reduces lactose intolerance and inhibits unfriendly bacteria. Lactobacillus helveticus enhance the recovery of gut atrophy induced by malnutrition.”(2) A number of studies have been conducted in regard to the myriad of potential health benefits offered by L. helveticus. These studies have focused on health topics such as bone mineral density and bone mineral content, calcium and bone metabolism, arterial stiffness, and blood pressure.

BONE MINERAL DENSITY AND BONE MINERAL CONTENT

According to research conducted in 2004, milk fermented with L. helveticus compared to ordinary sour milk was shown to be more effective at increasing calcium absorption.(3) Along with L. helveticus-fermented milk ,sour milk, skim milk and water were utilized in this study to determine how bone mineral density and bone mineral content were affected by these food products. It was found that “the L. helveticus-fermented milk intervention significantly increased the bone mineral density and bone mineral content compared to the sour milk, skim milk and water interventions.”(3). The conclusion of this study indicates that “L. helveticus-fermented milk increases bone mineral density and bone mineral content in relation to body weight in the long-term feeding of growing rats.”(3)

Furthermore, a 2004 study indicated that “L. helveticus fermented milk supports bone mineral density in animal models and increases calcium absorption in postmenopausal women.”(4)

ARTERIAL STIFFNESS AND BLOOD PRESSURE

Arterial stiffness is associated with cardiovascular disease, which includes both heart attack and stroke. According to a study conducted in 2007, L. helveticus fermented milk that contains certain tripeptides showed a positive effect on arterial stiffness. The research from this study indicates that “[the ambulatory arterial stiffness index] improved significantly in the peptide milk group, but not in the placebo groups, suggesting a mechanism for the antihypertensive effects of these peptides.”(5) Peptides are the building blocks for proteins and are small structures built by amino acids.(6) A tripeptide such as isoleucine-proline-proline, which is a milk peptide, can have a blood pressure lowering affect. Additionally, “a fermented milk product with the biologically active peptides valyl-prolyl-proline(Val-Pro-Pro) and isoleucyl-prolyl-proline (Ile-Pro-Pro) was shown to lower blood pressure in spontaneously hypertensive rats.”(7) Because health problems such as arterial stiffness may be related to untreated high blood pressure, adding L. helveticus to one's diet may contribute to improved arterial health.

CONCLUSION

The addition of Lactobacillus helveticus to a diet may help lower blood pressure, increase calcium absorption, decrease arterial stiffness, and increase bone mineral content/density. L. helveticus is a beneficial bacteria that can help reduce or prevent the growth of unhealthy bacteria within the body thereby improving the overall health of an individual.

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**Lactobacillus Plantarum**

Lactobacillus plantarum, like all probiotics, is a beneficial bacterium that can be used for improved health. Lactobacillus is the largest genus of the lactic acid bacteria group. Lactobacillus plantarum is one of over 50 Lactobacillus species. It was first isolated from human saliva.

One of the most versatile probiotics, Lactobacillus plantarum is found in plant material and the gastrointestinal tract of animals, including humans. It is used in the fermentation of foods like sauerkraut, kimchi, pickles, and sourdough bread. It has been used for this purpose for hundreds of years, and is a healthier option in food preservation. Along with promoting normal digestive health, Lactobacillus plantarum has been shown to be an effective treatment for irritable bowel syndrome (IBS), Crohn’s disease, and colitis. It has the ability to destroy pathogens and to preserve critical nutrients, vitamins, and antioxidants. It has also shown the rare ability to produce L. lysine, a beneficial amino acid. One of the most exciting uses for Lactobacillus plantarum involves using it to deliver therapeutic compounds and proteins to the body. This area of research using the bacteria is new and ongoing.

Among the latest research on Lactobacillus plantarum it that which has shown it to be highly effective in preventing soy-related allergies. Researchers at the University of Illinois conducted two studies in 2008. They fermented soy seeds, flour, or meal using a variety of microorganisms. Fermented and unfermented soy products were introduced into blood plasma from people allergic to soy. Lactobacillus plantarum enabled the greatest reduction in immunoreactivity to the soy products. In many cases, it was as much as a 99 percent reduction. The process also increased the number of essential amino acids in the soy, along with new beneficial peptides, providing an additional health boost. Though a soy allergy only affects a small number of the population, that number is expected to grow as soy continues to become a more common ingredient in a wide range of food products.

A 2001 study by Swedish researchers at Lund University explored the properties and use of Lactobacillus plantarum 299v. This particular strain originates from human intestinal mucosa. Animal subjects with this bacterial strain have shown improved liver status and a reduction of mucosal inflammation. Lactobacillus plantarum 299v reduced abdominal bloating in patients with irritable bowel syndrome. It also increased the amount of carboxylic acids in feces and decreased fibrinogen concentrations in the blood. In addition, scientists conducting the study stated that lactic acid fermentation, such as that used with Lactobacillus plantarum, is the safest way to preserve food.

A different study by Polish researchers in that same year showed similar results. Using 40 IBS patients for the four-week study, researchers put half on the same strain, Lactobacillus plantarum 299v, and half on a placebo. By the end of the study, researchers reported a significant difference in the results of the two groups. Patients using Lactobacillus plantarum showed a normalization in stool frequency. All 20 reported a resolution of abdominal pain and 95 percent showed improvement on all IBS-related symptoms.

When a healthy colony of Lactobacillus plantarum lives in the intestines, it prevents harmful bacteria from attaching to the mucosal lining and competes for the nutrients the bad bacteria need to survive. With no food and no room to live, the harmful bacteria pass harmlessly through the body.

In a related factor, Lactobacillus plantarum has been shown to be highly resistant to most antibiotics. Though antibiotics are often necessary, they cause yeast overgrowth in adults and children. This often results in an upset stomach and a disrupted digestive system. When a healthy colony of Lactobacillus plantarum lives in the intestines, it prevents the overproduction of the yeast and eliminates this common problem that is often the result of antibiotic use.

As with most probiotics, supplements of Lactobacillus plantarum are available at health food stores and online. Another way to introduce a larger amount of this healthy bacteria to the digestive system is by preserving food using a starter culture, also available at most health food stores.

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**Lactobacillus Reuteri**
Lactobacillus reuteri is a type of probiotic bacteria that is found in the gut flora of some mammals and birds. Probiotics, as defined by the Food and Agricultural Organization of the United Nations, are “live microorganisms which, when administered in adequate amounts, confer a health benefit on the host.”(1) Those in the H. reuteri strain may stop or reduce the overproduction of pathogens. They may also inhibit pathogens’ production of virulence factors. L. reuteri has been shown to be an effective therapy in treating infantile colic,(2) acute diarrhea,(3) rotavirus,(4) gardnerella vaginalis(5) and alleviating the occurrences of eczema.(6) They also show promise in the reduction of workplace sicknesses(7) and the suppression of infections related to H. pylori.(8)

Scientists have been aware of L. reuteri since early in the 20th century, when it was mistakenly classified as a member of Lactobacillus fermentum. Scientists began to conduct more research on the probiotic when it was discovered to be colonizing in animal intestines. Unique strains of L. reuteri have been found in the respective guts of pigs, sheep, chickens and rodents. German microbiologist Gerhard Reuter first isolated L. reuteri from L. fermentum in intestinal and fecal samples from humans during the 1960s. L. reuteri is now considered to be an indigenous component of some, but not all, human gastrointestinal tracts. It is viewable on the mucosa of the duodenum, gastric antrum, gastric corpus and ileum.(9-10)

Walter Dobrogosz, Ivan Casas, and their fellow researchers conducted additional studies in the early 1980s. They discovered that L. reuteri is able to ferment glycerol, thus resulting in the designation of a broad-spectrum antibiotic substance. Dobrogosz and his colleagues named the probiotic “reuterin” in honor of Gerhard Reuters. The discovery of its significant properties led to more research. The existence of L. reuteri has been found a number of foods, including meat products and milk. In 2008, it was established that L. reuteri’s ability to produce reuterin in the gastrointestinal tract enhanced its effectiveness in reducing the growth of harmful E. coli bacteria. Reuterin’s relative safety as an anti-microbial agent was highlighted when it was confirmed that four to five times the amount of reuterin would be needed to vanquish beneficial bacteria than the amount necessary to eliminate “bad” bacteria.(11)

**Lactobacillus Reuteri Benefits**

**Helps Prevent Infections**
L. reuteri is a naturally occurring substance in humans, but the probiotic is not present in all people. Some people need daily supplements to introduce and keep adequate levels. The L. reuteri bacteria begin to colonize only days after supplements are ingested. While present in the body, the bacteria can provide strong protection against infections and help maintain a healthy immune system. The probiotic colonies can shut down after ingestion has been discontinued, so it is crucial to go on with taking dosages of L. reuteri to achieve the sought-after benefits.

**Heals Colic**
A 2006 study showed that infants given L. reuteri as a supplement over several weeks spent less time crying each day. Intense, sustained periods of crying are key symptoms of colic, as the condition is believed to cause considerable gastrointestinal pain in babies. Colic has been a puzzling idiopathic condition for centuries, and babies endure the condition for weeks to months of their early lives. L. reuteri was also shown to have greater efficacy than simethicone, which for years has been the traditional therapy for colic.(12)

**Treats and Prevents Diarrhea**
It has been demonstrated that L. reuteri is capable of effectively treating diarrhea, particularly when it is a symptom of rotavirus among children. When administered versus a placebo, children recovered more quickly from the illness,(13) greatly lessening the possibility of dehydration and other dangerous effects of rotavirus. Rotavirus is estimated to cause the deaths of some 500,000 children under the age of five each year. L. reuteri may also be used as a preventive measure. Children who receive daily doses of the probiotic while healthy are less likely to contract diarrhea and/or rotavirus.

**Prevents and Treats Female Urogenital Tract Infections**
The RC14 strain of L. reuteri is very effective as not just a therapy, but also a preventive measure against yeast infections, urinary tract infections and gardnerella vaginalis.(14) Many women experience these uncomfortable conditions on a chronic basis. Taking at least 10 billion colony-forming units (cfu) per day of RC14 can greatly improve urogenital health, reducing the likelihood that these troublesome infections will return.

**Suppresses Occurrences of Eczema**
A study conducted by a group of Swedish scientists in 2007 shows that infants born to eczema-prone women who ingested L. reuteri during pregnancy were less likely to develop the rash(15) that produces itchy, scaly skin. When the infants in the study were given L. reuteri immediately after birth and for the next six months (versus a placebo), there was a significant reduction in the number of those who developed eczema following ingestion of the probiotic versus those who were administered the placebo. L. reuteri may also be an effective treatment for children who already have eczema.

**Supports Dental Health**
L. reuteri destroys streptococcus mutans, which hastens tooth decay. In tests conducted with a number of forms of probiotic bacteria, L. reuteri was the only species that halted the production of S. mutans.(16) The use of chewing gum made with L. reuteri may also help to prevent gingivitis.(17) Inflammation of the gums and the related symptoms of gingivitis may subside or be eradicated completely with products made with appropriate dosages of L. reuteri.

**May Eradicate H. Pylori Bacteria**
There is limited evidence that L. reuteri may reduce the presence the bacteria Helicobacter pylori, which is responsible for causing peptic ulcers.(18) This bacteria strain is also prevalent in developing nations with sub-par sanitation standards.

**Safety of Lactobacillus Reuteri**
L. Reuteri is generally well tolerated when taken in appropriate dosages. Gastrointestinal problems may result in some patients, and an increase in nausea has been reported among HIV patients.

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**Lactobacillus Rhamnosus**

**Introduction**

Lactobacillus rhamnosus, or L. rhamnosus, is a type of probiotic bacteria. Probiotics, as defined by the Food and Agricultural Organization of the United Nations, are “live microorganisms which, when administered in adequate amounts, confer a health benefit on the host.” (1) L. rhamnosus was first isolated in 1983 in the intestines of a healthy human subject by scientists Barry Goldin and Sherwood Gorbach, when it was shown to have remarkable tolerance for the harsh acids normally found in the stomach and digestive tract.. The “GG” in the title of the strain L. rhamnosus GG is derived from the last names of the two scientists. Like other probiotics, L. rhamnosus has properties that are beneficial to the intestinal tract. It is also believed to be of considerable assistance with the immune system, particularly in combating intestinal and urinary tract pathogens. L. rhamnosus is also used as a natural preservative in yogurt-based products, where the bacterium attaches to the lining of the intestines, where it encourages the growth of helpful organisms that aid in digestion..  Lactobacillus rhamnosus is a probiotic bacterium that helps eliminate and prevent the growth of harmful bacteria in the intestines. Many consumers may be familiar with lactobacillus probiotics, which are touted today by some yogurt manufacturers as an aid in digestion and in promoting regular bowel activity. In fact, lactobacilli have been used for centuries to aid in the fermentation of dairy products. During the 20th century, researchers began evaluating these organisms and their positive effects on the human body and its ability to naturally ward off disease and infection. The lactobacillus rhamnosus bacterium was first isolated by researchers in 1983, when it was shown to have remarkable tolerance for the harsh acids normally found in the stomach and digestive tract.(2)  The following are some of the well noted benefits of Lactobacillus Rhamnosus:

**Helps Fight Intestinal Tract Illnesses**
According to studies published by Goldin and Gorbach, L. rhamnosus is said to be able to survive the highly acidic conditions of the human stomach, as well as the intestinal tract. It is also believed to be bile-stable. (2) This makes the probiotic highly desirable in its ability to conquer intestinal ailments.

**Suppresses Bacterial Infections in Renal Patients**
In 2005, it was demonstrated that with patients experiencing kidney-related illnesses, L. rhamnosus is capable of interrupting the gastrointestinal transportation of the variety of enterococcus that is resistant to the antibiotic vancomycin. (3)

**Assists in Prevention of Urinary Tract Infections**
According to an article published in the November 2009 issue of Renal and Urology News, daily ingestion of L. rhamnosus Gr-1 may be effective in helping postmenopausal women who suffer from chronic urinary tract infections. While dosage of trimethoprim-sulfamethoxazole is considered to be a standard treatment for a UTI, L. rhamnosus is a viable alternative when antibiotic resistance is a consideration. (4) The probiotic seems to be capable of safeguarding the urogenital tract by its ability to excrete biosurfactants. This enables the tract to limit the adhesion of pathogens.

**Helps Build a Superior Immune System**
While blood cells are certainly a major agent in managing the body’s immune system, the gut is also a huge contributor in this area. Because of the ability of L. rhamnosus to survive in extremely acidic environments such as the digestive system, the probiotic can thrive in the gut. L. rhamnosus stimulates the production of antibodies and also assists in the process of phagocytosis, a means by which the body combats dangerous invasive bacteria.

**Aids in Dairy Product Digestion Among the Lactose-Intolerant**
A 1998 study conducted among dairy-sensitive research subjects showed that the subjects who consumed milk with L. rhamnosus GG did not exhibit the inflammatory response that occurred with the subjects who drank milk without the probiotic. Also, the L. rhamnosus appeared to enhance the immune system in the test subjects in whom the probiotic-enhanced milk did not generate an inflammatory reaction. (5)

**Decreases Duration of Diarrhea**
Research conducted in 2000 in several European countries indicated that the administration of L. rhamnosus GG to children suffering from rotavirus shortened the duration by at least one day of the pervasive diarrhea associated with the illness. (6) Another study showed that ingestion lf L. rhamnosus GG was helpful in reducing the extent of diarrhea when it exists as a side effect of antibiotic use to combat H. pylori infections. (7)

**Safety of Lactobacillus Rhamnosus:**
With the exception of extremely rare occurrences of sepsis in limited groups of patients with serious diseases, such as HIV or AIDS, and in patients with short bowel syndrome.(8,9), no significant side effects have been shown to exist with the the use of L. rhamnosus. There may be an initial brief period of bloating and gas among subjects taking it for the first time. These symptoms should disappear as the body becomes accustomed to the presence of the probiotic.

**Conclusion**

Lactobacillus rhamnosus is one of the most widely studied probiotics, noted and valued for its ability to survive and even thrive in the harsh conditions of the digestive and urinary tracts. Multiple clinical trials have determined the bacterium to be especially beneficial in promoting and maintaining digestive tract health. Lactobacillus rhamnosus is extremely well tolerated by men and women, and has been associated with only very rare side effects. Studies have shown that, taken regularly, lactobacillus rhamnosus can be an effective supplement in promoting and maintaining digestive tract health.

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**Lactobacillus Sporogenes**

The word “probiotic” literally means “good life,” and the real world applications are very much in line with that definition. Probiotics are live microorganisms, usually bacteria, that live in the digestive system of mammals and aid the body in a variety of ways. Lactobacillus sporogenes is one such bacterium.

The name Lactobacillus sporogenes is actually a misidentification of the bacteria which is now known as Bacillus coagulans. The confusion originated because the bacterium has characteristics of both the Lactobacillus genus and the Bacillus genus. In 1974, it was reclassified into the Bacillus genus. Bacillus coagulans does produce lactic acid, just as bacteria in the Lactobacillus genus do. Bacillus coagulans, however, is also a spore-forming bacterium. Since Lactobacillus bacteria do not, by definition of their scientific classification, form spores, Bacillus coagulans can not belong to that genus.

So, Bacillus coagulans is known to be a spore-forming bacterium. What does that mean scientifically and to consumers? The bacterium forms an endospore, a thick wall which surrounds its DNA and other internal cell structures. This tough wall allows these bacteria to survive stressful environments such as those with extreme temperatures, chemicals, high acidity, and certain types of radiation. Because of this characteristic, Bacillus coagulans has the potential to survive industrial processes which other probiotics may not.

Several strains of Bacillus coagulans have been consumed around the world for many years. It is part of a 1978 patent for a method of improving the flavor and shelf-life of natto, a Japanese food made from fermented soybeans. In addition, Bacillus coagulans is used as a veterinary nutritional supplement, particularly with cats, pigs, and shrimp.

Bacillus coagulans is also used for many health applications. These include treatment of infectious diarrhea, diarrhea caused by antibiotics, irritable bowel syndrome, Crohn’s disease, ulcerative colitis, and as a cancer preventative. However, extensive research on the effect of Bacillus coagulans on these conditions is limited.

There are, however, several very recent studies on the particular probiotic strain named Bacillus coagulans GBI-30, 6086. These studies were at least partially funded by Ganeden Biotech, which markets the GBI-30, 6086 strain under the commercial name GanedenBC30, but were performed by medical doctors.

One of these studies showed that Bacillus coagulans could be an effective deterrent to viral respiratory tract infections. The study used ten healthy men and women, who each took one capsule of the strain of Bacillus coagulans known as GBI-30, 6086 once a day with water. Blood from participants was tested in vitro before and after the study’s completion. T-cell production increased significantly with exposure to adenovirus and influenza A, though no significant response was shown to other forms of influenza. Along with the fact that no serious adverse effects were reported during the entire duration of the study, this data offers a basis for a safe and effective therapy to increase T-cell production and reduce the risk of certain viral respiratory tract infections in humans.

Another 2009 study investigated the effect of Bacillus coagulans GBI-30, 6086 on irritable bowel syndrome (IBS). IBS is a gastrointestinal disorder which involves chronic abdominal pain and changes in bowel results. Because IBS sufferers usually have reduced amounts of good bacteria in their digestive tract, probiotics are becoming a common treatment. A variety of probiotics have been shown to restore a proper balance of these helpful bacteria and decrease inflammation of intestinal mucosal tissues. This particular eight-week study analyzed 44 men and women with IBS symptoms, half of whom received a placebo and half a preparation of Bacillus coagulans GBI-30, 6086. The severity of self-reported bloating and abdominal pain decreased significantly in the patients receiving Bacillus coagulans GBI-30, 6086, but not in those receiving the placebo.

Results of another study conducted on the same Bacillus coagulans strain demonstrated the safety of this strain for human consumption. This data was published in the May issue of Food and Chemical Toxicology and reported that Bacillus coagulans GBI-30, 6086 is safe for humans even in large consumption amounts. In the study, this strain was administered to rats in amounts almost 100,000 times beyond the recommended dosage for humans, yet produced no harmful effects. Given the safety of its use and that it has been shown to survive manufacturing processes that produce extremes of heat and cold, use of Bacillus coagulans GBI-30, 6086 is expected to increase.

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**Lactobacillus Salivarius Provides Antimicrobial Boost for Travelers and Others**
The World Health Organization (WHO) urges holiday and business travelers alike to practice common sense disease prevention protocols when in the presence of individuals potentially infected with H1N1. (1) A frequently overlooked aspect of personal health protection is the individual’s fortification of the immune system with natural, antimicrobial boosters. It is interesting to note that one such natural boost can come from the oral supplementation with probiotics in general and Lactobacillus salivarius in particular. Have you had yours today?

**Good Bacteria vs. Bad Bacteria, Microbes and Fungi: A Primer**

The H1N1 virus, mold spores and disease causing E. coli bacteria are all around. Frequently they attack from the inside out; this is especially true when they are accidentally ingested. Undesirable bacteria – you usually hear about them in the news when there is a food borne illness warning -- have the power to wreak havoc in the intestinal tract, especially if there is an insufficiently nourished healthy gut flora that can curtail them.

Other times the beneficial bacteria have been eradicated – alongside their harmful cousins – during an antibiotics treatment. While this is a lifesaving step to remove potentially deadly bacteria from the human organism, it has the undesirable side effect of also removing good bacteria that help maintain overall health. Failure to supplement good bacteria at this time leaves the human organism susceptible to attacks from opportunistic bad bacteria that take up residence where no desirable bacteria out-compete them.

It is interesting to note that good bacteria – most notably lactic acid bacteria -- have a strong antimicrobial effectiveness. This is associated with the production of hydrogen peroxide, which effectively kills microbes. (2) One strain of such lactic acid bacteria is Lactobacillus salivarius.

**Lactobacillus Salivarius: Beneficial Resident of the Small Intestine and Mouth**

Lactobacillus salivarius resides in the mouth and small intestine. During metabolic functions, the bacteria produce enzymes that are toxic to undesirable bacteria. (3) It is a probiotic (4) that can be supplemented quite easily via capsules or even dry powder. What makes it such a commercial success is its prolific reproductive prowess that reduces the overall amount of required daily supplementation.

**Why Supplement Lactobacillus Salivarius?**

Lactobacillus salivarius naturally occurs in the mouth of humans. (5) Supplementation delivered surprising and highly desirable results. A study involving 66 healthy individuals, who were randomly split into two groups, provided the sample; one group received Lactobacillus salivarius orally while the other was given xylitol as a placebo.

Researchers obtained plaque samples, which conclusively proved that the lactobacillus is instrumental in reducing at least five dangerous bacteria associated with the formation of plaque. This in turn greatly increases dental health. (6)
Animal testing confirmed that Lactobacillus salivarius improves the immune system response to simulated colitis and also septic shock. Researchers studied the bacillus’ effectiveness when rats where treated with trinitrobenzenesulfonic acid (TNBS) that caused a model condition associated with colitis. In a closely related experiment, septic shock was induced in mice. In both cases, Lactobacillus salivarius was instrumental in counteracting the effects and striving to reestablish a balance within the organisms’ intestines. (7)

**Potential Weaknesses of Lactobacillus Salivarius (and how they work in your favor!)**

Although Lactobacillus salivarius is a rather user-friendly probiotic due to its low supplementation dose requirement, it also needs a bit of help with remaining in top shape. Just like other desirable bacteria that live in the human intestines, Lactobacillus salivarius is most effective and thriving when ingested food is lactobacillus friendly.

Even though the lactobacillus survives in the acidic environment of the intestinal system, it – just like its probiotic lactobacillus cousin Lactobacillus rhamnosus (8) – thrives when glucose is introduced, especially in the form of fructooligosaccharides. (9) The good news is the ready availability of this substance in healthy and tasty foods such as bananas, tomatoes, barley, chicory root, asparagus, artichokes and garlic.

It is safe to say that the supplementation of Lactobacillus salivarius not only offers health benefits to dental and gut health, but also provides solid antimicrobial protection. Since it can even encourage the ingestion of healthy foods, is it not time to make Lactobacillus salivarius a staple in your daily health regimen?

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**Saccharomyces boulardii**

Saccharomyces boulardii, or S. boulardii, is an important probiotic that can recolonize and sustain flora in the large and small intestine. Probiotics, as defined by the Food and Agricultural Organization of the United Nations, are “live microorganisms which, when administered in adequate amounts, confer a health benefit on the host.” (1)

S. boulardii is a strain of yeast, first discovered in 1920 by French biologist Henri Boulard while in southeast Asia. Boulard’s purpose for traveling to the area was to look for a strain of yeast that would be particularly heat-resistant for the production of wine. A cholera outbreak occurred during Boulard’s stay. Boulard noted that to help combat the diarrhea associated with the disease, people would either chew on the skins of lychee and mangosteen fruits, or boil the skins to make tea. He was able to isolate the particular substance that successfully stopped the diarrhea, and discovered that the yeast could grow at the unusually high temperature of 98.6 degrees Fahrenheit. (2) Determining that the yeast was of the Saccharomyces genus, he named his discovery after himself. In 1947, Boulard sold the rights to Saccharomyces boulardii to the fledgling pharmaceutical company Biocodex. The company continues to hold the patent to S. boulardii.

S. boulardii is classified as being non-systemic and non-pathogenic. It confines itself to the intestinal tract, instead of spreading throughout the body. It is popularly marketed in lyophilized (freeze-dried) form.

**Benefits of Saccharomyces boulardii:**

Controls Various Forms of Diarrhea
Below are applications of how S. boulardii is effective in not only the treatment but in the prevention of a number of diarrhea-related gastrointestinal disorders. (3)

**Decreases Incidence of Acute Diarrhea**
Studies conducted in 1994 and 2005 indicate that the use of S. boulardii versus a placebo shows efficacy in reducing acute diarrhea in children and adults. The dose administered to children age three months and older, as well as to adults, was 250 mg. twice per day for five days. (4) (5)

**Reduces Rate of Recurrence of Pseudomembranous Colitis**
When administered concurrently with either of the antibiotics metronidazole or vancomycin, S. boulardii was found to decrease the likelihood of additional episodes of pseudomembranous colitis among people experiencing the disease. (6)

**Lessens Bowel Movement Frequency in Irritable Bowel Syndrome Patients**
Research conducted in a series of studies shows that ingestion of S. boulardii significantly diminished the number of bowel movements in people with diarrhea-predominant irritable bowel syndrome. Use of S. boulardii also improved the texture of the stool.

**Reduces Likelihood of Contracting Travelers’ Diarrhea**
In 1989, a group of Austrians planning a worldwide tour participated in a study to determine the efficacy of S. boulardii in preventing “travelers’ diarrhea.” They ingested S. boulardii on a daily basis, five days prior to departing. It was found that the higher the dosage, the less likely the tourists were to develop diarrhea while experiencing food and water qualities of varying levels. It was also found that the incidence of diarrhea corresponded to the locations visited. (7) Another advantage of using S. boulardii during travel is that the yeast does not need to be kept as cold as some other probiotic strains.

**Decreases Diarrhea as an Antibiotic Side Effect**
Although the primary purpose of antibiotics is to kill infection-causing bacteria in the body, they can produce undesirable side effects like diarrhea, as well as the cramping and nausea associated with it. When used as a preventative treatment, S. boulardii has been shown to reduce the onset, duration and frequency of this side effect among adults. (8)

**Assists in Anti-Inflammatory Protection**
When the body is affected by an Escherichia coli (E. coli) infestation, the proinflammatory cytokine known as Interleukin 8 has a tendency to become secreted in the gut. The use of S. boulardii is seen as beneficial to prevent such secretions, reducing the severity and toxicity of the E. coli bacterial invasion. It has been demonstrated that the effect of the S. boulardii yeast on E. coli is not to reduce the number of adherent bacteria produced, but to lower the number of intracellular bacteria by some 50 percent. (9)

**Safety of Saccharomyces boulardii:**
S. boulardii is generally well tolerated. Side effects, which are typical of many probiotics, include flatulence, bloating due to gas, constipation and increased thirst. These side effects become less pronounced with regular use of the yeast. People who are allergic to yeast should not use S. boulardii. Patients with severely compromised immune systems should consult a doctor prior to using S. boulardii supplements, as there is a possibility of the development of fungal infections. Infections of this nature have not been reported among S. boulardii users with healthy immune systems. Certain antibiotics may interfere with the efficacy of probiotics, reducing or obliterating the bacteria colonies. The yeast should not be used in concert with anti-diarrhea medications.

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**Streptococcus Thermophilus**

As long ago as 1907, when Russian biologist and Nobel Prize winner Elie Metchnikoff wrote about longevity research in his book The Prolongation of Life, the bacterial strain Streptococcus thermophilus was known to promote gastrointestinal health. Streptococcus thermophilus, along with Lactobacillus bulgaricus, soon became the starter strains used to make yogurt. Today, these two probiotics are still used in the production of true yogurt.

Many of the yogurts sold in grocery stores are not this true yogurt. Some do not use the appropriate probiotic strains, as these are usually more expensive. Some do, but still pasteurize their product after the culturing process. Pasteurization destroys harmful bacteria, but it also destroys the beneficial organisms such as Streptococcus thermophilus. Consumers can look for the National Yogurt Association’s Live & Active Cultures seal on packaged yogurt. This means the product did contain live cultures when it was made, although it is no guarantee that the beneficial bacteria will still be alive after shipping and storage.

By purchasing a starter of Streptococcus thermophilus and Lactobacillus bulgaricus, yogurt can be made at home with a simple recipe. These probiotic cultures are available most health food stores, online, and even in the health food section of some grocery stores. Boil one quart of milk, preferably 2% or whole milk, then remove it from heat and cool to between 104 degrees and 114 degrees. It is important to use a sterile container to pour the milk into. Add a generous teaspoon—or the appropriate amount listed on the package instructions—of the yogurt starter. Stir, cover, and incubate at 104 to 110 degrees for six to ten hours. Refrigerate.

This constant incubation temperature is a very important part of the process. Those that have trouble maintaining this temperature might want to consider purchasing a yogurt maker, which regulates temperature.

The process behind this yogurt production is beneficial to digestive health in a couple of ways. The good bacteria ferment the sugar in the milk, also known as lactose. The lactose is transformed into lactic acid, which is highly effective in preventing lactose intolerance. The production of the lactic acid reduces pH and results in the milk curdling and turning tart. This also prevents the growth of bacteria that causes food poisoning.

Streptococcus thermophilus is used as a starter culture for dairy foods besides yogurt, including Mozzarella cheese. It is considered one of the most commercially important of the lactic acid bacteria. USDA statistics from 1998 showed that more than 2.24 billion pounds of Mozzarella cheese and 1.37 billion pounds of yogurt were produced, for almost five million dollars in consumer value. Today’s 40 billion dollar dairy industry relies more and more on Streptococcus thermophilus and other probiotic strains.

The cell structure of Streptococcus thermophilus allows the bacteria to endure elevated temperatures, such as the many industrial dairy fermentation processes that require high temperatures. Streptococcus thermophilus also lacks genes which contain surface proteins. This is important because harmful bacteria use these surface proteins to attach to mucosal tissues and hide from the body’s defensive actions.

Ongoing research and experimentation have improved the Streptococcus thermophilus strain even beyond its natural beneficial state. This improved strain is responsible for the consistent taste and texture of many dairy products. It also provides stable fermentation and a resilience to bacteriophage.

Streptococcus thermophilus also produces exopolysaccharides. These are essential to the texture of fermented milk products and also to the production of reduced-fat dairy products that maintain similar characteristics to their full-fat counterparts. One of Streptococcus thermophilus’ unique abilities is that it can break down casein, the protein in dairy products like cheese. It reduces them into small peptides and amino acids that are required for the maturation of textures and flavors in reduced-fat cheeses. Different bacterial strains produce cheeses with differing characteristics. Streptococcus thermophilus, for example, produces a low-moisture cheddar cheese with a minimal level of bitterness, good for very mild cheddar cheese. However, by combining bacterial strains with varying characteristics, a high quality, reduced-fat cheddar cheese may be produced that is very similar to regular, full-fat cheddar.

In addition to the natural ability of Streptococcus thermophilus to prevent transformation of nitrates into cancer-causing nitrites, the bacterium has other exciting cancer-related applications. One strain which is undergoing exciting research is Streptococcus thermophilus TH-4. Chemotheraphy often causes intestinal mucositis, severe inflammation of primarily the small intestines which can be fatal. Although there are a variety of treatments for this condition, they often do not work.

A 2009 study in Adelaide, Australia has shown very positive results when Streptococcus thermophilus TH-4 was used to treat rats with mucositis caused by chemotherapy drugs. Rats responded to the treatment by showing a normalization of healthy cell function in the affected areas and a significant reduction of distress to the tissue of the intestines.

As research continues to produce varied strains of Streptococcus thermophilus, the usefulness of this probiotic seems limitless. Its effects on digestive and overall health have already been widely documented. Its benefits to cancer patients undergoing chemotherapy are beginning to be understood. Streptococcus thermophilus is one of the many reasons probiotics are changing the health industry.

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**Prebiotics**

The term "prebiotic" means a substance that encourages existing microflora to increase its population. Prebiotics differ somewhat from probiotics, in that a prebiotic substance may consist of an enzyme, component, or chemical extracted from a particular strain of bacteria, or from a fermentation reaction involving bacteria. When prebiotics are found to be effective, the purpose they serve is that of a catalyst to promote the growth of the host's indigenous colonies of helpful bacteria. A simple way to remember this is that a prebiotic prepares the way for a probiotic. Prebiotics do not act in isolation, they do not introduce new bacteria, and they typically do not contain an entire culture of bacteria. Prebiotic substances often consist of high-tech laboratory extracts derived from bacteria, wherein a particular chemical reaction or component of bacteria has demonstrated effectiveness in encouraging the activity of surrounding micro-organisms.

Over the past ten years, the field of microbiology has mapped the genomes of many strains of bacteria, while studying the metabolism and behavior of helpful microflora such as Bifidobacteria and Lactobacillus. By adjusting lab-produced fermentation processes, it has been observed that probiotics or helpful bacteria become more active when certain chemicals or prebiotics are present. A frequent subject of study is the chemical called "GOS," which is short for Galactooligosaccharide(s). An oligosaccharide is a short chain of sugar molecules, where as Fructo-oligosaccharides (FOS) consist of short chains of fructose molecules.  Inulin is another prebiotic that also consists of short chain fructose molecules and both are often derived from vegetables.  These compounds can be only partially digested by humans, but the undigested portion offers life sustaining food for certain probiotics.  Various mixtures of GOS, including natural and cloned or synthetic products have proved to be effective prebiotics. GOS and other oligosaccharides appear to boost the growth rate of surrounding bacteria, in laboratory, animal, and human studies.

Because breast-feeding of infants has been proven for many years to enhance the establishment and growth of beneficial microflora in the GI tract, many studies have sought to identify the exact substances that give breast milk its immune system advantages. Once identified, the chemicals that create a prebiotic or bifidogenic effect may be applied in the production of other food-related products, such as immune-boosting supplements for people with illnesses related to microflora imbalance. A 2008 study by Boehm and Moro cited in "The Journal of Nutrition" aimed to mimic the positive effects of breast-feeding on the growth of microflora. Although the prebiotic and probiotic aspects of breast milk are attributed to dozens of substances, oligosaccharides appear to be an optimum fuel for intestinal microflora.

The Boehm and Moro study found that including oligosaccharides in infant formula can mimic some of the positive effects of breast milk, in terms of providing a preferred prebiotic that enhances the colonization rate of beneficial microflora. A similar study in 2008 by R. Gonzalez and E. S. Klaassens upheld the idea that the bifidogenic properties of human milk are related to its oligosaccharide content. The Gonzalez study used a cloned or semi-synthetic medium containing GOS, which contains a large amount of lactose and galactose, comparable to human milk. By exposing the synthetic material to B Longum bacteria and observing its reaction, this study drew many parallels between simulated GOS and the carbohydrate-utilization genes present in human milk. In order to optimize infant formula, and applications for other food-related products, these studies provide insight into the mechanisms needed to produce effective prebiotics.

A 2009 study by Pokusaeva and O'Connell-Motherway correctly hypothesized that particular isomers of sucrose would enhance the hydrolytic activity of certain genes within a strain of Bifidobacterium. The genes they isolated performed the function of encoding glucosidase. These particular genes are affected significantly when optimal pH levels and temperature are adjusted. Studies such as this have helped to identify which substances and environments are most helpful in encouraging the growth of helpful bacteria, and what chemicals are effective as prebiotics to prepare an optimal environment for microfloral growth.

How are new prebiotics discovered and tested? Some studies of the substance called GOS indicate that a galactosyltransferase chemical is combined with lactose and a strain of Bifidobacterium Bifidum to produce new oligosaccharide mixtures. Sometimes the mixture is observed in vitro, and sometimes it is introduced to animals for "in vivo" trials, in order to assess the prebiotic effects of a particular substance. If successful, animal trials are eventually followed by human trials in the testing of a particular prebiotic.

Both approaches were used in a 2008 study by Depeint and Tzortzis, as cited by "The American Journal of Clinical Nutrition." Their study produced an effective prebiotic made from a newly developed oligosaccharide mixture which significantly increased the Bifidobacteria and Lactobacillus populations in human and animal subjects. During this trial, oligosaccharides also appeared to inhibit the growth of E coli and salmonella within the colon of the subjects. The oligosaccharides, when added to the subjects' diet, also increased the concentration and density of Bifidobacteria. Prior to testing with human subjects, the same research team performed a variety of studies on pigs, to ascertain their microfloral reaction to various oligosaccharide mixtures.

Studies in the field of prebiotics offer a glimpse into the future of food production, genetics, applied microbiology, and new medical applications. Whereas probiotics use various forms of existing bacteria, prebiotics tend to isolate components of those cultures and manipulate certain genes to optimize their microfloral functions. When teamed together, a prebiotic substance such as GOS has been shown to create a welcoming environment prior to the ingestion of a probiotic formula.  Many formulas utilize FOS and Inulin as prebiotics with great success at increasing the viability and longevity of the probiotic formula.  Some prebiotics are used without probiotic supplements, and still show a benefit to the indigenous microflora of the host. Future studies in the field of prebiotics may identify which form of oligosaccharide is preferred by each strain of microflora, in order to maximize the accuracy of probiotic medicinal benefits. If each of the GI tract microflora which are beneficial to human health could be optimized and nurtured by the use of a designated prebiotic, the potential to prevent and reduce diseases would be significant.

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**Probiotics for Dogs**

Pets are a vital part of life and family. There is no better sight after a long day at work than a dog at the door. Dogs protect, comfort, and add joy to life. Studies have shown they improve human health and increase longevity. As humans learn of ways to improve their own health, shouldn’t our pets benefit as well?

Fortunately, there are a growing number of products available for our pets, and probiotic supplements are among the best. Probiotic supplements offer a wide range of health benefits for dogs and other pets, just as they do for humans.

Anyone who has had to deal with a dog who is experiencing any kind of irregular digestive problem knows that it is no fun and usually messy. Just as the beneficial bacteria in the human digestive system is often reduced or destroyed by diet and environmental factors, the bacteria that should be present in the canine gastrointestinal tract is diminished in the same ways.

Raw meat, which dogs would often be eating in a natural environment, contains enzymes that are required for food to be metabolized properly. Enzymes are proteins that aid in essential biochemical reactions. They work with probiotics to help absorb nutrients, produce vitamins, and metabolize calcium. Dry and canned pet foods do not usually include these enzymes that are so helpful in digestion because the enzymes are destroyed as the food is processed.

When dogs are outside, they drink from standing water, eat things they may find in the yard, roll around in grass, or splash in nearby ponds or streams. Getting dogs to stop this behavior is neither practical nor even healthy, as they need to be outside and certainly benefit from the exercise these activities generate. In doing these things, however, they are exposed to a variety of toxins. Chemicals are used to treat lawns and often end up in ground water and streams and rivers. Exposure to these chemicals often kills beneficial bacteria in the body.

Another factor that causes fluctuations in a dog’s natural amount of good bacteria is stress. Stress, in fact, is a big problem for pets, often a result of changes or traumatic events. A visit to the vet, being left alone for long periods, thunderstorms, pregnancy, changes in diet, a new family member, or moving to a new location can all cause a dog a high amount of stress. This stress results in changes to the digestive tract, killing beneficial bacteria and causing the animal further digestive problems.

Using antibiotics for pets, though sometimes necessary, kills beneficial bacteria, just as it does in humans. A further problem for dogs and cats occurs when they are ill. The digestive system shuts down so that nutrients can be sent to the immune system. They do not hold very much energy stored in their muscles, often only enough for about 24 hours. When this stored energy is used, the body must burn the energy stored in fat. If this energy allotment is depleted before the dog has recovered from illness, they can die.

For every one of the problems listed above, probiotics can help. These bacteria aid the immune system and help fight infection and disease. They also prevent diarrhea. Though that is always a good thing, it can be essential when a pet is fighting an illness, preventing further loss of nutrients. The probiotics will also metabolize food that remains in the animal’s system when he or she is ill, making additional nutrients available and giving the pet longer to recuperate.

There are a variety of canine probiotic supplements available. It is a good idea to use the same criteria for choosing a pet supplement as for a human supplement. The product should come from a reputable company and have dosage and manufacturing processes readily available. It should always list exactly how much and which probiotics and other ingredients are included in the supplement. Common bacterial colonies include Lactobacillus acidophilus, Entercoccus faecium, Lactobacillus plantarum, Bacillus coagulans, and other bacteria that are common in human supplements. These pet supplements will often include a helpful combination of enzymes along with the probiotics, so that animals get the most benefit from the supplement. An ideal supplement should contain at least three bacterial strains and enzymes that include protease, lipase, amylase, and peptidase.

Dogs who are generally healthy should receive a probiotic and enzyme supplement once a day, depending upon weight of the dog and according to specific label directions. Dogs who are taking antibiotics should get an accelerated dosage of probiotics during the duration of the antibiotic treatment, as well as for a week or two afterwards. Pets who are ill or undergoing prolonged stress should receive a concentrated probiotic/enzyme formula that contains three or more times the amount of a regular dosage.

More and more veterinarians are using probiotics to treat dogs and other pets. From regular digestive problems to chronic kidney disease, illnesses in pets can be eliminated or eased with the proper probiotic supplements. Pet owners should talk to their veterinarians to find out more information about the products that would be most helpful to their dogs.

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**Probiotics for Children**

Some probiotics appear to be safe and appropriate for children, if adequate caution is used in administration. The introduction of genetic changes to various probiotic species has caused difficulty in keeping the safer strains separated from lesser-known strains, at least in terms of a public image. Although particular laboratories may work hard to promote their own synthetic probiotic strains, or "symbiotics," it is unknown how humans will react to some of the less familiar probiotic and prebiotic products. However, with regard to children's health, there are some major success stories concerning specific probiotic strains that have met the standard of repeated scientific studies on animals and humans. Lactobacillus Reuteri, or "L Reuteri," and Bifidobacteria Lactis (B Lactis) are two such rising stars, both of which are now recommended to children by pediatricians on a regular basis for the relief of gastroenteritis. Other claims regarding the immune benefits of probiotics, such as the reduction of respiratory infections in children, have received mixed reviews in the academic and scientific literature.

A 2002 university study of infant rhesus monkeys produced very positive results for L Reuteri as an effective additive to infant formula. This study sought to find out whether the introduction of L Reuteri would have beneficial effects on infant health, assist with microflora colonization in the gut, and help with resisting infectious disease. Infant monkeys were fed control infant formula, control formula with L. Reuteri or control formula
with L Reuteri and supplemental zinc from birth to four months. Many indicators of health were monitored, including the monkeys' growth, nutritional status, mineral absorption, intestinal colonization of helpful bacteria, and frequency and severity of enteropathogenic gastroenteritis. Gastroenteritus was deliberately induced in some of the subjects by the introduction of E coli cultures, in order to study the recovery ability that might be increased or decreased with a probiotic supplement.

The result of this rhesus monkey study was that gastrointestinal L Reuteri colonization was achieved with no adverse effects on growth or nutrition. Infant monkeys fed with the L Reuteri-supplemented formula exhibited reduced diarrhea severity throughout the study period and recovered more rapidly from acute diarrhea than the other groups. The study concluded that L Reuteri supplementation of infant formula is safe and beneficial to infant rhesus monkeys, which have many genetic similarities to human infants. The probiotic-supplemented formula was found to benefit recovery from gastroenteritis, improve iron levels, and decrease the severity of diarrhea. The study concluded that human infants might receive similar benefits from L Reuteri, given the positive results with rhesus monkeys.

In 2005, researchers from Ben-Gurion University in Beer-Sheva, Israel, examined whether a formula supplemented with a particular probiotic strain could help reduce respiratory and gastrointestinal infections in infants attending child care. This study was notable for its large number of participants and a long period of observation: 21 months. Over 200 healthy infants and toddlers between the ages of four months and ten months participated in this study. All of them had been weaned from breast milk to formula and all of them attended child-care centers in Israel. Each infant was randomly assigned to receive one of three infant formulas. The three control groups consisted of a standard cow's milk infant formula, the same formula supplemented with the probiotic Bifidobacterium lactis (B Lactis), and the same formula supplemented with the probiotic L Reuteri.

At several points in the Israeli daycare study, the infants' heights, weights, and head circumferences were measured. Researchers measured stool samples to check for the presence of harmful bacteria, such as the species that tend to cause diarrhea. Parents completed daily questionnaires about their children's health and habits during the study period of almost two years. The parental questionnaire information asked about indicators of respiratory and gastrointestinal health, such as runny nose, cough, shortness of breath and gastrointestinal symptoms. Parents were also asked about general behaviors in their children, such as eating patterns and stool habits.

The conclusions of the Israeli study found that infants who were fed the unsupplemented formula had more frequent high fevers, compared to the infants fed formula with either L Reuteri or B Lactis. The children receiving the unsupplemented formula experienced diarrhea more often and for longer periods, compared to those receiving the probiotic-supplemented formula. The L Reuteri group showed better results than both other control groups with regard to a reduced number of days of sustained high fever, lower number of clinic and doctor visits, and fewer absences from child care.

In this daycare study, the group who consumed L Reuteri in their formula also needed fewer antibiotic prescriptions during the study period. However, with regard to respiratory infections, the three groups did not differ in the frequency and severity of illness; the infants taking the two probiotic supplements and those taking the unsupplemented formula had the same rate of respiratory infections. Although many health indicators were improved with the probiotic formula, the L Reuteri and B Lactis supplements could not claim a significant benefit in the area of respiratory infections among the 200+ infants included in the study.

For the stage known as early infancy (from the age of birth to four months old), another Israeli study conducted by the same team examined the effects of probiotic-supplemented formula at this first stage of life. This was a randomized, placebo-controlled trial conducted within the clinics of the Soroka Medical Center in Beer-Sheva Israel for a period of four weeks, during 2006. Only full-term healthy infants were included, so the results cannot be generalized to preterm or premature babies. The study was a comparison of the safety and tolerance of two formulas supplemented with different probiotic agents. Fifty-nine infants were randomly assigned to one of three formulas, including a control group with a standard milk base and no probiotics added. The other two groups of infants received formulas supplemented with either Bifidobacterium Lactis (BB-12) or Lactobacillus Reuteri (ATCC 55730).

The indicators of a healthy outcome which were measured throughout the early infancy study included rate of growth, daily characteristics of feeding, stool habits, behavior, and side effects. The patients in all three groups were comparable at the start of the study with regard to gestational age, birth weight, sex, growth parameters, and their previous breast-feeding rate before the study. The supplemented formulas were well-accepted and did not reveal any adverse effects. Upon comparison of growth parameters, variables of feeding, stool habits, crying, and irritability, the subjects revealed no statistically significant differences between the control group versus the groups receiving probiotic fortification in their formulas. This pilot study concluded that the use of L Reuteri and B Lactis in infant formula, even for the ages of four months and younger, was safe and well-tolerated.

With the increased standardization of particular bacterial strains over the past decade, the use of probiotics for infants and children becomes better understood. When a definite nomenclature and international labelling standards are set for particular sub-strains of bacteria, the risks of exposure to an unknown or unsafe product will be further reduced. Many scientific studies support the use of specific probiotic sub-strains for the early stages of life, where those sub-strains are well-identified and where patients are monitored closely for adverse reactions. However, the manufacturers of microflora supplements will need to uphold high standards in order to bring the full theoretical potential of probiotics into safe and well-tolerated food and beverage products for children. Especially in the area of reducing gastroenteritis, L Reuteri and B Lactis have demonstrated the potential for widespread food-grade uses. If the most beneficial sub-strains of these species are fully catalogued, controlled, advertised, and labelled with integrity, they may offer significant health benefits to children and infants.

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