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# BACTERIA: FOR AND AGAINST

By Judith A. DeCava, CNC, LNC

More than 90% of the cells in your body are bacteria. The human digestive tract houses a huge variety of bacteria, up to 1000 kinds. Although most human bacteria live in your digestive tract (from the esophagus to the anus), there are also bacteria living in your mouth, nose, in and around reproductive organs, urinary tract, and all over your skin. The appendix is packed with bacteria waiting to be sent to the intestines when needed. About 100 billion bacteria live on your skin; about 10 billion are in your mouth. More than one quadrillion bacteria are excreted in your feces each day. An adult intestine contains about 2 to 4 pounds of bacteria. Micro-creatures contribute so much to your body's biology that it's difficult to tell where the body ends and the micro-creatures begin. Thousands of different species of bacteria and other important micro-creatures live inside us, found in numerous combinations and compositions as unique as our fingerprints. What you eat and your health status affect the amounts and types of various bacteria in your gut. In turn, these various bacteria affect your health. Bacteria have a special kinship with each other, working together, coordinating activities. In laboratory cultures, scientists look at single species. But in nature bacteria "readily organize themselves into diverse communities, divvying up duties from food manufacture to garbage disposal to public defense," explains Jessica Snyder Sachs. There are unique 'neighborhoods' of species within the same community. Two teeth in the same mouth, for example, can host different bacterial species.

Since the 1800s, the medical establishment has been doing battle with bacteria (and viruses), blaming them for various diseases. But during the last decade, scientists have begun to alter their thinking. One immunologist said this shift "is not dissimilar philosophically from the recognition that the earth is not the center of the solar system." In 2000, Nobel laureate Joshua Lederberg called for an end to the "We good; they evil" thinking regarding microbes and viruses. Very few microbes make us sick; if they do, it's because they're sick themselves. Otherwise, microbes (bacteria, viruses, fungi) are symbiotic with us, naturally live with us, and positively influence our health. They keep our body functioning, affect how much energy we absorb from foods, prime the immune system, induce production of certain immune system cells, and play other roles in metabolic processes. Metabolic genes in bacteria complement the human genome, including ones that break down dietary fiber, amino acids, or drugs, and others that produce methane or vitamins. Viruses are important too, even helping us to be less susceptible to certain sick bacteria.

**FOR:** Probiotic, prebiotic, and symbiotic are terms for substances that provide or promote healthful bacteria and some fungi in the body. **Probiotics** are live microbial food ingredients that benefit our health—"friendly" bacteria and, according to some scientists, also yeast (*Saccharomyces*). Probiotic ("*favorable to life*") contrasts with antibiotic ("*against life*") regarding microorganisms. **Prebiotics** ("*before life*") are food for probiotics—indigested portions of foods we eat (fermentable fibers and sugars) that remain in our intestines for a while to provide nourishment for microflora and help them grow, thrive, and function. When fermented in the intestines, prebiotics increase the numbers of healthful bacteria, allowing them to do their beneficial activities. Substances such as inulin, fructooligosaccharides (FOS), trans-galactooligosaccharides (GOS), other oligosaccharides—ingredients in some natural foods—are prebiotics. Whole foods containing prebiotics are better than isolated compounds taken from foods such as chicory root or made with enzymes from table sugar. Some of the many foods containing prebiotics include onions, bananas, honey, whole grains, legumes, nuts, artichokes, garlic, leeks and other fruits and vegetables. Although probiotics and prebiotics have different jobs, they work together in a symbiotic or harmonious relationship. **Symbiotic** means a food or supplement contains **both** pre- and probiotics. You can eat or take a product containing a prebiotic plus a product containing a probiotic it promotes, or use one that already contains both.

Research trials usually test isolated strains of bacteria which may be patented or may be prototypes that aren't yet on the market. Real **food** sources of pre- and probiotics contain complexes and communities of these compounds which yield superior synergistic effects. A healthy population of friendly bacteria can be promoted and sustained by consuming a diet rich in fruits, vegetables, whole grains, nuts, and legumes. It's also helpful

to eat **fermented foods** containing live cultures or to take high-quality supplements. One reason we may need to supplement our diet is, well, our diet. Most people eat far too many refined, industry-modified, over-cooked, over-processed nonfoods and too little fresh produce, beans, tubers and unrefined grains. Our ancestors ate billions of times more probiotic bacteria. They had two basic methods of preserving foods—drying (which destroys some nutrients) and fermentation (which maintains most essential nutrients). Even meat and fish were buried in the soil for a time which made them more edible and yielded thousands of species of bacteria and fungi. Now meat and fish are processed and stored in ways that make most all the natural bacteria disappear. Other foods that were fermented include milk (yogurt, kefir, some cheeses), vegetables (like kimchi, sauerkraut, pickles), roots, fruit, beans (miso, tempeh, etc.), wine, beers, and grains (sourdough, for instance, or kvass). Refined grains are absorbed in the upper small intestine; too little reaches the large intestine to be food for bacteria. Fermented foods (not subsequently pasteurized) are the best way to establish and replenish healthy micro-creatures. Yogurt from stores may not be a reliable source since bacterial strains vary and are depleted with storage. Fermentation makes minerals more soluble and produces enzymes that help break down proteins and fats, aiding digestion and absorption. Beneficial byproducts of fermented food include short chain fatty acids like butyrate, other fatty acids, amino acids, polyamines, vitamins, lectins, and much more. [1]

**Prebiotics and probiotics have shown numerous beneficial health effects**. Among them are:
Improve and complete (through fermentation) digestion; better absorption of nutrients and production of energy
Reduction of "sick" bacteria including *Helicobacter pylori* in the stomach and others in the intestines
Help in managing and eliminating toxic substances
Aid in breaking down bile acids (which emulsify dietary fats) and bilirubin; improve chronic liver disease
Relief from diarrhea from numerous causes including antibiotic-induced diarrhea
Relief from constipation, irritable bowel syndrome, gastroenteritis, inflammatory bowel disease (ulcerative (colitis, Crohn's disease); and allergic colitis
Accelerate healing from effects of food allergies (after withdrawal of allergens from the diet) and improve digestive tolerance of allergens
Help treat enterocolitis, colic and diarrhea in infants; reduce abdominal pain in children; prevent allergic disorders in babies; reduce risk of spontaneous preterm delivery
Improve lactose intolerance and digestibility of milk products
Alleviate intolerances or hypersensitivities to foods; aid the healing process for leaky gut
Exert beneficial effects on mineral metabolism, particularly regarding bone density and stability
May help overweight by reducing appetite, increasing satiety, increasing breakdown and use of simple carbohydrates, diminishing excess absorption of fat
Cancer prevention (neutralizing cancer-causing substances)
Reduction of cholesterol and triglycerides when blood concentrations of either or both are excessive.
Decrease elevated blood pressure
Relief and resolution of vaginal yeast 'infections'
Relief and resolution of urinary tract 'infections' and prevention of bladder cancer
Prevent and clear acne as well as atopic dermatitis and eczema in children
Harvest nutrients, mining (making more soluble) minerals from the diet, for example.
Manufacture nutrients such as certain B vitamins (thiamin, riboflavin, pyroxidine, B12, folate), vitamin K, various amino acids, polyamines, lectins, and generate short-chain fatty acids like butyrate
Boost and modulate immune system function and activity (enhance natural resistance): reduce severity and duration of colds, flu, and other illnesses; reduce incidence of ear infections, strep throat, tonsillitis, etc.
Help control excess inflammation in chronic conditions (arthritis, bursitis, organ dysfunction syndrome, etc.)
Alleviate incidence and symptoms of allergies such as hayfever
Improve dental health by decreasing plaque, cavities, and gingivitis
Help to balance hormones; for example, by manufacturing B vitamins in the gut which help the liver to inactivate excess estrogen and make natural hormone precursors more available
Reduce and treat neurobehavioral and neurodevelopmental disorders such as ADD/ADHD and autism
Influence the activity of hundreds of genes and how they are expressed in a positive manner. [2]

Humans aren't born with micro-creatures in their guts. The intestinal tract of infants becomes colonized with many diverse bacteria by passage through the birth canal, introduction of breast feeding, and weaning.

Breastfed babies have a more diverse population of micro-creatures and lower numbers of 'sick' bacteria than do formula-fed infants. Micro-creatures and their products are present in mothers' milk which provides protective effects for the baby. Infant gut micro-creatures are adversely influenced if mother is overweight. The prevalence of cesarean sections and use of antibiotics during the period around birth disrupt infants' gut micro-creatures and are unequivocally linked to an increased risk of atopic diseases (allergies such as hay fever and asthma; hypersensitivities like contact dermatitis and digestive-tract reactions) in infancy and later childhood.

**AGAINST**: About 2,000 strains of bacteria have already been identified in humans. Our bodies are designed to balance healthy and 'sick' bacteria, yet due to many aspects of modern-day living, a dangerous imbalance can occur. 'Sick' bacteria can proliferate and cause harm. Such harmful microbes "are a minuscule minority." Microbiologist John Ingraham says the percentage of such harmful bacteria "is far, far less than the percentage of humans that commit first-degree murder." Helpful probiotic bacteria prevent the growth of 'sick' bacteria, viruses, and fungi. Good nutrition and a healthful lifestyle help preserve a balanced state. If this balance is disrupted, detrimental consequences can follow—anything from indigestion to cancer. Many things negatively affect the composition of our micro-creatures and can lead to problems. Lack of physical activity, too much stress, and serious illness affect microbial balance. Excess alcohol consumption can damage the digestive tract and its micro-creatures. Refined, altered, over-processed, and fake nonfoods tilt the balance between healthy and 'sick' bacteria to the 'sick' side. Though humans have been consuming bacteria in their diets for thousands of years, pasteurization and sterilization of our current food supply has changed things. To extend shelf life and reduce ill effects of contamination (including unsanitary production conditions), manufacturers subject most of our food to high temperatures, gases, high pressure, microwaves, herbicides, pesticides, and other chemicals. Efforts to destroy harmful pathogens eliminate beneficial strains of bacteria. GMO foods may change the genetic structure of healthy bacteria, potentially resulting in production of abnormal proteins in us.

**Medical treatments** cause serious derangements in the structure and function of probiotic flora. Many micro-organisms then become 'sick,' overgrow, and may become dominant in ill people, especially after antibiotic, antineoplastic or anti-microbial treatment. **Antibiotics**, introduced in the 1950s, have been grossly overused during the past few decades. Taking a course of antibiotics can be like dropping a bomb on bacteria—both healthy and 'sick,' plummeting their numbers. When they start to repopulate, the 'sick' ones often win out. Diarrhea, yeast infections, and many other problems can develop. Some types of healthful bacteria never come back. You get traces of antibiotics in commercial meats, poultry, and milk products that adversely affect friendly flora. The idea behind antibiotic use was to destroy potentially pathogenic microorganisms (PPMs). But medical doctors like DJW Knight and KJ Girling point to an alternative approach: Rather than directly eradicating PPMs with antibiotics, preserve or re-establish normal, healthy gut flora with probiotics that naturally dispose of 'sick' bacteria. Besides suppressing healthy micro-creatures, **many drugs** also inhibit secretions of and protective mucus production in the digestive tract. This can lead to leakage of 'sick' bacteria and toxins from the intestines into the body. These drugs include antibiotics, some psychiatric drugs, drugs that inhibit secretion of hydrochloric acid in the stomach (such as Prilosec), and chemotherapy drugs. The flora in hospital patients is often deranged, particularly those in intensive care units. Overuse of antacids, which alter the pH of the digestive tract, and laxatives, which disrupt the colon's peristaltic action (muscular motion that moves food along), make the gut more prone to 'sick' bacteria. Women who **douche** promote vaginal disturbances by ridding themselves of healthy bacteria, tipping the scales to favor 'sick' bacteria. Artificial **infant formulas** have adverse effects on intestinal flora. **Antibacterial** cleaning products, hand sanitizers, most mouthwashes, and other such items impair both 'sick' and health-enhancing bacteria. Municipal **water** supplies are heavily chlorinated and frequently contain fluoride which destroys colonies of bacteria. Water also contains various pesticides, herbicides, toxic metals, drug residues, and chemicals such as phthalates (from plastics) and parabens (preservatives) that can all destroy protective healthy bacteria and other helpful micro-creatures. Healthy micro-creatures help protect us from invasion, damage, and disease from toxins. Once they're disrupted or destroyed, our first line of defense is gone. Strengthening and supporting the numbers and quality of healthy bacteria reduces the assaults on our immune system, plus enhance and invigorate it.

The bottom line is that you have a great deal of control over your micro-creature population and your health. What you eat, the medications you take, and the toxins you're exposed to all affect bacteria and other micro-creatures in and on your body. Rather than an illness being caused by the presence of a single pathogen as

previously thought, "the real pathogenic agent is the collective," says Dr David Relman, an infectious-disease investigator at Stanford University. In other words, it's not a 'germ' that causes an illness, but a lack of balance and harmonious cooperation from micro-creatures, cells, present nutrients, environment, and lifestyle. Identifying individual bacterial or viral species "may be irrelevant in some cases" of diseases previously thought to be caused by 'germs.' "It might not matter who is there but rather what the collective is doing." [3]

**Antibiotic resistance**, now a huge problem, is a result of being against bacteria. Antibiotics are no longer able to kill bacteria blamed for causing a disease or illness. Persons with drug-resistant 'sick' bacteria require more treatment with other drugs, have medical complications, and are sicker longer. Although new antibiotics have been developed, 'sick' bacteria continue to show up in ill and diseased people. One reason for this is the overuse of antibiotics in food **animals** (cattle, pigs, poultry). Antibiotics are routinely added to the animals' feed and water to spur growth and prevent diseases caused by poor nutrition, feeds they can't digest, filth, and overcrowded conditions in confined factory farms. When the animals become sick, more antibiotics are administered. Manure from these factory-farmed animals is spread on fields as fertilizer, transferring antibiotic residues and byproducts as well as 'sick' bacteria into **soils** and **crops**. At this time, such manure is allowed to be used under the organic label. Multitudes of scientists, the World Health Organization, and the Food and Drug Administration recommend that antibiotics should be banned from animal feeds. But they continue to be used. Actually, **70%** of all (35 million pounds of) antibiotics used in the US are used for factory animals.

Another cause of antibiotic resistance is human **overuse** of antibiotics and antibacterial cleaning and hygiene products. Colds, flu, coughs, bronchitis, sinusitis, ear 'infections, and many skin rashes "can usually be treated without antibiotics," admit medical experts. Every time a person takes antibiotics, all bacteria—healthy and sick—are affected, many killed. Some healthy and 'sick' bacteria survive because all bacteria species have a remarkable ability to internally mutate or **change**. In 1955, a book entitled *Bacteria, Inc* recounted a series of experiments by Dr EC Rosenow; the results were later affirmed by other scientists. It was demonstrated that bacteria readily change with their environment. For example, *streptococci* take on all the characteristics of *pneumococci* simply by feeding them from a different environment; feeding *pneumococci* on pus quickly changes them back into *streptococci*. Or taking *pneumococci* from the lungs and putting it in the intestines can change it into *e.coli*. Many experiments were made and in every instance, the bacteria, regardless of type, changed into other types when their food and environment were altered. Even in the same environment bacteria will change in stages as cells disintegrate and/or the chemistry is altered. Denied their type of food, moved from their regular habitat, and fed other kinds of food, they quickly change into forms common to their new surroundings. Bacteria are nature's recyclers. What they consume can determine whether they're healthy or sick. Unhealthy surrounding cells, wastes, and toxins they eat can make sick bacteria. If not handled by a healthy immune system including plenty of healthy bacteria, sick bacteria may contribute to illness. As bacteria are repeatedly exposed to antibiotics, they become immune to the drug's effects through a series of mutations. They not only resist the antibiotic drugs, but "eat them for breakfast," says geneticist George Church, Harvard Medical School. Antibiotic resistance was noted as early as the 1950s; it began almost as soon as doctors prescribed the first dose. Our bodies were designed to deal with foreign or sick bacteria. But given antibiotics, the body is less able to produce immune substances needed to deal with them. For one thing, white blood cells are less active. This immune-system suppression is one reason why seemingly minor inflammations recur, require repeat treatments, and often worsen. A person can be admitted to the hospital for one condition, but while there develop another serious condition such as pneumonia. Common 'infections' become more difficult to treat and can become life threatening. This happens especially since emphasis is placed on attacking (as in war) the 'bad guys' rather than supporting and enhancing health, vitality, and well-being.

Antibiotics are not preventive, not for long-term, continuous use. They should be used only in emergencies, when nothing else will work. No matter what, they come with many potential side effects including severe illnesses. Plus they lead to the proliferation of 'sick' bacteria. Some doctors contend that about 95% of the time, antibiotic prescriptions are totally unnecessary and can be harmful. According to Doug Kaufmann, author of *The Fungus Link*, antibiotics taken in small doses are basically poisons used to kill small organisms; but taken in big doses or for a long time, they can also kill big organisms like humans. Antibiotic resistance is more common in people who used antibiotics within the preceding 12 months or who have a history of heavy antibiotic use in the past. The resurgence of diseases like tuberculosis, meningitis, malaria, typhoid fever,

some forms of pneumonia, and gonorrhea as well as problems from normally rare *staphylococcus aureus* (staph), *Clostridium difficile* (causes dysentery) and other bacterial forms are linked to use of antibiotic drugs. Newer and deadlier forms of such diseases have emerged. 'Sick' bacteria, usually ushered out and kept to a minimum by healthy bacteria and other aspects of the immune system, are allowed to proliferate as they feed on unhealthy tissues, toxins, and dead harmless flora. One consequence was the emergence of MRSA (methicillin-resistant *Staphylococcus aureus*) strains of bacteria, once considered little more than a nuisance bug. Overuse of antibiotics led to severe illness and death when MRSA became sicker, more prevalent and highly resistant to antibiotics. Scientists admit the emergence of MRSA was caused by widespread use of antibiotics. MRSA, now in decline, is being replaced by other sicker bacteria (like *Acinetobacter baumannii, Clostridium difficile*, and *Enterococcus faecium)* with resultant illness and death. Some strains resist nearly all antibacterial drugs. *Clostridium difficile* alone is involved in the illness of almost 500,000 people and death of nearly 28,000. More recently, NDM-1 (*New Delhi Metallo-beta-lactamase*), discovered in India, is a new threat. Antibiotic-resistant diseases like these are human-made problems, created by excessive, unnecessary use of antibiotics. Scientists scuttle to develop new, more powerful antibiotics or use older, more harmful types. No longer viewed as a magic bullet, antibiotics are less useful in squelching symptoms and more prone to causing problems. Some scientists are considering the possibility of supporting probiotic growth as an alternative to using antibiotics in order to keep sick bacteria to a minimum and support the immune system. [4]

**Real food** is the best way to feed and care for healthy bacteria. High quality pre- and probiotic **supplements** are helpful in restoring healthy bacteria if an imbalance or detrimental condition exists. Lactic acid bacteria and bifidobacteria are increasingly being offered in supplement form, are well tolerated and not associated with any side effects—even during pregnancy and early infancy. For example, the strain *Lactobacillus acidophilus* occurs in some yogurts and other fermented dairy products. It can increase the solubility and absorption of minerals, including calcium, plus spur the growth of cells lining the gut, improving digestion and protection. This bacteria strain feeds only on milk sugar (its prebiotic), converting it into beneficial lactic acid. Standard Process' **Lactic Acid Yeast** contain ingredients (including *Saccharomyces cerevisiae*, a mycelium yeast), that convert ALL forms of carbohydrates into lactic acid. It helps your body get rid of toxins, promote development of healthful micro-creatures, and usher out 'sick' micro-creatures. Soil-based micro-organisms (**SBOs**) are also beneficial. Not only do they exert powerful functions in the soil and ensure lush plant growth, but many forms of SBOs—including their enzyme and nutrient by-products—support human health. Plant foods had always been sources, but modern agricultural techniques (including use of pesticides, fungicides, germicides) and heat-based food processing techniques tend to destroy SBOs and their enzyme and nutrient by-products. Even organically-grown produce in stores may be rinsed in chlorinated water that destroys SBOs. Some SBOs are available in supplements, but the best source is locally-grown organic produce.

**Prebiotics** have therapeutic benefits of their own. They increase absorption of minerals (such as calcium, iron, magnesium, zinc) and stimulate production of nutrients such as lactate and short chain fatty acids like **buyrate**. Butyrate provides 70% of the energy for cells lining the colon; without it, the lining deteriorates and loses integrity, resulting in leakage and movement of wastes and food components to bodily areas where they don't belong. Butyrate helps protect the colon from cancer. Fructooligosaccharides (**FOS**) are the most abundant oligosaccharide prebiotic. The typical US diet delivers between 2-8 grams per day while a diet containing plenty of fresh produce, whole grains, and beans delivers between 12-18 grams per day. Prebiotics like FOS and **inulin** help reduce insulin resistance, reduce blood levels of cholesterol and triglycerides, aid inflammatory bowel diseases, and prevent allergic illnesses, among other benefits mentioned above. Human trials on inulin consistently show increases in probiotic numbers. Inulin modulates intestinal micro-creature ecology and induces digestive tract changes that help maintain overall health and well-being including improved immune function. A healthy gut produces hormones that help regulate various metabolic functions by sending signals to the brain or other organs (like the liver and pancreas). This affects appetite, energy, and processing of nutrients—preventing overweight, diabetes incidence, and much more. Mineral absorption, bone mineral content, and bone mineral density improve with consistent ingestion of oligofructose and inulin.

The quality of pre-, pro- and symbiotic supplements varies greatly. Many products don't meet label claims and/or contain the wrong organisms. Use only products from companies confirming that they contain the correct organisms, are safe, contain the proper concentration and are manufactured to the highest standards. [5]

In addition to an organic, whole-foods diet (including real fermented items), the following supplements can be considered to improve and maintain healthy micro-creatures:

With Each Meal (3 times a day):
1 ProSynbiotic and 1 Lactic Acid Yeast – chew

After One Meal:
1 Inulin

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