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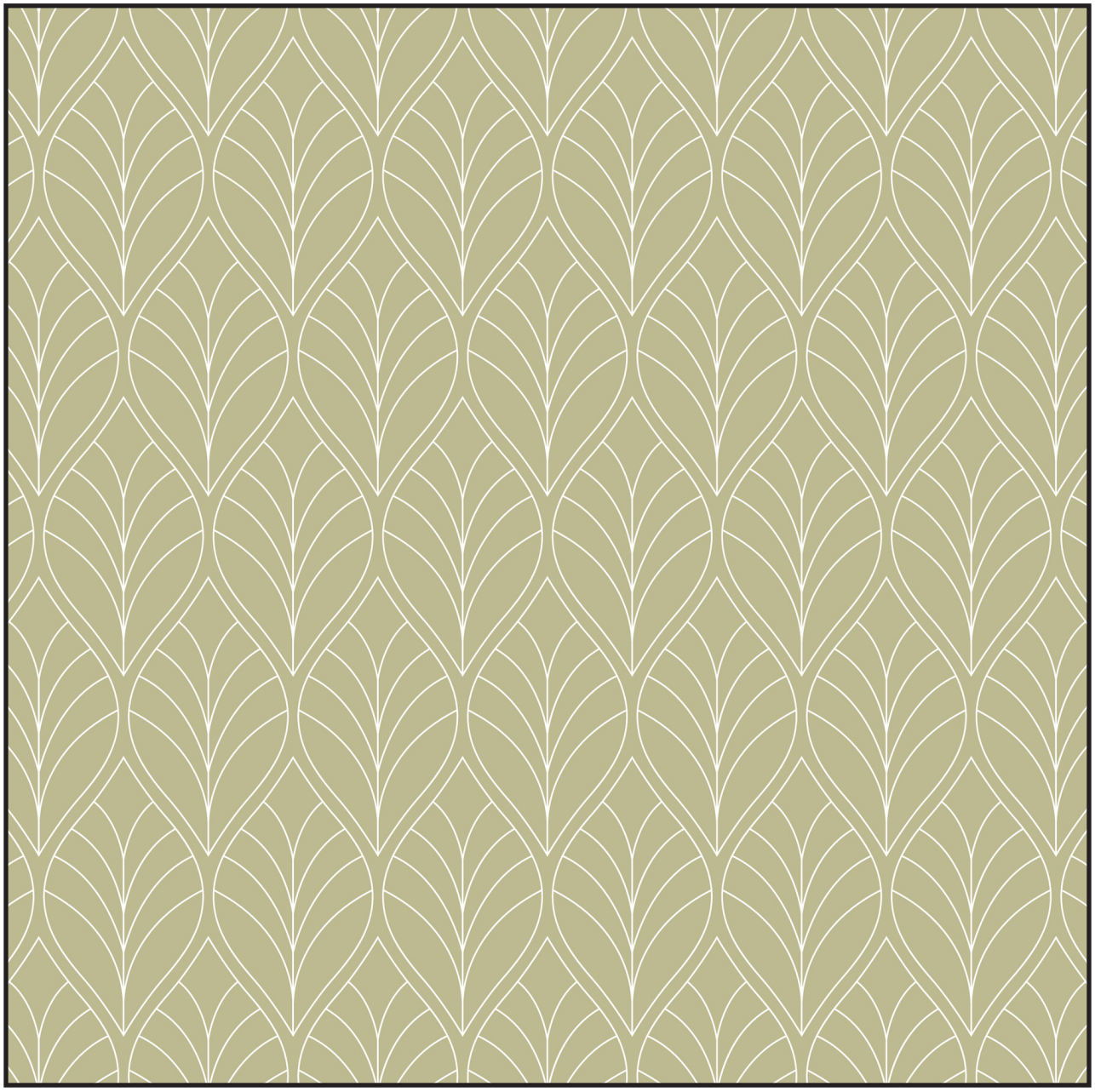

Postbiotic Metabolites: A Paradigm Shift in Microbiome Science

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Postbiotic metabolites are compounds produced by beneficial bacteria in the colon. These metabolites regulate the health of the gut microbiome ecosystem and many of these metabolites are absorbed and regulate the health of other organ systems, especially the brain and the immune system. The discovery that postbiotic metabolites regulate many aspects of human health has resulted in a major paradigm shift in microbiome science.

The importance of postbiotic metabolites was expressed by the authors of an article published in 2022 in *Biomolecules*, in which they stated, "There is increasing evidence that the health benefits associated with probiotics are typically derived from metabolites and secreted compounds produced by the live microbes rather than solely the presence of the live microbes themselves."[1]

The importance that postbiotic metabolites play in regulating human health was emphasized in a 2021 article published in the *Journal of Immunology* which stated, "It is now clear that the depletion of microbial metabolites beneficial to host health is associated with a rapid rise in non-communicable chronic diseases."[2]

All Disease Begins in the Gut

Hippocrates, who lived about 2000 years ago, is referred to as the Father of Modern Medicine because he shifted the practice of medicine from superstition and magic to a scientific discipline that attributed illness to natural causes like diet and environment. Hippocrates is credited with saying, "All disease begins in the gut." Hippocrates was almost correct. It is important to differentiate between acute and chronic diseases. Acute diseases, such as an infection from a cut or a broken bone, come on quickly and are not related to a dysregulated gut microbiome. However, it is now known that most chronic, age-related diseases are associated with dysbiosis, which is also known as bacterial imbalance in the gut microbiome. Hence, I suggest editing Hippocrates' statement to read "All chronic disease begins in the gut."

The Human Gut Microbiome

The human gut microbiome is estimated to contain from 3000 to 5000 species of bacteria totaling approximately 100 trillion bacteria.[3] Over 99% of the bacteria in the human intestinal tract reside in the colon. Hence, the colon is the site of the gut microbiome.

The Malnourished Microbiome

When you eat, you are not just feeding yourself—you are feeding 100 trillion guests: the bacteria in your gut microbiome. However, if you don't feed your beneficial bacteria well, they will not thrive and survive, and equally importantly, they will not be able to produce the postbiotic metabolites that regulate many aspects of your health.

The components in food that beneficial bacteria require to thrive and be able to produce postbiotic metabolites are dietary fibers and polyphenols. The best sources of these dietary components are fruits and vegetables. However, studies have reported that 90%-95% of American children and adults do not meet the recommended daily intake (RDA) of dietary fiber.[4,5] Similar disparities have been reported regarding dietary polyphenols, which are primarily found in fruits and vegetables. One study reported that 91% of American adults do not consume adequate daily amounts of vegetables and 88% of adults do not consume adequate amounts of fruits.[6] Data from 2005-2006 National Health and Nutrition Examination Survey reported that 80% of Americans fall short fall short in the consumption of virtually every color category of polyphenol-containing foods.[7]

The Diversity Dilemma

Different species of bacteria have different DNA, and they require different kinds of food for their survival, which explains why it is important to consume a wide variety of plant-based foods that supply a diversity of dietary fiber and polyphenols. This diversity promotes the growth of different species of probiotic bacteria, which ensures a healthy gut microbiome. Unfortunately, the diet of many Americans contains high amounts of sugar and

highly processed foods, with a corresponding deficiency of dietary fibers and polyphenols. This deficiency compromises the ability of probiotic bacteria to proliferate and produce the postbiotic metabolites that regulate many aspects of human health. The data just presented, suggests that most Americans do not consume a diet that supports a healthy gut microbiome.

I suggest that people eat small amounts of many diverse types of fruits and vegetables daily, which will provide a diversity of dietary fibers and polyphenols to support a healthy gut microbiome. I encourage people to watch my 8-minute YouTube video that teaches people how to make a microbiome-supporting salad that contains 16 different vegetables. To view this video, do a search using these terms: *Ross Salad Buzz*.

Benefits of Postbiotic Metabolites

Different species of probiotic bacteria produce postbiotic metabolites with distinct biological effects. In *The Mind-Gut Connection*, respected author and microbiome scientist Emeran Mayer, MD, states that our bacteria use the information in their millions of genes to transform the food people eat into "hundreds of thousands of metabolites."[8]

Here are some examples of postbiotic metabolites. Some of these metabolites are antioxidants, many provide anti-inflammatory activity, and others are neurotransmitters like GABA (γ-aminobutyric acid) and serotonin that communicate with the brain to influence our moods and emotions. We used to think we got all our nutrients from the food we eat. Now scientists have learned that various species of probiotic bacteria manufacture some of our essential nutrients including vitamins B1, B2, B3, B6, B12, K, and folic acid and the amino acids tryptophan, tyrosine and phenylalanine. Antimicrobial peptides are another important category of postbiotic metabolites. These postbiotics are natural antibiotics that suppress the growth of (or kill) pathogens, but they do not harm your beneficial bacteria. Hence, antimicrobial peptides are an important part of our immune system. Many postbiotic metabolites are weakly acidic compounds that help to create weakly acidic environment in the gut microbiome. Examples include short-chain fatty acids (SCFAs), organic acids, nucleic acids, amino acids and fulvic acids.

Dysbiosis

Dysbiosis is the term that denotes microbial imbalance in the microbiome ecosystem. A healthy gut microbiome consists of approximately 85%-90% beneficial bacteria and only 10%-15% potentially bad bacteria.[9] Everyone's gut microbiome harbors strains of bacteria that are *potentially* harmful, but these bacteria generally do not cause problems when beneficial bacteria predominate.[10] It's all about maintaining the correct balance.

Primary Causes of Dysbiosis

Antibiotics are one of the most common causes of dysbiosis. Antibiotics have saved millions of lives, but during the past several decades, the over-prescribing of antibiotics has resulted in microbiome destruction, weakened immune systems, and the rise of deadly antibiotic-resistant "superbug" infectious diseases. Antibiotics dramatically alter the bacterial composition of the gut microbiome, which causes dysbiosis and often leads to additional health problems.[11]

Americans consume an enormous amount of antibiotics every year. Recent data report that in 2022, 236.4 million antibiotics prescriptions were filled in the United States. In 2020, dentists prescribed 25.2 million antibiotic prescriptions, approximately 10% of the total number of antibiotic prescriptions prescribed that year. Another alarming statistic is that approximately 70% of children under 2 years old receive at least one antibiotic prescription.[12]

Environmental toxins such as heavy metals, pesticides and herbicides and may other known toxic chemicals also harm the gut microbiome, which can lead to or exacerbate many human diseases.[13]

Bad diets are a serious cause of dysbiosis-related health problems. It was stated earlier that most American children and adults do not consume a diet that supports a healthy gut microbiome. Scientific studies provide convincing evidence that the gut microbiome is the very foundation of health.[14,15] It is becoming alarmingly clear that the Standard American Diet, known as the SAD diet, is more than just SAD, it is killing people.[16]

The Oral Probiotic Dilemma

Many people think taking high-dose probiotics orally will fix gut bacterial imbalance and dysbiosis-related problems. This is an unfortunate misunderstanding. Most oral probiotics do not provide the benefits that manufacturers lead people to believe. Here are some facts that explain why most orally ingested probiotics do not work very well.

Stomach acid. Stomach acid is 10 000 to 100 000 times stronger than the acidity in the small intestines and colon. Stomach acid is an important part of your immune system; it is designed to kill bacteria and other harmful agents that are ingested. Stomach acid kills many orally ingested probiotics. Spore-based bacteria, such as the *Bacillus* genus, have a protein coating that protects them from harsh conditions such as stomach acid. However, this coating does not ensure they will be effective for reasons explained below.

The small intestine. The small intestine is a hostile environment for orally ingested probiotic bacteria. Bile acids and pancreatic enzymes are released into the small intestines to digest food. These compounds will also damage the cell membranes of probiotic bacteria, which reduces the viability and survivability of probiotics in this environment.

Food deserts. A food desert is an area where no healthy food choices are available. Most Americans do not consume an adequate quantity or diversity of dietary

fibers and polyphenols to support a healthy gut microbiome. Hence, if orally ingested probiotics survive transit through the intestinal tract, when they arrive in the colon, they are essentially arriving in a food desert. They will likely die of starvation.

Repairing the gut microbiome ecosystem. When an ecosystem is damaged, just putting the inhabitants back will not repair the damage. For example, when loggers clear-cut hundreds of acres of trees in the Amazon rain forest, just putting the inhabitants such as the ants, birds, bees, butterflies, snakes, and monkeys back into the damaged ecosystem will not cause the trees to grow back, and those animals will likely die.

Similarly, when people have dysbiosis, the microbiome ecosystem has far too many bad bacteria; the environment is toxic because it has become too alkaline and there is damage to the gut lining. Just taking probiotic bacteria orally will not fix that damaged ecosystem.

The 2 most important steps to repair a damaged microbiome ecosystem are as follows:

1. **Increase consumption of a diversity of fruits and vegetables.** This step will supply a diversity of dietary fibers and polyphenols so that your innate probiotic bacteria can begin to thrive and begin to produce postbiotic metabolites.
2. **Directly ingest postbiotic metabolites.** These are the compounds that will help to heal a damaged microbiome ecosystem. Many postbiotic metabolites are weakly acidic, creating a weakly acidic environment that is required to support the growth and proliferation of probiotic bacteria, and inhibit the growth of pathogens. Others are antimicrobial peptides, which suppress or kill pathogens. Some provide antioxidant and anti-inflammatory activity. Others directly promote healing of the gut barrier lining.

Thus, postbiotic metabolites accelerate healing of a damaged gut microbiome ecosystem.

Dr. Ohhira's Probiotics®

Dr. Ohhira's Probiotics® Original Formula is a Japanese fermented food probiotic that is produced in a multi-year fermentation process that uses a wide variety of Japanese fruits, vegetables, mushrooms, and seaweeds, which are added to 80-gallon fermentation vats along with 13 starter strains of bacteria. After 3 years of fermentation, the bacteria have converted the dietary fibers and polyphenols into over 500 postbiotic metabolites.

Dr. Ohhira's Probiotics Professional Formula gets an additional 2 years of fermentation in huge 10 000-gallon anaerobic fermentation vats. The human colon in humans is an anaerobic environment where anaerobic bacteria ferment foods to create postbiotic metabolites. The additional 2 years of anaerobic fermentation for Dr. Ohhira's Probiotics Professional Formula results in a higher amount of postbiotic produced by anaerobic bacteria.

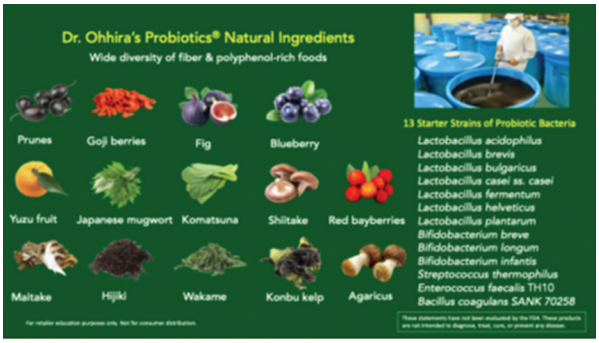
Fermentation time. It takes food from 24-72 hours to pass through the colon (an average of 36-hours). Hence, beneficial bacteria have this of time to ferment food in the colon and produce postbiotic metabolites in humans. The 3 years of fermentation time in Dr. Ohhira's Probiotics Original Formula means that bacteria have 26 280 hours to convert dietary components into over 500 postbiotic metabolites. In the Professional Formula, 5 years of fermentation time gives bacteria 43 800 hours to produce postbiotic metabolites. No other product in the world compares to Dr. Ohhira's Probiotics. This is the Dr. Ohhira's Advantage!

Be proactive. Because the gut microbiome is such an important regulator of human health, I recommend that people take proactive steps to create and maintain a healthy gut microbiome. The 2 most important actions are to increase the consumption of a variety of plant-based foods and take Dr. Ohhira's Probiotics daily.

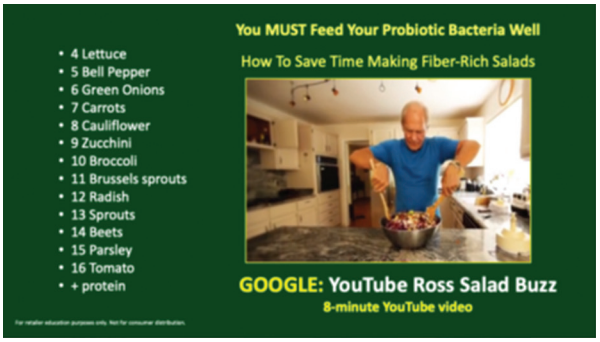
Dr. Ohhira's Probiotics human clinical trials. Multiple human clinical trials have been conducted, which show that taking Dr. Ohhira's Probiotics results in a wide range of health benefits. Essential Formulas, Inc. markets Dr. Ohhira's Probiotics in the United States. For more information, visit the Essential Formulas website at http://www.essentailformulas.com. Healthcare professionals can place orders or open a professional account by calling +1(800) 430-6180.

80-Gallon Fermentation Vats 10 000-Gallon Anaerobic Fermentation Vats

The image below shows the 14 different Japanese fruits, vegetables, mushrooms & seaweeds and the 13 strains of bacteria used in Dr. Ohhira's multi-year fermentation process



The image below shows the 16 different kinds of vegetables in Dr. Ross' microbiome-supporting Salad Buzz



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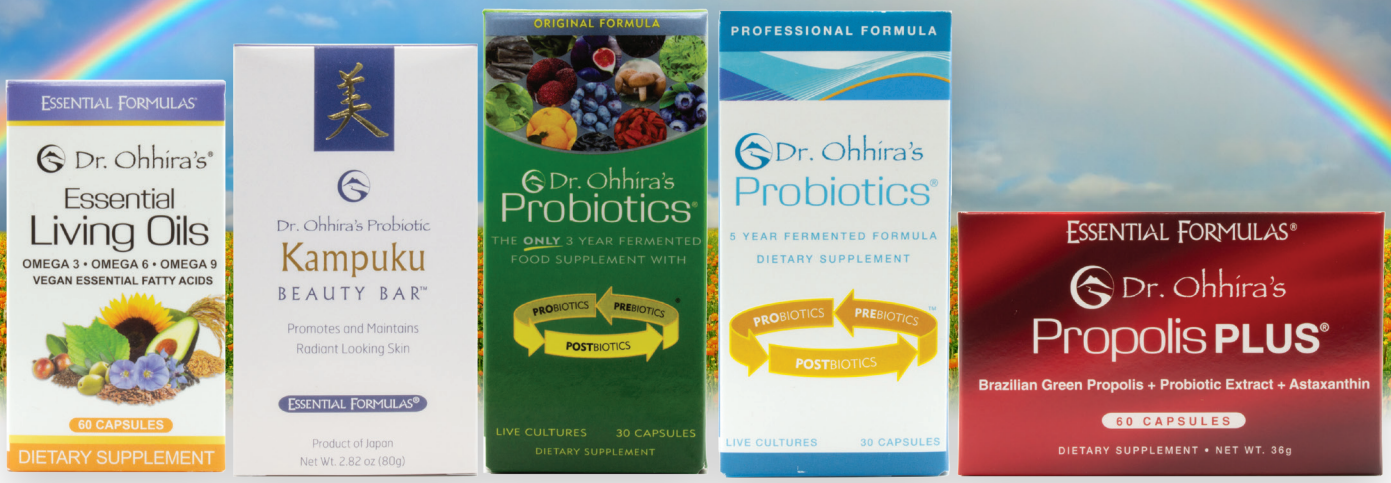
A Spectrum of Solutions



Probiotic health is a rapidly growing segment that shows no signs of slowing down. Dr. Ohhira's Probiotics' stellar reputation for quality and effectiveness has earned us a loyal and ardent following that are asking for our products by name. Through advertising, word-of-mouth and our loyal health care practitioners, thousands of people daily will . . .

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For a complete listing of Essential Formulas products available, please visit emersonecologics.com

Dr. Ohhira's Probiotic Formulations include:

Dr. Ohhira's Probiotics® Original Formula E12125
Fermented for 3 years containing live, viable probiotics and postbiotic metabolites to promote healthy digestion and immunity*

Dr. Ohhira's Probiotics® Professional Formula PRPR6
Fermented for 5 years containing live, viable probiotics and postbiotic metabolites to promote healthy digestion and immunity*

Dr. Ohhira's Essential Living Oils® ELO
Important building blocks of nutrition, these essential fatty acids are vegan certified

Dr. Ohhira's Kampuku Beauty Bar™ PRKAM
gentle skin cleanser with natural plant extracts and the protective qualities of probiotics*

Dr. Ohhira's Propolis Plus® EF1138
proprietary blend of Brazilian green propolis with astaxanthin and probiotic support*

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