LOS ANGELES

COLON AND RECTAL SURGICAL ASSOCIATES

Norman N. Hoffman M.D., Inc. Gary H. Hoffman M.D. Eiman Firoozmand M.D. Liza M. Capiendo M.D.

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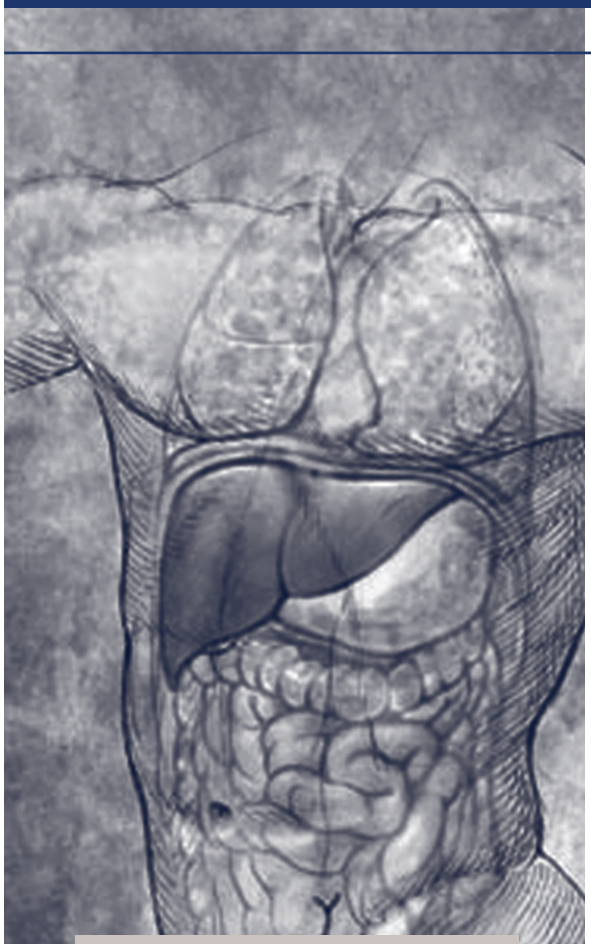


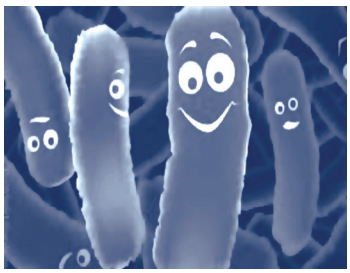
PROBIOTICS. HELPFUL OR HYPE?

Only Your Microbiome Knows for Sure.

"The decision to use or not to use microbiome enhancing probiotics may, at day's end, be a gut decision. Caveat Emptor."

PROBIOTICS. WHAT ARE THEY AND WHERE DO THEY RESIDE?

Probiotics have been enjoying a surge in popularity due to studies that looked at the gut-brain axis and the gut's influence on the immune system. Probiotics are touted to provide health benefits through modulation of the immune system and the gut-brain axis.



Today, there are probiotics in tablets, capsules, and powders; available for adults, infants, and even your pets! Probiotics have been added to everything from facial cream, coffee, pizza, chocolate, even dog food. Common foods that contain probiotics are kefir (a dairy drink containing both bacteria and yeast), kimchi (fermented cabbage), and yogurt.

Probiotics reside in our microbiome. Our microbiome is the total collection of intestinal organisms, and it is the microbiome that probiotics aim to supplement. Much research is currently focused on our microbiome and the various diseases thought to be related to an altered microbiome. Diseases such as Clostridium *difficile* infections, inflammatory bowel diseases and autoimmune disorders all are targets of the probiotic advertising campaigns.

PROBIOTICS. WHO INVENTED THEM?

The term probiotics came into common use in the 1980's, but the concept of colonizing the gut was introduced in 1907 by Nobel laureate Élie Metchnikoff. He observed increased longevity in Bulgarian peasants and theorized that their extended life expectancy might be due to their consumption of fermented milk. Metchnikoff felt that toxic substances released by the actions of proteolytic colon bacteria contributed to aging. He hypothesized that the lactic-acid producing bacteria in fermented milk created an acidic milieu through their fermentation of lactose, thereby creating an unfavorable environment for proteolytic bacteria in the colon. His theory has not been proven.

PROBIOTICS. WHAT'S IN THEM?

What exactly are probiotics and why do we need them? Probiotics are live microbes (bacteria or yeast) that may confer a health benefit to the host when consumed. The different types of bacteria found in probiotics include most commonly *Lacto-*

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baccilus, *Bifidobacterium, Saccharomyces boulardii* (which is a yeast), *Streptococcus thermophilus* (which produces lactase), *Enterococcus faecium*, and *Leuconostoc.* Microbes help process fiber, aid in maintaining regularity, contribute to the absorption of minerals, produce certain vitamins, and fend off pathogenic bacteria. For a probiotic to be beneficial, it should at least have one billion colony forming units, or CFU's, and be stable to gastric acidity.

Most bacterial strains in today's probiotic drinks and yogurt are chosen due to their ease of manufacture and growth, and not necessarily for their unproven health effects. Probiotics delivered at low concentrations into the human host have not made much difference in the host's microbiome content, which easily outcompetes the commercially prepared ingested probiotic products. There are thousands of different bacterial strains and species inhabiting the gut. Successful colonization of a new ingested bacterium depends on the host's already existent bacterial milieu, which is highly individualized. Some companies are creating probiotics combined with a prebiotic to enable the probiotic to successfully colonize the host if its prebiotic food source is consumed simultaneously. A prebiotic is a non-digestible oligosaccharide or fiber that ferments in the colon and produces short-chain fatty acids which act as a food source for colonic bacteria producing vitamin K, vitamin B12, thiamine, and riboflavin.

THE MICROBIOME. WHAT IS IT?

To understand any beneficial effects of probiotics, we must first understand the microbiome. In 2007, the National Institutes of Health began the Human Microbiome Project to categorize the trillions of microbes in the human body. However, our microbiomes have been found to be vastly diverse and individualized. They defy simple categorization. Various factors such as lifestyle, diet, environment, and even gender seem to play a role in controlling the content of the microbiome. This leads us to ask, -What exactly is an ideal "healthy" microbiome? And how can probiotics help? No one knows the answers - yet.

THE MICROBIOME. WHAT DOES IT DO?

There are studies looking at the complex relationship between the central nervous system and the GI tract, the so-called gut-brain axis. Animal studies have given insight into how intestinal bacteria influence the body's stress response and also influence areas of the brain that deal with anxiety and depression. The microbiome can not only influence myelin genes of nerves in the prefrontal cortex, but may also secrete neurotransmitters that influence the enteric nervous system lining the gut, sending messages to the brain. However, studies have not provided solid evidence regarding causality in humans.

Promising studies have shown a modest decrease in the duration of infectious diarrhea by using *Lactobacillus GG* and *Saccharomyces boulardii.* Some studies have suggested that probiotics can reduce the incidence of *Clostridium difficile* associated diarrhea and antibiotic associated diarrhea. However, other studies have shown no benefit. The difficulty with these studies is due to the variability of the probiotic strains, dosing, and duration of treatment. There was no standardization of any of these three variables. Probiotics used in the treatment of constipation, irritable bowel syndrome, inflammatory bowel disease, and allergies have shown promise, but confirmatory studies lack solid evidence. Dosing, species of bacteria, individual needs, and the variety of preparations have made it challenging to give supportable recommendations.

Early exposure of the gut to microbes has been connected to the development of the natural immunological response of the host. Newborns passing through the birth canal pick up bacteria from the mother, such as *Bacteroides*, *Bifidobacterium*, *Lactobaccilus*, and *Escherichia Coli.* Newborns born via Caesarean section are not exposed to the birth canal flora and are thought to have more allergies and lower levels of gut microbes. Again, these claims are unproven. Allergy treatment studies have looked at using probiotics to alter the gut composition in patients with asthma, allergic rhinitis, and eczema. There is no solid evidence that prebiotics, probiotics, or synbiotics (the combination of prebiotics and probiotics) have any efficacy in treating allergic conditions. Probiotics have been used alone and as an adjunct with antibiotics in treating bacterial vaginosis, but reviews are mixed. Studies have shown variable efficacy in the treatment of ulcerative colitis but no efficacy in treating Crohn's disease. As of now, adjunctive probiotics for routine treatment of *C. Diff* associated diarrhea is not recommended.

PROBIOTICS AND THE FDA.

Currently, the FDA exercises no oversight of commercial probiotic preparations, enabling companies to oversell probiotic supplements. The European Commission has banned the word "probiotics" on any product, so as not to mislead the public into thinking there exists a proven health benefit. The FDA and Federal Trade Commission (FTC) have dealt stiff fines to companies claiming health benefits of probiotics with no solid evidence.

With all this hedging on the usefulness of probiotics, is there really any downside to consuming them? Health considerations aside, probiotics are expensive. With costs around one dollar per pill, probiotics are not inexpensive and may not be covered by insurance. There are no safety or efficacy regulations since probiotics are classified as a food supplement, and are not under the purview of the FDA. ***Caveat Emptor.***

PROBIOTICS AND YOU. A GUT DECISION.

There is no guarantee that you are getting the promised health benefits for which you are paying. The bacteria must be alive in order to have some benefit, but storage of the probiotic, if not ideal, will render the product non-viable. Storage, shelf life, potency, site of administration (oral, vaginal, intestinal) are all variables. The FDA and World Health Organization (WHO) recommend that the minimum viable number of each probiotic strain at the end of shelf life be listed on the product's label. However, this recommendation is honored in its breach. "But is it harmful if I just want to take it for my general well-being?" Short answer, Who knows? Bacteremia and fungemia may occur in at-risk individuals such as the immunocompromised, those with medical comorbidities, recent surgical patients, and those with prolonged hospitalizations. There is still much to be discovered regarding probiotics and scientists are finding that they have just scratched the surface of the intestine's many mysteries.

The decision to use or not to use microbiome-enhancing probiotics may, at day's end, be a gut decision. ***Caveat Emptor.***