

Is There a Role for Probiotics in *Helicobacter pylori* Therapy?

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KEYWORDS

• *Helicobacter pylori* • Probiotics • *Lactobacillus reuteri*

KEY POINTS

- Probiotics are live bacteria that may confer a health benefit to the host.
- Several studies provided evidence that probiotics may also compete directly with *Helicobacter pylori*, interfering with other pathogens colonization or by the production of antimicrobial molecules.
- The effectiveness of many commonly recommended treatments has declined to unacceptably low levels for the increasing antimicrobial resistance and compliance reduction.
- *Lactobacillus reuteri* has been shown to inhibit *H pylori* in vitro and in vivo and may play a role in eradication therapy.
- The goals of this therapy could be to eradicate *H pylori*, reduce the inflammation associated with the infection, and enhance therapy by improving treatment success.

WHAT PROBIOTICS ARE

Microbial communities are present on all mucosal surfaces. The intestinal tract is the host to a vast microbe community that plays an important role in the integrity and function of the gastrointestinal tract. They also provide a relevant contribution in the maturation and induction of gut-associated lymphoid system (innate immunity), and stimulation of specific systemic and local immune responses (acquired immunity). The gut-associated lymphoid system is a major component of the immune system, accounting for more than 70% of lymphoid tissue.¹

We have any commercial or financial conflict of interest and any founding sources.

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Gastroenterol Clin N Am 44 (2015) 565–575

<http://dx.doi.org/10.1016/j.gtc.2015.05.005>

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In addition, the gut microbiome consumes, stores, and redistributes energy allowing humans to extract calories from otherwise indigestible carbohydrates. In humans, the contribution of microbial fermentation to the host's energy balance is usually around 10% to 30%. Short chain fatty acids promote colonocyte proliferation, acidification of the intracolonic environment, enhancement of colonic contraction, stimulation of colonic blood flow, and absorption of salt and water.² Moreover, these microbial communities serve as an important barrier against pathogen colonization by competing for attachment sites and for available nutrients, as well as by directly inhibiting pathogen growth by altering the intraluminal pH, reducing redox potential, and producing inhibitory molecules such as bacteriocins.^{3,4} Disturbances of the intestinal epithelial barrier function can result in increased uptake of microbial and food antigens, stimulating the mucosal immune system and triggering an inflammatory response.⁵⁻⁷

However, the gut microbiome also has the potential to contribute to the development of diseases by a variety of mechanisms. Conditions affecting gastric acid barrier, such as use of antisecretory drugs, gastric atrophy, surgery, autoimmune disease, and aging, or local mucosal and systemic immune diseases, such as selective immunoglobulin A deficit, human immunodeficiency virus infection, immunosenescence, and/or intestinal clearance modifications may result in qualitative and quantitative alterations of gastric, digiuno-ileal, and colonic flora dysbiosis (ie, specific bacteria overgrowth/reduction).⁸⁻¹⁰

PROBIOTICS

The role for intestinal microbes in health and disease has been recognized in alternative and complementary forms of medicine for many years. The Russian Nobel Prize recipient Eli Metchnikoff, professor at the Pasteur Institute in Paris, in 1907 states that "senility is due to poisoning of the body by the products of certain of these intestinal bacteria.... The multiplication of these organisms could be prevented by a diet containing milk fermented by bacilli which produce large amounts of lactic acid."¹¹

Manipulation of the intestinal microflora with therapeutic intention is the subject of intensive and ongoing research. The methods by which the intestinal microflora can be altered include administration of antibiotics, prebiotics (dietary components able to promote the growth and metabolic activity of beneficial bacteria), and probiotics. Probiotics are microorganisms that have beneficial properties for the host. This definition has been made more precise over time. For example, Fuller¹² described probiotics as "live microbial feed supplement which beneficially affects the host animal by improving its intestinal microbial balance". He stressed 2 important factors: the viable nature of probiotics and the capacity to help with intestinal balance. In 2001, an Expert Consultation of international scientists working on behalf of the Food and Agriculture Organization of the United Nations and the World Health Organization defined probiotics as, "live microorganisms which when administered in adequate amounts confer a health benefit on the host".¹³ The International Scientific Association for Probiotics and Prebiotics organized a meeting of clinical and scientific experts on probiotics (with specialties in gastroenterology, pediatrics, family medicine, gut microbiome, microbiology of probiotic bacteria, microbial genetics, immunology, and food science) in 2013 to reexamine the concept of probiotics and suggested a more grammatically correct definition: "live microorganisms that, when administered in adequate amounts, confer a health benefit on the host." Overall, the definition includes the essence of the term, *microbial*, namely, viable and beneficial to health.¹⁴

The European Commission advised the Food Safety Authority of Ireland that where terms like 'live' or 'active' are used to describe bacteria and imply a probiotic function,

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