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RESEARCH METHODOLOGY IN ENVIRONMENTAL SCIENCES

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Chapter-11

A Study on Role of Probiotics on Human Health

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Abstract

Probiotics including bacteria and yeast are live microorganisms that are good for human health, especially human digestive system. We usually think of bacteria as something that causes diseases. Human body is full of bacteria, both good and bad bacteria. Probiotics are naturally found in human body. We can also find them in some food supplements. The potential application of probiotics includes prevention and treatment of various human health conditions and diseases such as gastrointestinal infections, inflammatory bowel disease, lactose intolerance, allergies, urogenital infections, cyst fibrosis , various cancers, reduction of antibiotic side effects, in oral health such as prevention of dental caries, periodontal diseases and many other effects which are under investigation. The results of many of these clinical investigations suggests that probiotics may be useful in preventing and treating various human health conditions and diseases. This review article explains the currently available data on potential benefits of probiotics in human health and disease.

Keywords: Probiotics, food supplements, clinical investigation

Introduction

Each day, every human being ingests a large number of living microorganisms, that are mostly bacteria. Although these microorganisms are naturally present in food and water, they can also be added during the processing of foods such as cheese, yogurt, sausages, and fermented milk products. For several decades now, bacteria called probiotics have been added to some foods because of their beneficial effects for human health. Although people often think of bacteria and other microorganisms as harmful “germs,” many are actually helpful. Some bacteria help digest food, destroy disease-causing cells, or produce vitamins. Many of the microorganisms in probiotic are the same or similar to microorganisms that naturally live in human bodies.

In October 2001, the World Health Organization (WHO) defines probiotics as “live microorganisms which when administered in adequate amounts confer a health benefit on the host. Following this definition, a working group convened by the Food and Agriculture Organization (FAO)/WHO in May 2002 issued the Guidelines for the Evaluation of Probiotics in Food.

Concept of Probiotics and Their Potential Benefits:

probiotics are known to have particular properties such as; resistance to acid pH, bile tolerance, tolerance to pancreatic fluid, adhesion and invasion capacity in the intestinal epithelial cells. The above properties permit their survival in the

gastrointestinal tract and the improvement of the intestinal balance. During the past years, the use of probiotic microorganisms has been applied to modulate the microbiome in a beneficial way and thus fighting against infections threatening human and animal health.

Mechanism of action of probiotics:

Enhancement of the epithelial barrier The intestinal barrier is a major defense mechanism used to maintain epithelial integrity and to protect the organism from the environment. Defenses of the intestinal barrier consist of the mucous layer, antimicrobial peptides, secretoryIgA and the epithelial junction adhesion complex. S. thermophilus and L. acidophilus increase activation of tight junction proteins avoiding the development of a leaky intestine. Lactobacillus rhamnoses GG can prevent inflammation and programmed cell death of the lining intestinal epithelial cells.

Increased adhesion to intestinal mucosa and inhibition of pathogen adhesion: Adhesion of Probiotic bacteria to the intestinal mucosa is important for its colonization. Lactic acid bacteria (LABs) display surface adhesions that are involved in their interaction with intestinal epithelial cells (IECs) and mucus. Mucin produced by the host intestinal epithelial cells is a complex mixture of glycoprotein that is the principal component of mucous, thereby preventing the adhesion of pathogenic bacteria. MUC2 and MUC3 mRNA expression is increased in response to lactobacilli, protecting cells against the adhesion of pathogenic bacteria.

Competitive exclusion of pathogenic microorganisms

Efficacy of a Probiotic can be determined by its ability of binding to receptor sites present in the intestinal tract. The binding of Probiotic bacteria inhibits the adhesion of pathogenic bacteria and prevent its colonization. For example, Lactobacillus GG and Lactobacillus Plantarum 299V competitively inhibit the adhesion of E. coli.

Production of antimicrobial substances:

Probiotics produce certain short chain fatty acids, which lower the intracellular pH, inhibiting the growth of pathogenic organism. Many Probiotic organisms secrete antimicrobial peptides. Including Bacteriocins and AMPs (Antimicrobial peptides). Bacteriosin such as Nisin, Plantaricin and lactacin show a narrow activity spectrum against some pathogens.

Modulation of the immune system:

Probiotic bacteria can exert an immunomodulatory effect on the host by interacting with epithelial and dendritic cells (DCs) and with monocytes/ macrophages and lymphocytes Immune effects of probiotics.

- Probiotics deliver anti-inflammatory molecules to the intestine.
- Reduce inflammatory response by increasing signaling in host cells.
- Switch in immune response to reduce allergy.
- Induce antibody response to reduce infection Decrease the production of inflammatorysubstances.

Sources of probiotics: Yogurt, Kefir, Sauerkraut, Tempeh, Kimchi, Miso, Kombucha, Pickles, Traditional Buttermilk, Natto, Some Types of Cheese

Role of Probiotics on Human Health

Human gut microbiome associated diseases:

Probiotics are used constantly to improve the homeostasis of internal microbiota to maintainthe human intestinal health.

The Homeostasis of Human Get Microbiota and Its Potential Roles in Human IntestinalHealth:

human intestinal microbiota are known to perform various functions in the host including intestinal development, homeostasis and protection against pathogenic bacteria.

Antibiotic-Associated Diarrhea (AAD)

One of the causes of AAD is a disease-causing bacterium, Clostridioides (formerly Clostridium) difficile, that can cause infection of the large intestine as a result of reduced resistance to antibiotics. Interestingly, it has been suggested that probiotics may be beneficial and safe in the prevention of AAD as demonstrated in several Randomized Controlled Trials

Colorectal Cancer (CRC)

CRC, also known as bowel cancer, the roles of probiotics in the prevention of colorectal cancer through alteration of the intestinal microbiota and its possible immunomodulatory mechanisms.

Probiotics in Oral Health and Disease:

Probiotics have a role in maintaining oral health through interaction with oral microbiome, thus contributing to healthy microbial equilibrium. The nature and composition of any individual microbiome impacts the general health, being a major contributor to oral health.

Treatment and Prevention of Diarrhea by Probiotics:

using strains Lactobacillus acidophilus, Lactobacillus Rhamnoses strain GG, Lactobacillus Bulgaricus and yeast Saccharomyces Boulardii) could be used to prevent antibiotic associated diarrhea.

Anticancer Properties of Probiotics:

the importance of probiotic therapy that inhibited transformation of procarcinogen to active carcinogens which further reduced the risk of colon cancer.

Probiotics and Corona virus disease 2019:

Focusing on the symptoms of COVID-19 patients, few patients showed intestinal microbial dysbiosis that was reduced with the use of probiotics such as Bifidobacterium and Lactobacillus. Additionally, the useof probiotics helped in balancing intestinal microbiota that lowered the risk of moving toward secondary infection.

Conclusion and Future Prospective

There is no doubt that we will witness a significant increase in the role of probiotics in nutrition and medicine over the next decades. Their application in the prevention and treatment of various disorders should be considered by medical professionals as well as should be promotedby the food industry. Newly developed probiotic strains should be thoroughly evaluated for safety before being marketed. Although much remains to be learned regarding the mechanisms of action and the appropriate administration of probiotic strains, it is clear that different strains can have very specific effects. Moreover, their effects may vary in health and disease, in different disease states, and in different age groups.

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