

# “Probiotics – An Emerging Concept”

Dr. Harneet Singh\* Dr Harmandeep Singh\*\*

\*Department Of Oral Medicine & Maxillofacial Radiology, PGIDS, Rohtak  
\*\* Dr Bhandari's Dental Clinic, New Delhi

**Abstract-** Probiotics are live microorganisms (e.g., bacteria) that are either the same as or similar to microorganisms found naturally in the human body and may be beneficial to health. Often referred to as “good bacteria” or “helpful bacteria,” probiotics are available in various forms of supplements or other delivery systems. There is a constant debate regarding the effectiveness of probiotics in today's lifestyle. As the question arises whether the living & dietary habits of an individual can be altered and hence improved upon by the use of Probiotics.

**Index Terms-** Probiotics, Prebiotics, Good Bacteria

## I. INTRODUCTION

The term “Probiotics” comes from the Greek “for life”. Probiotics are live microorganisms (in most cases, bacteria) that are similar to beneficial microorganisms found in the human gut. They are also called as “friendly bacteria” or “good bacteria.” The first recorded probiotic was fermented milk for human consumption. After that, Probiotics became popular with animal nutrition. Probiotics have been used as growth promoters, for lactose intolerance<sup>3</sup>, antitumour and anticholesterolaemic effects. When ingested, these living microorganisms replenish the microflora in the intestinal tract. This results in the promotion of a number of health-enhancing functions, including enhanced digestive function.<sup>1</sup>

Probiotics as defined by the World Health Organization (WHO) are live microorganisms which, when administered in adequate amounts, confer a health benefit on the host<sup>2</sup>. Probiotics have been extensively studied under *in vitro* and *in vivo* conditions. The main fields of research with respect to probiotics are heart diseases, allergic reaction, cancer, diarrhoea, etc. Intestinal infections caused by *Escherichia coli*, *Campylobacter fetus* subsp. *jejuni*, *Clostridium perfringens* and *C. botulinum* were reduced in the presence of *Lactobacillus* supplements. The *Lactobacillus* has shown promising results and *Bifidobacterium longum* has been successfully used to reduce the after-effects of antibiotic therapy.

## II. HISTORY

Probiotic food such as fermented foods and cultured milk products has been used since the ancient times. Interest in probiotics in general has been growing. Over the last century, different microorganisms have been used for their ability to prevent and cure diseases leading to the coining of the term probiotics. In 1907 the Ukrainian born biologist & Nobel laureate Elie Metchnikoff stated that consumption of Bulgarian yogurt (which contains lactic acid bacteria) was good for health<sup>3</sup>. In the

1950s, probiotics product was tested by the United States department of agriculture as a drug for the treatment of scour (*E. coli* infection) among pigs.

The term probiotics, as an antonym to the term antibiotic, was originally proposed in 1965 by Lilley and Stillwell<sup>4</sup>. Discovery of Mann and Spoerig in 1974 that people who drank yoghurt fermented with wild strains of *Lactobacillus* specifically had low values for blood serum cholesterol, opened up a new area of study<sup>5</sup>. The first probiotic species *acidophilus* was isolated by Hull et al in 1984 and *Bifidobacterium bifidum* by Holcomb et al in 1991 (Tanboga et al; 2003)

In 1994, the World Health Organization deemed probiotics to be the next most important immune defence system when commonly prescribed antibiotics cohabited resistance (Kailasapathy and Chin 2000; Levy 2000).

## III. COMPOSITION OF PROBIOTICS

Most probiotics are bacteria similar to those naturally found in people's guts, especially in those of breastfed infants (who have natural protection against many diseases). Most often, the bacteria come from two groups, *Lactobacillus* or *Bifidobacterium*.

Within each group, there are different species (for example, *Lactobacillus acidophilus* and *Bifidobacterium bifidus*), and within each species, different strains (or varieties). A few common probiotics, such as *Saccharomyces boulardii*, are yeasts, which are different from bacteria. Among bacteria, lactic acid bacteria are more popular. *Lactobacillus acidophilus*, *L. casei*, *L. lactis*,

*L. helveticus*, *L. salivarius*, *L. plantarum*, *L. bulgaricus*, *L. rhamnosus*, *L. johnsonii*, *L. reuteri*, *L. fermentum*, *L. delbrueckii*, *Streptococcus thermophilus*, *Enterococcus faecium*, *E. faecalis*, *Bifidobacterium bifidum*, *B. breve*, *B. longum* and *Saccharomyces boulardii* are commonly used bacterial probiotics<sup>5</sup>.

## IV. MECHANISM OF ACTION

Probiotics can be in the form of powder, liquid, gel, paste, granules or available in the form of capsules, sachets, etc. Probiotics improve colonization resistance to gut pathogens by reinforcing the mucosal barrier and restoring normal gut micro ecology after diarrhea (Fig-1). If the intestinal micro flora is deficient, antigen transport is increased; probiotics have been shown to normalize an increased permeability. Binding is considered to be the first step in pathogenesis, and binding of bacteria to the intestinal mucosa or mucus may allow the colonization". Probiotics compete with pathogens for binding

sites and available substrates. Probiotics can also activate and modulate the immune system, and reinforce gut defense by immune exclusion, immune elimination and immune regulation. The intestinal micro-flora is associated with the development of immune system in the gut during infancy and early childhood<sup>6,7</sup>.

## V. USES

Probiotics are recommended for people who take antibiotics, are under stress or are travelling. Stress can upset the stomach and alter the microflora in the gut. Probiotics can help in stabilizing the gut microflora. According to Farnworth, the probiotics in yogurt may also help in shortening the duration of diarrhea caused by some antibiotics less severe and because the active cultures help replenish beneficial bacteria, returning colon function to normal. Probiotics could halt the unfriendly microorganisms and/or suppress their growth and activity in conditions like:

- Infectious diarrhea
- Irritable bowel syndrome
- Inflammatory bowel disease (e.g., ulcerative colitis and Crohn's disease)
- Infection with *Helicobacter pylori* (*H. pylori*), a bacterium that causes most ulcers and many types of chronic stomach inflammation
- Tooth decay and periodontal disease
- Vaginal infections
- Stomach and respiratory infections that children acquire in daycare
- Skin infections.<sup>6</sup>

## VI. CLINICAL IMPLICATIONS OF PROBIOTICS

### Anti-Cancer effects

There is a strong attestation to the importance of *Lactobacilli* in human nutrition and health, as well as the interrelationship between many dietary factors and cancer. There is some evidence that probiotics can interfere at various stages of the cancer process, such as prevention of DNA damage in the colon by live bacteria<sup>24</sup>, suppression of pre-neoplastic changes in the colon<sup>25</sup> and suppression of colon tumours in animals. Animal and *in vitro* studies have indicated that probiotic bacteria may reduce colon cancer risk by reducing the incidence and number of tumours<sup>3</sup>.

### Lactose intolerance

Lactose intolerance is a physiological state in human beings where they lack the ability to produce an enzyme named lactase or B-galactosidase. This lactase is essential to assimilate the disaccharide in milk and needs to be split into glucose and galactose. Individuals lacking lactase will not be able to digest milk and it often poses a problem in newborn infants. People with lactose intolerance problem express abdominal discomfort, diarrhoea, cramps, flatulence, nausea, vomiting, etc. Another problem associated with lactose intolerance is calcium deficiency. A person suffering from lactose intolerance will be advised to take non-milk diet. The resident bacteria in the colon ferment undigested lactose, producing acid and gas, causing symptoms such as abdominal pain, bloating and diarrhoea.

Yogurt contains less lactose than milk and delays gastric emptying, which partly explains why lactose-intolerant individuals tolerate yogurt<sup>3</sup>.

### Allergy

A change in the proper functioning of the immune system can present itself as an allergy. Large-scale studies have indicated an alteration in the composition of the gut microflora, such as decrease in the numbers of lactobacilli, preceding the development of an allergy. Probiotics have been shown to reduce the incidence of childhood eczema by half. Probiotics may exert a beneficial effect on allergic reaction by improving mucosal barrier function. In addition, probiotics consumption by young children may beneficially affect immune system development. Probiotics such as *Lactobacillus* GG may be helpful in alleviating some of the symptoms of food allergies such as those associated with milk protein. Probiotics consumption may thus be a means for primary prevention of allergy in susceptible individuals<sup>3,7,10</sup>.

## VII. EFFECTS OF PROBIOTICS ON ORAL CAVITY

Probiotics may act by direct interaction or indirect interaction on oral biofilm and microflora and vice versa.

Direct interaction may include:

- Involvement in binding of oral microorganism to proteins (biofilm formation).
- Action on plaque formation and on its complex ecosystem by compromising and intervening with bacteria to bacterial attachments.
- Involvement in metabolism of substrate (competing with oral microorganisms of substrate available).
- Production of chemicals that inhibit oral bacteria (antimicrobial substances)

Indirect interactions may include:

- Modulating systemic immune function selection pressure on developing oral micro flora towards colonization by less pathogenic species.
- Reduction of malodor<sup>8,9</sup>

Other effects

- Inhibit Growth of Pathogenic Bacteria
- Enhance Growth of Other Friendly bacteria
- Reduce Toxins
- Increase Immunity/Bacterial Resistance
- Produce Vitamins and Other Nutritional Factors
- Reduce Cholesterol
- Alleviate Flatulence

## VIII. ADVERSE EFFECTS

Probiotics safety has not been thoroughly studied scientifically, however. More information is especially needed on how safe they are for young children, elderly people, and people with compromised immune systems. Side effects of probiotics tend to be mild and digestive in nature leading to effects such as gas or bloating. More serious effects have also been seen in some

people. Probiotics might theoretically cause infections that need to be treated with antibiotics, especially in people with underlying health conditions. They could also cause unhealthy metabolic activities, too much stimulation of the immune system, or gene transfer (insertion of genetic material into a cell) <sup>2</sup>.

### IX. CONCLUSION

A good probiotic agent needs to be non-pathogenic, nontoxic, resistant to gastric acid, adhere to gut epithelial tissue and produce antibacterial substances. It should persist, albeit for short periods in the gastro-intestinal tract influencing metabolic activities like cholesterol assimilation, lactose activity and vitamin production. With the current focus on disease prevention and the quest for optimal health at all ages, the probiotics market potential is enormous. Health professionals are in an ideal position to help and guide the patients toward appropriate prophylactic and therapeutic uses of probiotics that deliver the desired beneficial health effects <sup>3</sup>.

### REFERENCES

- [1] Wells.C, Oberhelman.R , Hibberd .P,Walker .R and Klein.M ; An Introduction to Probiotics; National Center for Complementary and Alternative Medicine (NCCAM),August 2008,No: D345
- [2] Food and Agriculture Organization of the United Nations (FAO). 2002. Guidelines for the Evaluation of probiotics in Food.
- [3] Suvarna V. C and Boby V. U. Probiotics in human health: A current assessment; Current Science, June 2005: 88( 11) 1744-1748

- [4] Hammerman.C, Bin.A-Nun, Kaplan.M; Germ warfare: probiotics in defense of the premature gut Clinics in Periodontology; September 2004; 31(3)489-500
- [5] Gill HS, Guarner F. Probiotics and human health: a clinical perspective. Postgraduate Medical Journal. 2004; 80 (947):516–526.
- [6] Parvez.S, Malik. K.A. Ah Kang.S and Kim.H; Probiotics and their fermented food products are beneficial for health. Journal of Applied Microbiology; 2006; 100 1171–1185
- [7] Reid G, Jass J, Sebulsky MT, McCormick JK). “Potential Use of Probiotics in Clinical Practice”. Clin. Microbiol. Rev.(October 2003) 16 (4): 658–72
- [8] Hamilton-Miller J.M "The role of probiotics in the treatment and prevention of Helicobacter pylori infection". Int. J. Antimicrob. Agents (October 2003). 22 (4): 360–6
- [9] Kalliomaki, M., Salminen, S., Arvilommi, H., Kero, P., Koskinen, P. and Isolauri, E., Probiotics in primary prevention of atopic disease:A randomized placebo-controlled trial. Lancet, 2001, 357, 1076–1079.
- [10] Majamaa, H. and Isolauri, E., Probiotics: A novel approach in the management of food allergy. J. Allergy Clin. Immunol.1997, 99, 179–185.

### AUTHORS

**First Author** – Dr Harneet Singh, MDS, Sr.Demonstrator, PGIDS, Rohtak

**Second Author** – Dr Harmandeep Singh, BDS, Dental Surgeon, Dr Bhandari’s Dental Clinic, New Delhi

**Correspondence Author** – Dr Harneet Singh, Department of Oral Medicine & Radiology, Post graduate institute of Dental sciences & research, Rohtak, Haryana 124001, Email : drharneetomdr@gmail.com, Ph no : 09034900501