

Unlocking Wellness: The Power of Probiotics

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Abstract

Probiotics are live microorganisms that benefit health by enhancing gut flora, with common species including *Lactobacillus*, *Bifidobacterium*, *Saccharomyces cerevisiae*, *E. coli*, and *Bacillus*. Effective probiotics should contain 10^5 to 10^7 cfu/ml. The gut, crucial for digestion and immunity, is influenced by various factors. Dysbiosis, an imbalance in gut bacteria, causes digestive issues and is linked to antibiotics, lifestyle, and diet. Introduced by Elie Metchnikoff, probiotics, found in foods like yogurt and kimchi, offer numerous health benefits, including alleviating diarrhoea, IBS, infections, and potentially reducing colon cancer risk and blood pressure. Probiotics work by converting compounds, producing vitamins, antagonizing harmful bacteria, and improving gut barrier function. They must be safe, non-pathogenic, and viable in storage. Common strains include *Lactobacillus* and *Bifidobacterium*. Probiotic research in India is conducted by institutes like the Central Food Technology and Research Institute. Supplements are typically unnecessary for healthy individuals but may benefit those with specific health conditions, under medical advice.

Introduction

Probiotics are live microorganisms that provide health benefits when consumed, primarily by improving or restoring gut flora. They can be formulated into various products, including foods, drugs, and dietary supplements. The most commonly used probiotic species are *Lactobacillus* and *Bifidobacterium*, along with the yeast *Saccharomyces cerevisiae*, and certain *E. coli* and *Bacillus* species. To be effective, probiotic products should contain approximately 10^5 to 10^7 cfu/ml (colony forming units per millilitre).

Human gut (small intestine + large intestine) contains numerous numbers of bacteria which helps in digesting food, absorption of nutrients from foods and also acts against several harmful environmental factors by improving immunity. About 80% of our immune system is found in the gut. Much like genetic imprint of

an individual has a unique microbiota, though approximately one-third of the species are common across most humans. Many factors influence intestinal microbiota including hygiene, diet, geographical location and host genotype.

The World Health Organization (WHO) defines Probiotics as “Live microorganisms which, when administered in adequate amounts, confer a health benefit on the host”

Dysbiosis

It is a condition where there is an imbalance between the types of organisms present in a person’s natural microbiota, especially in gut, thought to contribute to a range of conditions of ill health. The main symptoms of Dysbiosis are digestive disturbances and may also experience bloating, abdominal cramping’s, diarrhoea, and constipation. common causes of Dysbiosis is antibiotic therapy, Autoimmune conditions, IBD and others are fast paced lifestyle, stress, food habits, Alcohol intake and cigarette smoking. Prebiotics are known to restore that balance of good bacteria and improve gut health.

History

The concept of Probiotics was first introduced by Elie Metchnikoff (father of probiotics). He hypothesised that consuming large amounts of fermented milk products that contained *Lactobacillus* bacteria could prolong and improve the quality of life. He suggested that “intestinal auto-intoxication” could be suppressed by modifying the gut microbiota and replacing proteolytic microbes such as *Clostridium*—which produce toxic substances including phenols, indoles, and ammonia from the digestion of proteins—with useful microbes. He developed a diet with milk fermented with the bacterium he called “Bulgarian bacillus”.

The term “Probiotics” was first introduced in 1965 by Lilly and Stillwell; in contrast to antibiotics, Probiotics were defined as microbially derived factors that stimulate the growth of other organisms. The word

“probiotic” comes from the Greek word pro meaning “promoting” and biotic, meaning “life”.

Examples of foods containing probiotics

Yogurt - *Lactobacillus bulgaricus* and *Streptococcus thermophilus*.

Curd - *Lactobacillus acidophilus*, *Lactococcus lactis* etc.

Kefir - *Lactobacillus kefirianofaciens*, *Lactobacillus helveticus*, *Lactobacillus bulgaricus* and *Streptococcus thermophilus*.

Kombucha – acetic acid bacteria and osmophilic yeast.

Sauerkraut - *Leuconostoc mesenteroids*, *Lactobacillus brevis*, *Pediococcus pentosaceus* and *Lactobacillus plantarum*.

Kimchi – *Leuconostoc mesenteroids*, *Leuconostoc pseudomesenteroides*, *Lactococcus lactis*, *Lactobacillus bravis* and *Lactobacillus plantarum*.

Tempeh – *Rhizopus oligosporus* or *Rhizopus oryzae* and *Firmicutes*.

Acidophilus milk – *Lactobacillus acidophilus*.

Sake – *Aspergillus oryzae* and *Saccharomyces cerevisiae*.

Health benefits of probiotics

There is increasing evidence in favour of the claims of beneficial effects attributed to probiotics, including improvement of intestinal health, enhancement of the immune response, reduction of serum cholesterol, and cancer prevention. These health properties are strain specific and are impacted by the various mechanisms mentioned above. While some of the health benefits are well documented others require additional studies in order to be established. In fact, there is substantial evidence to support probiotic use in the treatment of acute diarrhoeal diseases, prevention of antibiotic-associated diarrhoea, and improvement of lactose metabolism, but there is insufficient evidence to recommend them for use in other clinical conditions (Kechagia et al., 2013).

- **Diarrhea:** Increase in the frequency of bowel movements can be cured and prevented by consuming Probiotics.
- **Irritable Bowel Syndrome (IBS):** Reason for this disease is still unknown. a diagnosis is made

based on symptoms (stomach bloating and pain). IBS can be prevented by the *Lactobacillus plantarum* 299V.

- **Helicobacteriosis:** It is a bacterial infection caused by *Helicobacter pylori* that causes inflammation of the lining of the stomach. Probiotic has an in vitro inhibitory effect in reducing gastric inflammation.
- **Necrotizing enterocolitis:** It is a serious intestinal disease among premature babies. It happens when tissue in the intestine is injured or inflamed. Treating with *Bacillus infantis* and *Lactobacillus acidophilus* to newborn result in reduction of NEC.
- **Urogenital infection:** An infection in any part of the urinary systems, the kidneys, bladder or urethra can be prevented by taking *Lactobacillus fermentum* and *Lactobacillus rhamnosus*.
- **Colon cancer:** Lactic bacteria may act against cancer of the colon or rectum, located at the digestive tracts lower end.
- **Blood pressure:** Milk fermented by lactic acid bacteria may result in the reduction of this sickness.

Mechanism of action

Probiotics have various mechanisms of action although the exact manner in which they exert their effects is still not fully elucidated (Knight & Girling, 2003). These range from bacteriocin and short chain fatty acid production, lowering of gut pH, and nutrient competition to stimulation of mucosal barrier function and immunomodulation (McNaught & MacFie, 2001). The latter in particular has been the subject of numerous studies and there is considerable evidence that probiotics influence several aspects of the acquired and innate immune response by inducing phagocytosis and IgA secretion, modifying T-cell responses, enhancing Th1 responses, and attenuating Th2 responses (Isolauri et al., 2001).

- **Bioconversion** - It is the process of converting complex compounds into simpler ones, which helps in easy digestion and facilitates nutrition absorption for example, sugars into fermentation products

- **Production of growth substrates** - Probiotics produces growth substrates like vitamins B and K, which help other useful bacteria in its growth and activity.
- **Direct antagonism** - Probiotics produces antimicrobial substances like hydrogen peroxide, organic acids, Bacteriocin, acidophilin etc which is responsible for the death of harmful bacteria.
- **Competitive exclusion** - Probiotics binds it selves to the binding sites exerting competition to harmful bacteria for binding sites
- **Improved barrier function** - It makes intestinal walls impermeable for harmful bacteria and the toxins produced by them
- **Production of β - D- galactosidase enzymes** - In case of lactose intolerant people who are incapable to digest lactose because of the absence of lactase enzymes, these probiotics produces β - D- galactosidase enzymes that act as alternative and helps in breaking down lactose.
- **Reduction of inflammation** - By altering intestinal properties, probiotics help in reducing inflammation
- **Stimulation of innate immune response**

Desirable probiotic properties

In order for a potential probiotic strain to be able to exert its beneficial effects, it is expected to exhibit certain desirable properties. The ones currently determined by in vitro tests are

- (i) acid and bile tolerance which seems to be crucial for oral administration,
- (ii) adhesion to mucosal and epithelial surfaces, an important property for successful immune modulation, competitive exclusion of pathogens, as well as prevention of pathogen adhesion and colonisation,
- (iii) antimicrobial activity against pathogenic bacteria,
- (iv) bile salt hydrolase activity (Russell, 2009).

Nevertheless, the value of these parameters is still under debate as there are matters of relevance, in vivo and in vitro discrepancies, and lack of

standardization of operating procedures to be considered (FAO/WHO, 2002). As there are no specific parameters essential to all probiotic applications, the best approach to establish a strain's properties is target population and target physiologic function specific studies(Saarela et al., 2000).

Common strains of probiotics

- *Lactobacillus species*
- *Bifidobacterium species*
- *Bacillus cereus*
- Non-pathogenic *Escherichia coli*
- *Saccharomyces cerevisiae* (yeast)
- *Enterococcus faecalis*
- *Streptococcus thermophilus* etc

Institutes engaged in probiotic research in India

- Central Food Technology and Research Institute, Mysore, India
- National dairy research institute, Karnal, Haryana, India
- Institute of microbial technology, Chandigarh, India
- National dairy development board, Anand, Gujarat, India
- Nestle Pvt Ltd, Panipat, Haryana, India

Are probiotics supplements necessary?

Probiotics supplements are not necessary for normal, healthy individuals. In healthy individuals, daily consumption of Probiotics rich foods, particularly fermented dairy products like yoghurt and Curd adequately supplies the number of Probiotics required to maintain a healthy digestive system and overall wellbeing. Whereas in people who are suffering from different kind of diseases like irritable bowel syndrome, diarrhea etc, they might need additional supplements. It is required to take prescription from doctors before going for any additional supplements. Diet high in starches and fibre provide Prebiotics, which keep a healthy population of Probiotics in our intestines. Due to the multitude of strains, the FDA has not approved any specific health claims for Probiotics. The varying strains also make it impossible to establish an RDA for a Probiotic. Probiotic effects should be considered dose

specific. Dose listed on the label are based on studies that show a beneficial health effect in humans.

Conclusion

Probiotics, beneficial microorganisms like Lactobacillus and Bifidobacterium, enhance gut health and immunity. They are effective in treating digestive issues, infections, and potentially reducing colon cancer risk and blood pressure. While generally unnecessary for healthy individuals consuming probiotic-rich foods, supplements may help those with specific conditions, advised by a doctor. Probiotic research in India supports these findings, emphasizing their safe and beneficial use.

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