

## Use of Probiotics as a Functional Food against Cancer

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Cancer is considered as the disorder of the cell in which the natural death (apoptotic) pathway of the cell cycle is lost resulting in uncontrolled growth [1]. The World health organization (WHO) has declared cancer as the second leading cause of death universally with a mortality rate of 9.5 million people's in only 2018. The report further says that 1 in 6 deaths reported globally is due to cancer, in which 70% of deaths are from low- and middle-income countries [2]. Colorectal is the leading third most cancer in which nearly 8, 62, 000 deaths were reported in 2018 [3]. To cope up with this problem, few new synthetic medicines are discovered after several years of clinical trials and many are discarded at the last phase of trials due to host-drug incompatibility issues. The treatments of colorectal cancer are mostly given by the systematic route rather than the local action at the site of the disorder. This results in the systematic toxicity and adverse effects on vital organs. So there is a need of the drug that can be delivered by per-oral route with its local action, minimizing the systemic toxicity controlling morbidity and preventing the mortality [4].

The cost of these anticancer drugs and even certain antibiotics are beyond the reach of the common man and if made available are puzzled by the issue of innumerable side effects and suffering [5]. So, there is a need for such medicine which is from natural origin and deprived of its side effects. With the advancement in the studies of nutraceutical foods and the knowledge of nano-pharmacology, there is need of formulated functional food to heal gastrointestinal tract cancer [6]. This thing can achieved by deliver of the functional foods by the per-oral routes directly into gastrointestinal tract like food bolus. These nutraceuticals can act as a promising healer due to the natural origin and can be made available at a low price especially in developing countries like India.

Many holistic systems use the combinations of medicinal plants along with the fruits and vegetables containing the phytochemicals such as phenolic compounds, vitamins (vitamin A, C, and E) and

fibers to prevent and treat cancer [7]. These component acts as functional food which along with nutrients provide the health benefits called nutraceuticals. Many green leafy vegetables and season fruits act as a functional food and provide health benefits. The many exotic nature of the medicinal plants is used by the tribal community to heal many kinds of bodily disorders since ancient times [8]. Polyphenols are the group which contains different medicinal component such as simple phenols, acetophenones, stilbenes, hydroxycinnamic acids, coumarins, lignans, phenolic acids, flavonoids, and tannins. These components are found effective in blocking the telomerase in cancer cell lines proved by many *in-vitro* and *in-situ* studies [9]. The probiotics are considered as the class of microorganism that are found as residential microflora of the gastrointestinal tract assisting the digestive and enzymatic function of the host [10]. Probiotics are the basic source of the functional food used as 'yogurt, dahi' but come with the short shelf life. Functional foods are used as the alternative source of healing component not morphological but by the physiological pathways. These are used as the therapeutical agent along with the diet to reduce the risks of various diseases as a prophylactic agent. The most common diseases that are treated by neutraceutical agents are gastrointestinal diseases and buccal cavity disorders. The pharmacological activities that are observed in case of probiotics are mostly by antioxidant mode of actions without the liver damage and carcinogenesis. The antioxidant mechanisms of probiotics could be due to metal ion chelation, enzyme inhibition and free radical scavenging mechanism. The synthetic drugs that are of the chemical origin or synthesized in the lab precipitate toxicity after long use.

The probiotics especially *Lactobacillus* genera are extensively explored for a long time as part of the diet. The origin of these microbes is mostly from the milk and its derived products. Since birth, these microbes work together as part of the digestive system

as mutualism mode of adaption in the gastrointestinal tract. The probiotics fight the dysbiosis conditions with the pathogenic strains in the lumen of the intestine. In extreme condition, the inoculation of the *Lactobacillus* is found effective in suppressing and destroying the disease-causing microbes i.e. pathogens [11]. The probiotics include many different bacterial strains, each of these species differs in nature and activity. Most of the times strains of the same species are unique in characteristics such as adherence, immunological activity and other biological actions on the host. The major mechanism involved is the lowering of the pH in the colonic region, inhibiting the adhesion of the pathogenic strains to the intestinal lumen. Auto-aggregation and co-aggregation are the other two mechanisms that are inhibiting the colonization of pathogens. The hydrophobicity of the host-probiotics interaction also prevents various diarrheal diseases [12-14]. Currently, probiotic research aims in the isolation of new strains and investigation of microbiota and microbiome characteristics in each part of the gastrointestinal tract from the small intestine to the colonic region. The basic focus of research includes the host-microbe interactions within the intestine, microbe-pathogen interactions within the microbiota and the microbe-drug interactions in diseased condition. The discovery of the new strains of *Lactobacillus* from the new natural source from the heavy crowd of the microbiota is a tricky and time-consuming process. The mechanism of action shown by the *Lactobacillus* genera and its sub-strains vary in its pharmacological activity. By the genotypic phylogeny study, all of *Lactobacillus* strains may fall under the same ancestral category but varies in the biochemical and physiological activities. This indicates that newly discovered strain of *Lactobacillus* may come with new pharmacological activity against different diseases. The whole genomic sequencing of newly discovered culture highlights the potential of the strain as a functional food in treating many dreadful disorders of the intestine. The positive interaction seen in all the above cases is mediated by means of the antagonistic activity of these probiotics.

Currently, in the market, there is a need for such nutraceutical products which may provide health benefits. Mostly the world is suffering from dreadful diseases like cancer. There are various types of cancer cases, in which colon cancer ranks third in India. The prophylaxis measures available for cancerous diseases are nearly zero as the etiology of the disease is unknown. However, the probiotics are proven useful in treating the diseases of the gastrointestinal tract such as diarrhoea and minor infection or

manifestation by the pathogenic strains. Improper bowel habit is found responsible for causing the disease called adenomatous carcinoma a hybrid type of colorectal cancer. This gives the major clue that the *Lactobacillus* may be used as the major source to heal any kind of the disease including colonic cancer. Thus, probiotics especially *Lactobacillus* from different sources with formulation may act as functional nutraceutical mediators to heal diseases like cancer in future.

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