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Mini Review

A Review on Relationship between Probiotics and Gastrointestinal Diseases

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ABSTRACT

Probiotics are non-pathogenic bacteria that, when consumed, have a beneficial effect on the host's health or physiology. They can have a direct or indirect impact on intestinal physiology by modulating the endogenous environment or immune system. They are made up of yeast or bacteria, particularly lactic acid bacteria. Probiotic microorganisms have been discovered to be useful in the treatment of gastrointestinal problems. From the mouth to the anus, Gastrointestinal (GI) illnesses affect the GI tract. The gastrointestinal microflora has also been suggested to be involved in the pathogenesis of inflammatory bowel diseases in genetically predisposed subjects with immunological dysregulation. Enterotoxinogenic *E. coli*, salmonellae and shigellae account for about 80% of cases with an identified pathogen in acute diarrhoea. Irritable bowel disease is made up of two primary components: Crohn's disease and ulcerative colitis. The mucosal immune system's initial line of defence is a polarised single layer of epithelial cells covered by a mucus biofilm generated by goblet cells with bacteria intermingled. Microbicidal action is seen in all forms of defensins, and some also have activity against fungi and viruses. Understanding the virulence pathways that are common among important pathogens could lead to novel techniques for making bacteria more sensitive to the immune system's antibacterial arsenal.

Keywords: defensins, diarrhea, microorganism.

INTRODUCTION

The intestine is home to a rich and dynamic microbial environment that serves a variety of purposes. Metabolic activities, trophic effects on the intestinal epithelium, and interactions with the host's immune system are among the functions. The local microflora also acts as a barrier, preventing opportunistic and harmful microbes from colonising [1]. The Gastrointestinal (GI) tract, which runs from the mouth to the anus, is affected by gastrointestinal illnesses. There are two categories of gastrointestinal disorders: a) Functional-Those in which the GI tract appears normal but does not move properly when checked. They are the most frequent gastrointestinal issues (including the colon and rectum). Common symptoms include constipation, Irritable Bowel Syndrome (IBS), nausea, food poisoning, gas, bloating, and diarrhoea. b) Structural-Those in which the gut seems aberrant on examination and does not function properly. Surgical removal of the

structural anomaly is sometimes required. Strictures, stenosis, haemorrhoids, diverticular disease, colon polyps, colon cancer, and inflammatory bowel disease are all instances of structural GI illnesses [2].

An increasing data suggest that eating probioticrich foods is beneficial to one's health. An expert group has classified probiotics as "live bacteria that impart a health benefit on the host when provided in suitable proportions" [3]. They are made up of yeast or bacteria, particularly lactic acid bacteria. The method they operate in the gastrointestinal tract and the effects they have vary according to the strain. Through modification of the endogenous flora or the immune system, probiotics can have direct or indirect effects. Many health claims have been made about probiotics, particularly about their ability to prevent or treat digestive problems; Only a few probiotic strains, on the other hand, have been demonstrated to be effective in randomised placebo-controlled clinical trials [4]. Probiotics are also said to affect the host's immune response by competing with pathogens for microbial adhesion sites. Strains of *Streptococcus, Escherichia coli, Bacillus,* and *Saccharomyces* are among the less usually utilised probiotic bacteria. Streptococcus thermophilus has been used in probiotics to help lactose-intolerant people digest their food [5]. In babies, non-pathogenic *E. coli* strains have been demonstrated to suppress invasive *E. coli* adhesion and proliferation, as well as prevent microbial pathogen colonisation of the intestines. The quality of the many probiotic strains varies, and they each have a unique mechanism for preventing gastrointestinal illnesses.

INFLAMMATORY BOWEL DISEASES

In genetically predisposed people with immunological dysregulation, the gastrointestinal microbiota has been implicated in the aetiology of inflammatory bowel disorders [6]. Irritable bowel disease is made up of two primary components: Crohn's disease and ulcerative colitis. Crohn's disease is a recurrent inflammatory illness that mostly affects the gastrointestinal tract. Symptoms include stomach pain, fever, and clinical symptoms of bowel obstruction or diarrhoea with blood or mucus passing, or both [7]. The mucosal immune system's initial line of defence is a polarised single layer of epithelial cells covered by a mucus biofilm generated by goblet cells with bacteria intermingled. In patients with Crohn's disease, decreased expression of the mucin gene MUC1 in the inflamed terminal ileum shows that mucin cover is insufficient [8]. According to research, Crohn's disease is caused by a disruption in the normal symbiotic mutualism between the intestinal commensal microbiota and the human host [6].

Traditional treatment focuses on altering the host reaction but manipulating the gut microbiota is also a viable alternative. Single-blind research looked at a mixture of three Bifidobacterium species, four Lactobacillus species, and *S. salivarius ssp.* Thermophilus for the prevention of recurrent inflammation following surgery. Patients who received the antibiotic and probiotic combination had a considerably decreased rate of severe endoscopic recurrence [9]. YIT 0168, a Japanese product combining *B. breve*, *B. bifidum*, and *L. acidophilus*, has been studied as a dietary supplement in the treatment of ulcerative colitis.

ACUTE GASTROENTERITIS

In travellers with acute diarrhoea, Enterotoxinogenic *E. coli*, shigellae, and salmonellae account for roughly 80% of cases with an identifiable pathogen. Antibiotic-Associated Diarrhoea (AAD) is caused by a microbial imbalance that causes a decrease in the endogenous

flora, which is usually responsible for colonisation resistance as well as a decrease in the colon's fermentation ability [4]. Prophylaxis with a mixture of Lactobacillus acidophilus, *Bifidobacterium bifidum*, *Lactobacillusbulgaricus*, and *Lactobacillusthermophilus* has been demonstrated to lower the frequency of diarrhoea in Egyptian travellers. Gastroenteritis can be caused by a variety of viral, bacterial, or parasitic diseases, although rotavirus infection is the most common cause in children. Children's probiotic strains have been tested for their capacity to prevent nosocomial diarrhoea. When compared to a placebo, prophylactic usage of Lactobacillus GG has been demonstrated to dramatically lower the risk of rotavirus gastroenteropathy [10].

DEFENSINS AS ANTIMICROBIAL PEPTIDES

All forms of defensins α , β and θ have microbicidal activity against bacteria, and some also have antifungal, antiviral, and antiprotozoal activity. Antimicrobial peptides found in the gastrointestinal tract exhibit activity profiles and expression patterns that are similar to those found in neutrophils and epithelial cells from other organ systems. Mouse paneth cell α -defensins, also known as cryptdins, have microbicidal activity against a variety of bacteria, including E. coli, Staphylococcus aureus, and Salmonella enterica servovar typhimurium, when pH and ionic conditions are tuned (S. typhimurium) [11]. Some defensins can act as intercellular signalling molecules in addition to their antibacterial functions. Cryptdin-3, for example, causes the chemokine interleukin (IL)-8 to be secreted in t84 intestine cells via a mechanism involving the mitogenactivated protein kinase p38 and the transcription factor NFkB [12]. The understanding of defensins and other antimicrobial peptides may have a significant impact on future therapeutic techniques. Understanding the virulence pathways that are common among important pathogens could lead to novel techniques for making bacteria more sensitive to the immune system's antibacterial arsenal.

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