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Short Communication

Role of Human Gut Microbiota in Health and Disease

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In Indian traditional medicinal system-"Ayurveda", it is a popular statement that all diseases have origin in stomach. Ayurveda-means science of long life, designed to promote good health and longevity rather than to fight disease. It is 5,000-year-old system of medicine (1500–1000 BC) when nothing was known about human microbiota, but the prophecy is proving right now. Moreover, later a similar statement by Hippocrates (460–370 B.C.) "All diseases begin in the gut" has opened path to many novel researches these days. According to recent reports Human microbiota includes microbes like archaebacteria, bacteria, fungi and viruses etc. found all over different parts of human body. Majority of the microbial genome, which together shares more than 150 times of human genome, are being found in the human enteric habitat [1].

During co-evolution, human body became the niche for various microbes where along with commensal interaction, many of them developed symbiotic associations with human. Besides *Bacteroidetes* and *Firmicutes*, which are the two major phyla in the gut environment, others include the genus *Clostridia, Bifidobacteria, Cyanobacteria, Actinobacteria, Fusobacteria, Proteobacteria, Verrucomicrobia, Spirochetes* and others. Some of these genus establish their colony just after few days of the infant's birth [2].

Microbes play a very important role in the basic biological processes providing critical biosynthetic pathways which strengthens host metabolic capacity. They benefit host by inhibiting pathogen adhesion to intestinal surfaces, synthesizing unique and specific enzymes that helps in biochemical pathways like producing Short chain fatty acids., synthesizing vitamins like Vit. K and Vit. B and regulation and proper maturation of the immune system.

For instance, Bacteriodes initiate development of the intestinal submucosal capillary network by stimulating Paneth cells in the crypt epithilia to secrete angiogenins [1]. The filamentous form of-the dimorphic fungus, *Candida albicans*, which shows commensal interaction in the gastrointestinal tract of human normally, is fatal for immune-compromised patients, if enters into blood stream [3]. Along with playing crucial roles in regulating and modulating various metabolic reactions and life processes, dysbiosis of gut microbiota also affects the permeability of gut and blood-brain barrier especially in aged population, which increases the chance of age related neurological disorders like Alzheimer's Disease and Parkinson's Disease.

Bacteria secrete Lipopolysaccarides [endotoxins, major component of outer membrane of gram negative bacteria] and amyloids, which enhance the accumulation of Amyloid-beta protein in the gut axis barrier of permeability compromised aged patients. For the treatment of Depression and Epilepsy vagus nerve stimulation has been used and scientists are looking forward to discover such kind of treatment for Alzheimer's too [2].

Some other researchers have claimed that alfa-synuclein, clumps of which cause death of dopaminergic neurons, responsible for causing Parkinson's Disease, is being secreted by gut bacteria in the intestine and it reaches brain via Vagus nerve, a part of gut-brain axis. Micobiota regulates pathway which promotes alfa-synuclein aggregation and it also prevents the clearance of misfolded or insoluble protein aggregates [4]. Recent research [5] has shown that intestinal microbiota interact with the autonomic and central nervous system via diverse pathways including the ENS (Enteric nervous system) and vagal nerve. These authors found that on an average, the abundance of Prevotellaceae in feaces of PD patients was significantly reduced as compared with controls. The relative abundance of Enterobacteriaceae was positively associated with the severity of postural instability and gait difficulty. Thus gut bacteria are also responsible for the occurrence of Parkinson's Disease

[6]. These findings suggest that the intestinal microbiome is altered in PD and is related to motor phenotype. Further studies can elucidate the temporal and causal relationships between gut microbiota and PD and the suitability of the microbiome as a biomarker.

New research findings have proved that microbiota also plays a very important role in degradation and absorption of medicines. The molecule of L-dopa, the medicine for Parkinson's Disease, is broken down by the enzymes produced by the gut bacteria and thus it hinders the availability of drug to the brain. It has been reported that *Enterococcus faecalis* is responsible for degrading L-dopa inside the gut [7].

Thus controlling the population of microbes especially the gut microbiota, using probiotics or other measures would really prove helpful in finding newer scope of treatments for diseases like Depression, Alzheimer's Disease, Parkinson's Disease, Obesity, Epilepsy, Immunological, intestinal and many other disorders.

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