



Gut Microbiome and Human Health



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Introduction

Human microbiota is full of different microbial communities having trillions of microbes, more than 10 times of the human cells, mainly includes thousands of bacterial species with dominance of Firmicutes, Proteobacteria, Bacteroidetes, Euryarchaeota, Actinobacteria, Verrucomicrobia, viruses and fungi. They are partially aerobic and very difficult to culture. Proteomics and genomic studies have revealed some 3000 species of microbes colonizing the gut. The colonization of gut starts through fetus from mother's microbiome and become active on 6th day of the birth of the child, however, it gets internal stability and optimization by 450-500 days of growth. The gut microbiome is affected by nutrition, diet, lifestyle including social contacts and environmental factors. Human genome is estimated to consist of 61000 to 140000 genes while gut microbial genome may contain 1000,000+ genes that influence various functions of human body including the signals to brain and determine the psychological behavior, digestion, and immunity. Gut microbiome secretes vitamin K, B12, neurotransmitter metabolite like dopamine, short chain fatty acids like butyric acid, proteases, carbohydrate-active enzymes that include inhibitors of maltase and sucrases, accounts for 70% of the total immunity, stimulate certain tissues of intestine, lymphatic tissues, capillary density, production of cross-reactive antibodies that prevent infection and invasion by pathogens. The colonization of gut is managed by a combination of various factors like host genetics, local environmental conditions including diet, stress, lifestyle, food, good fatty acids, and interaction with other microbes and antimicrobial agents. We have observed that fiber rich vegetarian diet, particularly regional and seasonal, greatly influence the colonization of the gut to secrete biomolecules that helps the persons suffering from depression to improve. Healthy gut microbes like Bifidobacterium, Faecalibacterium and Coprococcus are known to produce short chain fatty acids from fiber rich diets. These are commonly called as "happy bacteria". For good health and well-being, it is suggested that a person should avoid the use of processed food and gluten containing grains to keep healthy gut microbiome. Social and environmental contacts also influence

the gut microbiome. The gut brain axis consists of bidirectional communication in three major inter-organs signaling; immune, neural, and endocrine linking emotional and cognitive centers of the brain with peripheral intestinal functions. Visceral organs and central nervous system continuously communicate with body's physiological conditions to adapt as required. Trillions of microbes in and on our body regulate gut-brain axis that are connected physiologically and biochemically and may influence the health of each other (Figure 1). Gut is known to contain 500 million neurons that are connected to brain through vagus nerve which sends signals in both directions. Vedic science says that the type of food determines the mood, thinking and behavior of human ("Jaisa Anna Vaisa Man"). Mechanism behind the impact of gut microbiota in neurodevelopment and pathogenesis need to be further investigated. After learning the genetic composition of gut microbiome, the scientists are investigating various cultural techniques to grow healthy bacteria under laboratory conditions to explore the possibilities of their commercial use. Covid-19 pandemic has taught the people to keep their natural immunity as strong as possible which is possible by focusing on healthy gut microbiome. The gut microbe-interaction with pathogens is also very important to keep good health. Various probiotics isolated from gut microbiota are already available as commercial products throughout the world as nutritional supplements and medicines to fight stomach infections and problems [1-7].

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