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Opinion Article

Impact of microbiome in human diseases and health

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DESCRIPTION

The bacteria, archaea, viruses, and eukaryotes that live inside and outside of our bodies make up the human microbiome. These microorganisms have an effect on human physiology in both health and sickness, improving or impairing metabolic and immunological processes. Microbes inhabit a variety of locations on and in the human body, where they adapt to unique characteristics of each niche. While stringent aerobes occupy the respiratory system, nasal cavity, and skin surface, facultative anaerobes are more prevalent in the gastrointestinal tract. Due to their biological interactions with the immune system throughout time, the native species in the human body have developed good immune system tolerances. The causation of disease and the impact on human health of changes in the gut microbial ecology are both significant. These changes are the result of both lifestyle choices and underlying medical conditions. Dysbiosis makes the host more vulnerable to infection, whose type varies on the affected anatomical region. The precise metabolic processes and bodily functions carried out by these microbes at each place of the body are explained by the distinct diversity of the human microbiota. Since the human microbiome influences both health and disease, it is crucial to comprehend its microbial makeup and activity.

A group of organisms that reside in and interact with the human body is referred to as the human microbiota. The varied interactions might be harmful, mutualistic, or commensalist. The genomic makeup of the organisms that live in a specific location in the human body is referred to as the human microbiome. Numerous anatomical body locations, including the skin, mucosa, gastrointestinal system, respiratory tract, urogenital tract, and mammary gland, are colonised by microorganisms. They come together to produce an intricate and distinct ecosystem that adjusts to the climatic circumstances of each niche. Beginning with childbirth, the human body and its natural microbiota begin to regularly interact. The preservation of overall health and welfare depends heavily on these relationships. The microbiota is made up of organisms that actively adapt to their unique habitats and live in their corresponding niches within the human body as a result of coevolution. These organisms are recognised as being a part of the body due to their biological activities, which causes various changes from conception to death. The microbiome of humans is continually changing in reaction to the host.

Disease and human microbiome

Cancer: The host's health is significantly influenced by the gut microbiota. Studies on the interactions between microbial communities and the host reveal that these organisms engage in biochemical processes that affect tumour growth, carcinogenesis, and immune treatment response. An increased risk of colorectal cancer may result from persistent intra-abdominal infections, antimicrobial medications, or both, according to a well-researched model of the elements that may contribute to gut dysbiosis. Additionally, the intestinal cell layer is impacted by end products generated by the gut microbiota, which can promote carcinogenesis or repress tumorigenesis. In addition to colorectal cancer, the intestinal tract's microbiota has been demonstrated to contribute to extraintestinal cancers such hepatocellular carcinoma through the deliberate spread of these microorganisms to other body regions. Additionally, Humans are more likely to get stomach cancer due to pylori. According to recent research on the relationship between the human microbiome and cancer, Fusobacterium and Clostridium are overrepresented in people with stomach cancer. Bacteroides massiliensis has been linked to an increased prevalence of prostate cancer.

Inflammatory bowel disease: An inappropriate immune reaction to body tissues is caused or triggered by the build-up of disease-causing germs. In actuality, this exacerbates autoimmune disorders, intestinal inflammation, and other grave illnesses. A healthy and organised relationship develops

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throughout time as a result of the immune system and the human microbiota coevolving together. But a change in the host's microbiota disrupts this relationship, impairing the immune response and perhaps triggering an inflammatory illness.

Cardiovascular conditions: Based on research demonstrating the microbial conversion of dietary phosphatidylcholine into the proatherosclerotic metabolite trimethylamine-N-oxide, there is growing interest in a connection between microbiota and cardiovascular disease (TMAO). Recent research on healthy individuals challenged with dietary phosphatidylcholine revealed elevated plasma levels of TMAO that were previously reduced by antibiotic therapy. Additionally, they discovered that among patients with cardiovascular disease risk factors, plasma TMAO levels were linked to an increased risk for cardiovascular events. In a different study, the same team demonstrated that healthy human volunteers who followed vegan diets did not exhibit elevated plasma TMAO levels after dietary phosphatidylcholine challenge, in contrast to those who did. This characteristic was linked to particular faecal microbiota compositional states. Therefore, this microbiota-dependent route, which may have diagnostic and therapeutic potential for cardiovascular disease, is of great interest.