BENEFICIAL INTERACTIONS BETWEEN THE MICROBIOTA AND THE HOST INCREASE IMMUNITY FOR A BETTER RESPONSE TO TREATMENT OF CANCER PATIENTS

Burgos-Molina AM[1], González-Vidal A[2], Mercado-Sáenz S[3], Alamilla-Presuel JC[2], Ruiz-Gómez MJ[2]

[1]Departamento de Especialidades Quirúrgicas, Bioquímica e Inmunología. [2]Departamento de Radiología y Medicina Física. [3]Departamento de Fisiología Humana, Histología Humana, Anatomía Patológica y Educación Físico Deportiva
Facultad de Medicina. Universidad de Málaga. Málaga, Spain

Introduction

The gut microbiota can have a beneficial or detrimental influence on the health of the host. Under healthy conditions, microorganisms do not exert pathogenic effects. Nevertheless, in certain situations, the establishment of some bacteria in unusual regions of the body or the massive increment in the title of bacteria in normal locations, give rise to diseases, such as obesity, diabetes, inflammatory bowel disease or colon cancer. This imbalance produced in the intestinal microbiota is known as dysbiosis. Microbiota has numerous benefits on the host's health.

Objectives

This work aims to summarize the beneficial interactions between microbiota and host for a better response of cancer patients to treatments.

Methods

A revision of the literature about microbiota, host, immunity, interactions, cancer, etc., was made using the main databases, pubmed and scopus.

Results

Intestinal microorganisms are responsible for obtaining nutrients from substances that cannot be metabolized by the host. They can generate energy by the fermentation of proteins and carbohydrates and the absorption of short chain fatty acids. These processes are used by both, the microbiota and the host and contribute in the maintaining of the microorganism's proliferation. Several studies have shown the implication of these microorganisms in improving the absorption of water and other essential metabolites, in addition to being able to metabolize numerous plant polysaccharides and produce vitamins such as vitamins K and B. The differentiation of epithelial cells is influenced by the interaction of microorganisms and their metabolic products, especially with short-chain fatty acids. Some of the most important compounds are butyrate, which inhibits the intestinal cancer cells, and acetate, which is used by cardiac and skeletal muscles for energy. The intestinal microbiota acts as a barrier, preventing the colonization of the epithelium by pathogenic populations. Bacteria compete to adhere to epithelial cells, and also produce bacteriolysins, synthesize metabolic products, and therefore by these processes establish inhibitory conditions of low pH and the consumption of essential nutrients. Basal gut bacteria can avoid the establishment of pathogens in the host epithelium by the expression of glycoconjugates, used as receptors to fix pathogenic microorganisms. They also produce immunoglobulins (IgAs), preventing the colonization of the gastrointestinal tract in healthy hosts. The protective functions are completed with the intestinal mucosa-associated lymphoid system (GALT), considered the most extensive immune organ in the human body. Bacterial colonization directly affects the composition of the lymphoid system, since after infection, the number of lymphocytes increases significantly and a greater number of immunoglobulins is synthesized. The tolerance of the immune system to some antigens avoids an excessive immune response. The reason is the presence of peptidoglycan in the cell wall of gram positive and negative bacteria, which permits the activation of non-specific immunity. Colonization of the intestine by the intestinal microbiota plays a fundamental role in the maturation and development of the immune system. The immune system must distinguish between self-microorganisms and potential pathogens. The structural components of bacteria and viruses are recognized by the innate immune system through the so-called Toll-like receptors (TLR). The activation of the innate immune system generates signals that are translated into the activation of the genes responsible for the synthesis of pro-inflammatory proteins, such as cytokines. In addition, signals emitted by epithelial cells attract and activate leukocytes, and increase blood flow and capillary permeability. Another important factors in the innate immune system are enterocytes. These cells play a fundamental role in the generation of signals after recognizing the different antigens present in microorganisms. Moreover, acting as antigen presenting cells allow their participation in the acquired immunity. Moreover, the acquired immune system induces the massive formation of T lymphocytes (T1, T2 and CD4). This process takes place thanks to the recognition of antigens by specialized cells, which induce the massive proliferation of lymphocytes. Among them, the CD4 lymphocytes stand out, whose role is fundamental in immunotolerance, since they secrete regulatory cytokines of an anti-inflammatory nature. These processes allow the continuous exposure to a huge antigenic load, without triggering inflammatory reactions that could damage the host.

Conclusions

Numerous beneficial interactions between microbiota and host contribute to produce nutrients, metabolites, immunoglobulins and an increase in lymphocytes. The correct colonization of the intestine by microbiota induces a correct maturation and development of the immune system and hence a better response of patients to treatment.