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Effects of Light on Beneficial Microbes in Humans and their Importance

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Abstract: Age, diet, ecology... The composition of the intestinal microbiota is influenced by many factors, and even exposure to solar radiation, namely ultraviolet type B, is one of these factors.

Keywords: ultraviolet B, microbiota, Radiation, electron twins, atomic nucleus, immune system.

The intensity of exposure to ultraviolet B (UVB) radiation depends on a number of natural factors, including latitude, altitude, weather conditions, time of day and season, with human behavior and lifestyle also playing an indirect role. In a recent study conducted in Vancouver, Canada, women were artificially exposed to UVB radiation. UVB radiation was shown to increase the diversity and richness of the gut microbiota, promoting good health.

The scientists repeated their study on Brazilians, whose living conditions and lifestyles are very different from those of Canadian women. They compared the gut microbiota of urban Canadians with that of various hunter-gatherer tribes, including the Yanomami , an ethnic group living in the Amazon region near the equator, who are highly exposed to solar radiation that is not blocked by pollution or wearing clothing and sunscreen.

As in Canadian women, UVB exposure appears to influence the gut microbiota of Yanomami Indians . The study showed a greater diversity of microbiota, an increase in the number of bacteria of the Firmicutes and Proteobacteria types , and a decrease in the number of bacteria of the Bacteroidetes type , compared with the composition of the microbiota of urban residents. The researchers speculate that the cause may be high exposure to UV radiation due to the lifestyle of the Yanomami Indians and the unique environmental conditions in which they live.

You've probably heard about “intestinal flora” more than once. Scientifically, it is called “gut microbiota” or “intestinal microbiota”. It consists [1] of trillions of microorganisms that live in the intestines, such as bacteria, viruses, fungi (including yeast) and even parasites. Each of us has our own unique microbiota, as unique as, for example, fingerprints. [1] When we are born, fecal and vaginal microorganisms transmitted from the mother during vaginal birth, or microorganisms from the environment (in the case of cesarean section) [3] begin to colonize the intestines, forming the microbiota. [4]

During approximately the first three years of life, the intestinal microbiota forms, becomes more diverse and stabilizes. [5] After reaching adulthood, its composition remains relatively stable until old age,6 when it again undergoes profound changes, but for the worse.[7]

By the way, the words “microbiota” and “ microbiome ” are often used interchangeably, but they have different meanings. The term “microbiota” is used when we are talking about microorganisms and their species, that is, it answers the question “who is there?” And the “ microbiome ” is the genome of these microorganisms, what is contained inside them; this term answers the question [2] “what happens in these microorganisms?”, in the sense of their functioning.

The study authors believe that ultraviolet radiation, both natural and artificial, should be considered as a factor that can influence the composition of the human intestinal microbiota. They concluded that a more in-depth study that takes into account latitude and therefore sun exposure could shed new light on the relationship between humans, their health, their gut microbiota and the environment.

The human microbe plays an important role in ensuring the normal functioning of the body. It protects against pathogens, supports immunity, is involved in food digestion and ensures the production of important nutritional components. The diversity and abundance of human microbial composition changes under the influence of various environmental factors and conditions residence, gender and age, as well as the appearance of various pathological conditions.

The article presents current data on the role of nutrition in changing intestinal microbial biodiversity, which plays a key role in the pathogenesis of many diseases.

In order to present data on the relationship between dietary patterns and the composition of the intestinal microbiome , an assessment of the potential changes in the qualitative and quantitative composition of the human intestinal microflora when consuming food products is shown.

prebiotics and probiotics obtained using biotechnological techniques in the modern theory and practice of adequate nutrition to maintain the human intestinal microbiome is considered .

Among the numerous environmental factors, nutrition is one of the most important, constantly, purposefully and diversely influencing the human body. The science of nutritionology deals with the comprehensive study of nutrition [1]. This is the most multi-disciplinary science, which includes chemistry, physics, biology, medicine, mathematics, computer science, new areas of knowledge - genomics, proteomics, metabolomics , genetics..., politics. No other science has such a range of possibilities.

Proper nutrition is the most important factor in health and longevity. And health is the greatest value of human life. Everything that makes our life full and happy depends on our state of health: quality of life, its duration, physical activity, and even competitive advantages in the labor market and education.

An analysis of the scientific literature shows the growing interest of scientists from all countries in a more detailed study of the relationship between human health, nutrition and the state of the intestinal microflora [2]-[4]. Until recently, the world of the microbiome remained little studied. As is often the case with scientific discoveries, the data obtained are misinterpreted or erroneous conclusions are drawn from them. The lack of understanding of the role of the microbiome stems from the fact that until recently scientists did not have the opportunity to study the microbes living inside humans. Microbiome is a collection of microorganisms (bacteria, viruses, fungi and archaebacteria) living inside a person and on the surface of his skin. Microbiota is a term that is used to characterize the microbiocenosis of individual organs and systems (for example, the microbiota of the intestine, skin, placenta, breast milk, oral cavity, respiratory tract, genitourinary system, etc.).

“The human body is a complex superorganism , a symbiotic community of numerous eukaryotic , prokaryotic cells, viruses and archbacteria . The metagenome of this superorganism consists of the genes of Homo sapiens itself and the genes present in the genomes of microorganisms that colonize its body” [5].

The human-associated microbiota consists of at least 40,000 bacterial strains in 1800 genera, which contain up to 10 million non-human genes [6]. The human biological environment is variable and is represented by various types of microorganisms that inhabit all ecological niches of the body. At the species and strain level, microbial divergence between individuals is quite significant: each individual has a distinct pattern of bacterial composition, determined in part by their genotype, initial colonization at birth through vertical transmission, and dietary habits. If the composition of the microflora of people is very similar, it means that they are close relatives, that is, the microflora have a family resemblance [6, 7]. The main factors influencing changes in the qualitative and quantitative composition of the human microbiota: physiological status of a person, gender, lifestyle, including nutrition, bad habits, place of residence, ethnicity, diseases, medications, environmental and professional factors, etc. Weight of the microbiome mainly depends on a person’s body weight and ranges from 1.2 to 3.5 kg.

In recent years, we have begun to realize that most everything we eat affects the microbes that live in our bodies, which in turn affects us. What we eat in one meal can change our microbiome composition within 24 hours [8, 9].

Many microorganisms help us digest food, strengthen the immune system, “turn on” and “turn off” our genes, and are interested in the survival of their host (Table 1). The microbiome regulates many vital processes of the body and even influences human behavior and thinking, and is a necessary ally in the fight against disease [9, 10].

In the context of globalization, migration and urbanization of the population, dietary changes occur without proper adaptation of the intestinal microbiome . Intestinal microflora is included in the list of possible risk factors for a number of diseases; scientists and doctors note, in the presence of a particular disease, primarily problems with digestion [11, 12, 13, 14]. The diversity of the intestinal microbiota programs both the healthy functioning of the body’s organs and systems and the risks of somatic diseases. As the disease develops, “bad” bacteria become abundant and the presence of “good” bacteria sharply decreases. New research data are emerging on the relationship between the composition of the microbiota and various pathologies, such as inflammatory bowel diseases, obesity, cardiovascular, autoimmune and allergic diseases. Currently, there is a lot of indisputable evidence that the intestinal microbiota plays a key role in the pathogenesis of many diseases. Microbiome analysis makes it possible to diagnose diseases and predict their occurrence. Medicines existing today are not able to predictably change the microflora. The gut microbiota is a potential target for improving human health, and nutritional components (both micro- and macronutrients) are recognized to play an important role.

The gut is connected to the entire immune system, so the microbes that live in the human body shape immune responses as a whole. The immune system makes, for example, the following decisions: how to respond to the invasion of pathogens; how autoimmune diseases will arise and develop; which types of microbes will be destroyed and which will remain as part of the microflora. Some microbiome researchers have even proposed giving the immune system a new name that would reflect its true role: the “microbe interacting system.”

That is, the quality of life and its duration depend on the microbes that live in us. As Hiromi said Shinya, a famous Japanese doctor, gastroenterologist and surgeon, author of several best-selling books on a healthy lifestyle: “We lost the war against bad bacteria that we waged throughout the 20th century! And the only way to improve and prevent your body is to properly feed the friendly bacteria of your own microbiome” [15].

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