MICROBIOME, IMMUNITY, AND CORONAVIRUS

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ABSTRACT

Structural changes in thalamus neuropil after feeding animals with extrusion foods were demonstrated in experiments on 14 Wistar rats. A comparison of these data with previously obtained results on the imbalance of intestinal microflora in similar experiments was the basis for arguing the hypothesis on the key importance of functional state of microbiome of a living organism for effective implementation of immunity and protective reactions. Thus, along with development of COVID-19 vaccine and the search for treatment methods, it is advisable to intensify studies aimed at more efficient use of untapped potential of microbiota in each patient to activate the body's protective reactions in order to resist coronavirus infection more effectively.

INTRODUCTION

There is an ongoing struggle for survival inside the microbial community. By the way, the same as in the thousand-year history of nature and human society development. The observation and intelligence of people allowed using some relationships among microbes to treat various diseases. The one can just mention the name of Alexander Fleming, and instantly thoughts arise about the talented use of secretory substances Penicilliumnotatum to inhibit reproduction of Staphylococcus. This idea is being developed along with new solutions and technologies [1]. A huge number of human lives have been saved thanks to one of the laws invented by nature and skillfully used by people in medical practice.

Going further, we turn to relationships between microbes both with each other and the human body. At present, the axiom is substantiated that human life actually depends on the functional state of microbiome [2-7]. It is known that human microbiome includes representatives of three domains –Bacteria, Archaea, and Eukarya, and the kingdom of Virae. Given the relevance of modern topics with the declared pandemic, we note that RNA of Coronaviridae representatives are often found on human skin and mucous membranes during microbiological examinations. So, the fact is that the human body (skin, oral cavity, airways, gastrointestinal tract, feces) contains a wide variety of harmful and non-harmful microorganisms, and their number significantly exceeds the number of living cells in the human body [8]. If this quantitative fact becomes the property of modern journalists and deputies, some of them will impulsively raise the issue of non-compliance with democracy, when the majority (microbes) are subordinate to the minority (cells of the human body). Scientists, in the aspect of the problem under consideration, from this seemingly absurd dilemma, conclude that it is impossible to effectively maintain the viability of the human body without taking into account significance of the “opinion” of all elements of a multicellular organism. Isn’t it a democratic approach to situations in everyday life? So, the “opinion” and capabilities of all elements of a living organism, including microbiome, are always worth considering. After all, if you do not know thoroughly what microbes are capable of in the human and animal body, then in fact at any time you should expect the development of unforeseen situation. In addition, this situation is developing now. Humanity is experiencing another pandemic.

METHODOLOGY

Paradoxically, but the ultramicroscopic virus COVID-19 cannot be dealt with in any country in the world. Moreover, the research results indicate neurotropism and neuroinvasion of coronaviruses [9], which complicates the development of universal and effective vaccines and therapeutic agents. Once again, we recall that humanity is constantly in contact with the
kingdom of viruses, starting from the first days of life [10,11]. It was found that the membrane protein ACE2, which is a catalyst for transformation of angiotensins [10, 11], has an affinity for S-glycoproteins of coronaviruses, including SARS-CoV and SARS-CoV-2 viruses [10, 11]. Therefore, one of the unique “gates” in the cell membrane was verified for the penetration of coronavirus into the cytoplasm of human living cells. Moreover, it was demonstrated that SARS-CoV-2 is able to suppress ACE2 activity, which is accompanied by excessive accumulation of angiotensin II, which causes development of acute respiratory distress syndrome and myocarditis [12].

Precision sequencing methods are proposed for faster diagnostics [13], as well as other complex diagnostic and therapeutic techniques, but not all this is yet a guarantee of success in the early diagnosis and treatment of patients. However, the instantly developing suppression of immunity in the course of COVID-19 disease often reduces to zero the chances of patients to successfully confront the infection.

We suggest turning again to the analysis of observations of Alexander Fleming in order to try to find a “golden bullet” filled with microbes that are harmless to patients but capable of blocking the pathological processes associated with COVID-19 coronavirus. Ideally, these will be able to destroy COVID-19 coronaviruses. Hypothetically, these microorganisms are waiting for the high point, living in obscurity among the cells of a human microbiome. The authors have repeatedly expressed the idea that the microbiome and, in particular, intestinal microbiota of each person act as original modulators of all physiological and pathophysiological processes that are associated with the cells of organs and functional systems of a living organism [2-7]. That is, not only the body has a neurohumoral effect on microenvironment where microbiota is located, but also the totality of microbiota microbes has both functional and, under certain conditions, pathological influence on the whole organism [2-7, 14, 15]. In order to confirm this point of view, a search project was conducted at the Brain Center of the Institute of Physiology of the NAS of Belarus, aimed at comparing the structural features in various parts of the brain of laboratory animals with changes in composition of intestinal microbiota in these animals [2]. One group of Wistar rats (n=7) weighing 230-250 grams was transferred to a diet of extrusion food for two weeks. The second group of rats (n=7) with the same body weight continued on a standard diet. Both groups had ad libitum access to water. All experiments were carried out in accordance with the Protocol of the Ethics Committee of the Institute of Physiology of the National Academy of Sciences of Belarus. Figure 1 shows usual neuropil at the level of thalamus in rat, which was on a standard diet for two weeks (on the left), and the picture with destroyed neurons and microglia in the same region of the brain in rat, which was fed with extrusion products for two weeks (on the right). Frozen brain sections were stained with hematoxylin and eosin according to the protocol (http://www.ihcworld.com/_protocols/special_stains/h&e_elis.htm). Previous experiments showed disturbances in the balance of main groups of microorganisms in intestinal microflora in rats after feeding with extrusion products [2].

CONCLUSION

It is advisable to maximize the use of all well-reasoned methods of fighting infection in the era of the COVID-19 coronavirus pandemic. It is necessary to use, in addition to developed and applied methods of treatment, protective reactions of human body verified in the process of natural selection in wildlife when planning preventive and therapeutic measures [19]. Even the paradoxical discoveries of unexplored
antagonistic relationships between viruses, for example, herpes simplex [20], which has coexisted with humanity for thousands of years, and the coronavirus COVID-19, are real among such defensive reactions. The ingenious Fyodor Dostoyevsky was right when he stated that there should be unity in man — both Soul and Body [21].

References


