The Role and Restoration of the Symbiosis of Microbiome and Human Body

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Authors:

PÉTER FRITZ DR. HABIL. associate professor - Miskolci Egyetem pfritz@hotmail.hu
Scientific activity: supervisor in doctoral school,
Main areas of research: sports nutrition, recreation

BÓDAY ÁDÁM JÁNOS (MSC) Herbaferm Kft. - aboday@herbaferm.hu
Scientific activity: interdisciplinary nutritional physiology research,
Main scope of research: Natural development of microbiome, natural microbial symbioses and the process of microbiome rebiosis; the effect of microbial guilds in food and waters on digestion and immunity; microbial signals, marker molecules and the physiological reflexes evoked by them

Abstract: The health and the physiologic processes of the human body are in correlation with the quality of the microbiome-human cohabitance. The symbiotic microbes are promoting the adaptation processes to the environment, they co-operate in the development and sustaining of natural immunity. The microbes are playing a critical role in the operation of the largest neuro-endocrine organ – the gastrointestinal system. The significance of this mutual dependence on the ecosystem of men and the microbiome has become the focus of scientific research. More and more scientific study deals with the artificial supplementation of the healthy microbiome recently. There is an emerging need to advert our attention to the natural sources of the healthy microbiome, in order to understand the underlying principles of the ecosystem of men and microbes.

The totality of the billions of microbes living in and on us, that is, the microbiota, and their genetic material called microbiome, has recently become a hit theme. Scientific literature has been investigating this (re)discovered system at full throttle.

The coexistence of humans and their microbes works as an ecosystem, and the co-operation of their complex symbiosis forms the status of the superorganism (Rodney D. 2016.)[i]. Our genetic characteristics, lifestyle and environment as a whole characterize the qualities of coexistence with microbes, our state of health, and quality of life. Of the microbes, the simplest prokaryotes conquered planet Earth 3 and a half billion years ago. They inhabited every corner of the planet, adapting to even the most extreme environmental conditions. With their metabolic products and life activities, they ensured the conditions for the spread of higher life forms (eukaryotes, multicellular organisms). As is well known, even the oxygen content of our planet's atmosphere is there thanks to the simplest photosynthesizing microorganisms.

The flexibility of microbes is marvelous which is well characterized by their extremely fast growth (as compared to us). For example, under favorable conditions, a yeast cell can double every half hour. This also means that in ideal conditions more than 10,000 generations (microbial lifetime) will develop in one year.

According to epigenetic research (Verhoeven et al., 2016)[ii], the genetic stock adapts to changes in environmental conditions in 2-4 generations. Measured on a human scale, this would take 50 to 100 years, while for yeast, an interval between 9 and 11 a.m. is enough. The presence and dominance of microbes is already getting clearly visible to us, and the connections unfold before our eyes as we examine the flaws in our people-centered worldview.

The composition, quantitative and qualitative parameters of the microbiome have been identified for almost all known NCD diseases, and the measurement and statistical analysis of the correlations are constantly revealing new physiological relationships. With this body of knowledge, we can make a hypothesis that provides a comprehensive picture of microbes and their hosts.

Humans adapt to the environment and their metabolism through microscopically sized communities (which are present always and in all habitats). Metabolism occurs through intimate contact with the environment, air, water, and food. Since microorganisms are present in all three elements of the environment, the human body has evolved and still functions to interact with them in this material flow. The processes of coexistence ensure a lasting and healthy relationship between humans and their microbiomes and the flowering of the superorganism's ecosystem by maintaining a balance of several factors. The first of these is protection. The presence of environmental microbes is detected by various sensory organs and receptors in the body (Buffie, C. G. et al. 2013)[iii]. Microbes and their metabolites, as key stimuli, trigger the production and delivery of non-specific, self-produced antibiotics to the surface of the body area affected by microbes such as the nasal cavity, the oral cavity, the skin, the lungs and of course the gastrointestinal mucosa.

We also take care of the microbes living in symbiosis with us, as our body fluids and secretions contain substances that protect and nourish the symbiontic microbes. In return, they are also involved (partly in self-defense) in controlling environmental microbes by producing special antibacterial agents. An example is hydrogen peroxide produced by environmental Streptococcus species that make up the oral flora, which produces a broad-spectrum hypothiocyanate (Wertz and de Szalay, 2020)[iv] from thiocyanate in the saliva using the lactoperoxidase system, thus effectively protecting the soft and hard parts of the oral cavity from hostile microbial colonization, also known as caries, inflammation, pathogenic organisms.

Environmental microbes and their metabolites also determine the process of nutrient breakdown and digestive processes. By sensing microbial metabolites (e.g., short-chain fatty acids, SCFAs) (by nasal chemoreceptors), the tuning and fine-tuning of the digestive program that supports the breakdown of a given food takes place in a reflex-like manner. The composition of saliva, gastric mucin, pancreatic fluid, and intestinal micin and saliva, the quality and quantity of their enzymes and antimicrobial substances change under the influence of this environmental stimulus, and the intensity of intestinal motility also becomes optimized as a result of the above mechanisms.

Among the microbes ingested with food and water, a significant number of soil-derived species are also present, and play a very important role in the digestive processes of our body. As breakdown organisms, they support the breakdown of foods for which our body does not have digestive enzymes. Just think of the process of fiber digestion. Foods and fibers that enter the body and are indigestible to the human body are broken down by the microorganisms that make up the colonic

flora, and many of the very important and crucial nutrients (such as short-chain fatty acids, essential amino acids), vitamins (e.g., biotin, cobalamin, folates, nicotinic acid, pantothenic acid, pyridoxine, riboflavin, thiamine (Hill, 1997)), modified bile acid (deoxycholic acid), hormones, neurotransmitters and signaling compounds (serotonin, cortisol, adrenaline, GABA, acetylcholine) are produced for the superorganism. (Clarke et al, 2014.)[v,vi]

In view of the above, the ecosystem of the host and the microbial community that populates it develops through continuous contact with the environment, and the environment remains a natural source of its maintenance. The microorganisms that come into contact with our body through water and food maintain a continuous action/reaction relationship, ensuring adaptation to environmental conditions.

Currently, the war on pathogenic microbes and the release of synthetic materials into the environment (water, food and hygiene products) have damaged the ecosystem of microbial communities, significantly reducing their quantity and diversity. Due to the decreased quality of the relationship between the environment and microbes due to our modern, civilized lifestyle and eating habits, our body is unable to replace the beneficial symbiontic microorganisms.

In order to restore the microbial ecosystem, in the interest of rebiosis, it seems necessary to override our way of life, our habits, so that we can re-establish the natural relationship and maintain the diverse symbiotic coexistence of our microbes.

The consumption of natural waters and food, a moderate mixed diet, proper exercise, restful and circadian rhythm-adapted sleep are the basic conditions for restoring the balance of our body and the microbes that populate it. And we can ensure contact with mixed and diverse microbial communities in our natural environment, protected from human activity as far as possible, during our social relationships and by consuming healthy food and water. As a source of microbes, it is necessary to mention the role of quality herbs, plants grown under organic conditions, and our pets, and it is also worth recalling the traditions of the pre-refrigerator times – processing and consuming foods made according to our grandparents' recipes including classic foods conserved by pickling.

There are traditional fermented foods and some new dietary supplements containing fermented plant extracts that contain adequately low concentrations of natural microbial ecosystems that are rich in species but balanced and are able to provide regular contact with microbes through regular consumption, supplementing our quasi-sterile diet with important symbiontic microbes from nature.

Abbreviations

NCD – non-communicable diseases, a common name for non-infectious diseases that spread similarly to an epidemic

SCFA – short chain fatty acids

GABA – gamma-aminobutyric acid

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