

ABSTRACT

The significance of the microbiome for overweight and obesity

While food selection and quantity are important, the way food interacts with intestinal bacteria also plays a key role

Prof. Dr. med. Christian Sina and Dr. med. Torsten Schröder,
Institut für Ernährungsmedizin, Universitätsklinikum
Schleswig-Holstein, Lübeck campus

The billions of bacteria, viruses and fungi on the skin, in the nose, in the mouth, in the entire gastrointestinal tract and on all other body surfaces form the microbiome. It is unique – we each have our own “microbial fingerprint” – and it is an active part of our lives. The intestinal microbiome, for example, also determines our body weight, the likelihood that we will become ill or what our mood is like. Current data is increasingly enabling us to understand the individuality of the risk of disease and to develop personalised strategies for therapy.

SIGNIFICANCE OF THE INTESTINAL MICROBIOME

There is a wide degree of variation in the individual risk of developing a metabolic disease. So far, it has been attempted to explain this difference in terms of the differences in people’s genetic repertoire. However, more recent research has impressively shown that the intestinal microbiome plays an important role in the relationships between nutrition, metabolism and health and presumably exceeds the influence of genes. The intestinal microbiome is thus an essential determinant of metabolic health. It is fundamental for digestion, given that we rely on bacterially coded enzymes to be able to process components of food that are not easily digestible.

DIVERSITY OF THE MICROBIOME

A high degree of diversity of intestinal microbiota generally indicates that the intestine colonised by the bacteria is healthy. A decrease in diversity is a sign of poor colonisation. Numerous chronic diseases are associated with a reduction in bacterial diversity.

One possible explanation is that a diverse microbiome can react faster, and probably also more adequately, to changing environmental conditions. It has been consistently observed that microbial diversity as an expression of a modern living environment is diminishing in the context of industrialisation.

INFLUENCE ON BODY WEIGHT

Although overweight and obesity have so far been primarily considered expressions of an individual’s chosen lifestyle and/or genetic disposition, studies are increasingly finding that the composition of the intestinal microbiome shows significant differences between normal and overweight/obese individuals. While food selection and quantity are important, the way food interacts with intestinal bacteria also plays a key role. In studies where microbiomes were transferred to mice that had been born and kept in a sterile environment, it was found that the animals that received the microbiome from obese humans gained more body weight than those receiving the microbiome from slender humans. In addition, the microbiome of the obese mice made more energy from the food available to the host. Further studies have shown an impact on insulin resistance, metabolic inflammation and visceral fat storage. Reductions in body weight also lead to changes in the microbiome. Studies recently published have shown that the dominance of certain bacterial genera enables us to make predictions about how successful a diet will be.

PERSONALISATION STRATEGIES

As an alternative to genetic analyses, for which there is still too little evidence, the determination of the microbiome could play a role in successful personalisation strategies for nutrition. For example, it is deemed certain that postprandial changes in blood glucose levels vary greatly between subjects. Along with various clinical parameters, this largely depends on the composition of the microbiome. Existing research indicates that the microbiome influences its host’s body functions by producing metabolites such as short-chain fatty acids and amino acids. Documenting these will also be important for developing personalised dietary recommendations.