

Undernutrition is a condition in which the body does not receive nutrients in sufficient quantities. Lack of energy, micro- and macroelements causes growth inhibition and changes in the body's physiology. We know that when diet changes, there are also drastic changes in the gut microbiota. What we eat is also food for our intestinal microbiota, and if certain ingredients are suddenly missing, these bacteria cannot grow either. Others, less demanding, take advantage of the situation and multiply in place of the extinct ones. Interestingly, a large part of bacteria is able to adapt to changing conditions through changes in their surface structure or metabolism. In chronically malnourished people, the number of pathogenic (unfavorable) bacteria of the genus *Salmonella*, *Shigella* and *Klebsiella* increases and the number of commensal (beneficial) bacteria of the genus *Faecalibacterium*, *Prevotella* and *Lactobacillus* decreases. As commensal bacteria help in digestion and produce the compounds we need such as vitamins, changes in their composition further worsen the patient's condition. We know little about how changes occur in the microbiota of undernourished people. From a physiological point of view, a number of pathologies occur in the undernourished intestine. The pH in the small intestine increases, as well as the production of bile acids, and the intestinal villi shorten and widen. How do these changes affect the bacteria that inhabit us? How do bacteria respond to these changes? In response, are bacteria able to actively modulate the intestinal environment?

In my project, I would like to investigate how sudden changes in diet, such as lack of vitamin A, iron and changes in the intestinal environment in the form of increased production of bile acids, affect bacteria important in malnutrition. Particularly important for me is to investigate how changing conditions affect the production of bacterial cell vesicles, which have recently gained fame in the scientific world as universal transmitters of information. Bacterial cell vesicles are spherical bacterial products consisting of the bacterial membrane and proteins, peptidoglycan, and nucleic acids, which are probably "packed" into the vesicles randomly. Bacteria influence what will be in such a vesicle, and these may be, for example, iron-binding proteins or RNA, which can modulate the action of the host's genes. There are sparse data that demonstrate the potential of bacterial cell vesicles to modulate the intestinal environment and these mechanisms are not yet well described in malnutrition.

Why is this research important? Because it concerns every each of us. Undernutrition affects not only people in distant Africa but also people around us, mainly older people, who for various reasons do not have access to nutritious meals. Additionally, undernutrition affects hospital patients, bedridden patients, and people undergoing long-term therapies, e.g. oncological. These are also people on strict and poorly balanced diets. In the future, ongoing research may lead to the creation of early markers of undernutrition and new therapeutic options.