

MICRO LIFE IN THE INTESTINE

"Probiotics", "lacto bacillus", "lactic acid bacteria" and "bifido bacteria" are concepts that are much used in the media when the topic is lactose products or other food products. The issue is "living micro organisms, which given in the right amount, have a positive effect on the health of the receiver." The word "probiotic" derives from the Greek words "pro" and "bios" meaning "promote life". To understand why it makes sense to take probiotics we have to take a closer look at the gut and intestinal system and the microorganisms living there and their tasks.

Historically, we can look back on a long common development between the intestinal bacteria and the human organism. We continuously take in bacteria with the food we eat. Only a few of them survive the passage through the acidic environment in the gut. But after this barrier the intestine and its content offers an excellent growing environment for bacteria. Through a co-evolution a very tight and specialised cooperation between the intestinal bacteria and the human organism has been created, for mutual benefits. Without these small activists a normal and healthy life would not be possible for us.

A total of 10^{14} - 10^{15} bacterial germs live in the human intestines. The so called intestinal flora is individually and gradually developed after the birth and it weighs approximately 700g. Both the absolute germ amount and the amount of species increase towards the large intestine. Also the ratio between aerobe and anaerobe germs changes towards this direction, to the advantage of the anaerobe germs, bacteria that do not tolerate oxygen. In addition, the intestinal flora is divided in the part that is attached to the intestinal wall (resident flora) and the part that moves around freely (luminale flora).

Which qualities make the intestinal bacteria so indispensable to us?

Research with germ free born and bred animals show, that a total morphological development of the intestinal mucosa or a total development of the body's immune system, is impossible without a permanent stimulation of the body's own intestinal flora.

The continuous flow of pathogen bacteria, intestinal bacteria, food products and foreign particles in the chymus furthered the development of a flexible, intestinal associated immune system. The task is partly to destroy pathogen germs and partly to oppress defensive reactions against food and other intestinal residents. 80% of the defence cells mature in the immune tissue of the intestines. These defence cells are "trained" through confrontation with so called anti-gene active microbial cell wall structures and through the release of low-molecular peptides from the intestinal bacteria. Afterwards, the non-resident defence cells migrate through the body where they protect the nose, throat, bronchi and vagina mucosa. Some of the cells return to the immune system in the gut.

An additional important quality is the intestinal bacteria's ability to compete with foreign germs, to win the receptors on the intestinal mucosa and the available nutrients, and to render foreign germs harmless through preventing growth or microcide metabolic products. Our intestinal flora is crucial in stopping foreign germs from getting out of control (colonisation resistance). Colonisation of fungi or selective propagation of unwanted germs (like *clostridium difficile*) is often seen if our intestinal flora is disturbed through radiotherapy or antibiotics. In addition to the anatomic construction of the intestinal wall and the body's own immune system, the residential intestinal flora contributes to secure the integrity of the intestine's barrier function. Hence, the intestinal wall has the ability to be open towards nutrients on one side and close off towards bacteria, antigens and toxins on the other side. A disruption of the barrier can lead to a penetration of more antigens, bacterial and endogen proteases (enzymes that break down proteins) and other inflammation promoting substances. An inflamed intestinal mucosa cannot carry out its functions, meaning resorption / secretion / barrier function.

The typical metabolism products in the intestinal flora are short chained fatty acids like lactic acid, acetic acid, butyric acid and propion acid. One presumes that 2-10% of our total energy demand is covered through fatty acids. The brain, the heart and the muscles need a large amount of these energy providers. Further, the large intestine's mucosa is almost exclusively nourished through butyric acid, probably due to an adjustment brought about through the historic development, where the mucosa has adapted to the micro biological environment. The short chained fatty acids, especially acetic acid formed by the microorganisms, stimulates the intestinal peristaltic and influences the blood circulation in the mucosa. In addition, they promote the absorption of calcium and other minerals as they decrease the pH-value in the chymos.

Some representatives of the intestinal flora, like certain bifido bacteria stems and E. coli, produce vitamins, folic acid, biotin, niacin, pantoten acid and vitamin K. As the large intestine mucosa has a poor ability to absorb vitamins, in addition to the microbial consumption, it is much discussed how much gain a person has from these vitamins.

Can we strengthen or protect our intestinal flora?

There is no doubt; an intact intestinal flora is essential for keeping us in good health. The remaining question is if we can do anything to strengthen and support our intestinal flora. During the last century, scientists have noticed a connection between lactic acid fermented products and an improved health. Based on these interesting observations, many comprehensive research projects and clinical studies have been carried out. Even if we still are far from understanding the whole impact of probiotic bacteria, some of the missing peaces were found, and many clinical studies show different positive effects from these germs.

The effect seems to depend on the right amount of germs that are consumed, if the probiotic germs can survive the stomach acid and digestive enzymes and if they are capable of attaching to the intestinal mucosa. If these conditions are fulfilled, all the above mentioned essential functions of the body's own intestinal flora are strengthened.

After this short excursion into our living inside, it must be allowed to say, that the expression "pro" "bios" – "for life" – is a very good choice.