Probiotics provide relief without adverse effects

In order to develop other, much needed treatment options, Schaller and his team have recently tested the effect of probiotic bacteria on C. albicans. Many people have been consuming such probiotics for many years in the form of functional food and as capsules for the treatment of indigestion, and even as constituents of cosmetics.

In recent years, science and medicine have also become increasingly aware of the positive characteristics of the microorganisms, and have started to use and study probiotics as drugs or for disease prevention. Lactobacillus bacteria have long been used for the treatment of vaginal yeast infections. The doctoral thesis of Daniela Mailänder-Sánchez, a biologist in Schaller's team, specifically focused on the effectiveness of Lactobacillus bacteria for the treatment of infections of the oral mucosa. The motivation for undertaking this type of research was the increasing resistance of C. albicans to common antimycotics. Therefore, there is currently no effective way of treating C. albicans infections (candidiasis).

Schaller and his team of researchers have been able to pinpoint which factors in the human immune system are involved in candidiasis. Normally, the human skin and mucous membranes produce peptides with an antimicrobial effect that prevent the excessive spread of the C. albicans fungus in the human body. The more aggressive the fungi, the more peptides are produced. The production of antimicrobial peptides is, amongst other things, regulated by Toll-like receptors, which are constituents of the innate immune defence system. The researchers' findings are based on a three-dimensional model consisting of epithelial cells of the human oral mucosa.

Therapy in the form of yoghurt drinks

Lactobacillus bacteria are what the researchers were looking for, simple to use and with no harmful effects. Lactobacillus bacteria have been used by humans for many centuries without causing significant problems or adverse effects. Moreover, previous research has shown that probiotic Lactobacillus bacteria had a
positive effect on treating vaginal yeast infections.

In order to find out whether the positive effect can be transferred to the treatment of thrush, the Tübingen researchers investigated Lactobacillus rhamnosus GG (LRGG) for its suitability as a probiotic. They wanted to find how protection can be achieved and whether LRGG bacteria are able to modulate the immune reaction of oral mucosa cells. The researchers established an oral candidiasis model consisting of a multi-layer epithelium made up of oral mucosa keratinocytes that were infected with and damaged by Candida albicans and subsequently responded with an inflammation.

The researchers tested a prophylactic approach in which the cells were treated with Lactobacillus bacteria before being exposed to Candida cells. They also investigated whether initiating treatment at the same time as or after infection made a difference.

Pretreatment with Lactobacillus bacteria protects against C. albicans infection

Using this model, Mailänder-Sánchez and her colleagues found that Lactobacillus bacteria were in fact able to protect human oral mucosa cells against damage caused by C. albicans infections: pretreatment of the model with probiotic Lactobacillus bacteria offered effective protection against the fungus, and inflammatory reactions were milder than without treatment. However, the researchers also found that the Lactobacillus bacteria were unable to directly inhibit the growth of the Candida cells.

"The Lactobacillus bacteria and C. albicans appear to compete for glucose; the bacteria thus deprive the fungus of the food it needs to form the hyphae that are crucial for its virulence," says Schaller explaining the effectiveness of the bacteria. "In addition, the bacteria occupy the docking sites that the fungus needs in order to attach to cells," says Schaller. The Tübingen researchers used molecular biology methods to find out how bacteria and C. albicans compete for food and space on human mucosa cells; they found that LRGG is able to affect important C. albicans virulence factors. The reduced ability to attach to and enter mucosal cells seems to be largely responsible for the greatly reduced damage to the mucosal cells.