Fungal infections of skin and mucous membranes are relatively common. Around 75 percent of the human population lives with Candida albicans, a fungus that has no harmful effects in people with an intact immune system that can fight off systemic infections. However, in people with immune systems that have been weakened by antibiotics or radiotherapy for example, C. albicans infections can lead to sepsis which may even be life-threatening. Prof. Dr. Martin Schaller and his group of researchers in the Department of Dermatology at Tübingen University Hospital have been studying the molecular pathogenesis of Candida infections for many years. The researchers have recently discovered that common probiotic bacteria are very effective against such infections.

How Lactobacillus bacteria fight Candida albicans infections

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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.