

Press Release

Liver-Bowel-Microbiome Interactions

On the road to personalized nutritional therapy

Hamburg. Diseases of liver and bowel are more closely connected than it has long been supposed. The connector is apparently the microbiome, although the interactions are complex and also include reactions of the immune system and a genetic susceptibility. The analysis of the connections may be clinically relevant and could lead to entirely new concepts as regards a nutritional therapy and the treatment of liver and bowel diseases, explained Prof. Samuel Huber, Hamburg, as one of the scientific organizers of a workshop of the Falk Foundation e.V. in Hamburg.

“The metabolism can probably be positively influenced with personalized dietary recommendations, based on the composition of the individual microbiome”, emphasized Huber. The personalized nutritional therapy could thus open up promising new therapeutic approaches, e.g. for chronic inflammatory bowel diseases and/or treatment of fatty liver diseases.

Close association between liver and bowel

There is a well-documented close association between the liver and bowel in ulcerative colitis and primary sclerosing cholangitis, which occur together in parallel with increased frequency. According to Prof. Markus Neurath, Erlangen, a direct connection also seems to exist in other diseases of the liver and of the bowel.

According to current knowledge, the phenomenon is induced by an uncontrolled activation of the mucosal immune system in the bowels of correspondingly predisposed patients. This activation seems to be triggered by antigens of the enteric flora. Different factors such as smoking, infections, the intake of antibiotics and/or non-steroidal anti-inflammatory drugs (NSAIDs) can influence this interaction, says Neurath.

Microbiome – trigger for metabolic and immunologically caused diseases

This can result in a disruption of the barrier function of the mucosa, followed by a bacterial translocation and an uncontrolled activation of the immune system: This can be the starting point for an intestinal inflammation and the development

of liver diseases, up to liver cirrhosis, thus also encouraging hepatocellular carcinoma.

The microbiome thus seems to be the pivotal element for the development of different diseases, as Prof. Stephan C. Bischoff, Stuttgart, explained: "It can therefore necessarily serve as a new target for the treatment of metabolic and inflammatory diseases". The microbiome is crucially affected by dietary habits. The nourishment that we consume can thus induce and maintain immunologically and metabolically caused diseases, depending on the individual composition of the microbiome.

The enteric flora is subject to a circadian rhythm

In this context, it is not only important what we eat. It is also important when we eat. The microbiome, like the entire organism, is subject to a special circadian rhythm. The function of the enteric flora is regulated by the internal clock of the respective organism, and also by the time at which food is consumed. "The function of the enteric flora can therefore be different during the day than at night", said Prof. Eran Elinav, Rehovot/Israel, explaining the consequences.

Adipose because the microbiome has got out of step?

This has been proven in the mouse model. The findings may be highly relevant for humans, especially for all those whose circadian rhythms are repeatedly disrupted by external factors. "They include, primarily, shift-workers and people who frequently fly through time zones and experience jet-lag a lot", said Elinav. This explains observations according to which these people have a substantially higher risk of developing adiposity, diabetes and fatty liver disease. In the digestion of food, the microbiome appears to vary in its activity depending on the circadian rhythm.

The enteric flora is not only influenced by endogenous and exogenous factors, however. In turn, it probably also has a direct influence on the functioning of the liver and bowels via signaling molecules.

"The new findings should not lead to a microbiome hype", says Huber. In his opinion, however, it is justified and important to analyze the connections more closely: "The previous standard recommendations in nutrition counseling have proven to be less successful. With a better understanding of the liver-bowel-microbiome interactions, we can probably work out personalized dietary recommendations based on the testing of the respective microbiomes and thus optimally influence the metabolism in the individual case".

Individualized “perfect nutrition”

The present findings currently do not yet have implications for the whole population, but prospective studies are already underway to investigate the connections. The first results show that there is probably a different “perfect diet” for every person. For example, it might well be the case that salad or poultry could be either unfavorable or particularly favorable for the metabolism, depending on the microbiome. The same applies to many other foods, especially carbohydrates.

“In future we will certainly be able to come up with personalized dietary recommendations depending on the individual microbiome”, said Huber. “It is to be expected that we will know specifically which foodstuffs are worth recommending in the individual case and what is to be avoided. With this it may be possible to get rid of unnecessary dietetic restrictions for many people and it may become easier to achieve healthier nutrition for individuals”. At the same time, with personalized dietary recommendations, it will probably be possible to reduce the risk of suffering adiposity, a metabolic syndrome, or liver and bowel diseases in general.

Workshop “**Liver-Bowel-Microbiome Interactions**” of the Falk Foundation e.V.,
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