

CBmed GmbH
Austrian COMET K1 Center for Biomarker Research

Programme: COMET – Competence Centers for Excellent Technologies

Programme line: COMET-Zentren (K1) 3. Call, 2. Förderungsperiode

Type of project: 3.23 Microbiome-based biomarkers/multi-firm



PROTON PUMP INHIBITOR-ASSOCIATED DAMAGE OF THE MICROBIOME

PROTON PUMP INHIBITORS ARE AN EFFECTIVE THERAPY OPTION FOR ACID-RELATED DISEASES, SUCH AS PEPTIC ULCER DISEASE OR GASTRITIS. HOWEVER, THE INHIBITION OF STOMACH ACID PRODUCTION CAN LEAD TO SEVERE CHANGES IN THE MICROBIOME AND ASSOCIATED SIDE EFFECTS.

Gastric acid is a crucial part of the gastrointestinal tract. It is involved in digestion and the extraction of important micronutrients but it also effectively kills food-borne pathogens. In some cases, such as peptic ulcer disease or gastritis, the production of gastric acid needs to be decreased by proton pump inhibitors (PPI), in German called “stomach protectors”. Long-term use of this drug leaves the body without the gastric barrier, an important firewall not only against pathogens but also against bacteria from the oral cavity that can colonize the lower intestinal tract and cause inflammation and other side effects. In chronically ill patients, prolonged use of PPI is linked to the development of complications or even mortality. In this project, we identified transnational, disease-independent biomarkers for the colonization of the intestine with oral bacteria and test new strategies to remove the

oral bacteria from the intestine without damaging the original gut microbiome.

One possibility is to use of probiotic bacteria. Some probiotics are capable of producing lactic acid and other substances that can inhibit the growth of pathogenic bacteria. Probiotics are also able to ameliorate other PPI side effects, as we could show in a pilot study in cooperation with Institut Allergosan (Graz, Austria) and Winlove Probiotics (Amsterdam, The Netherlands).

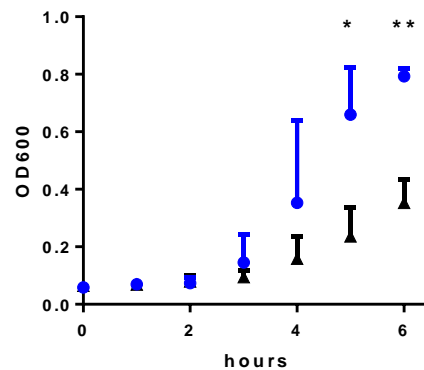
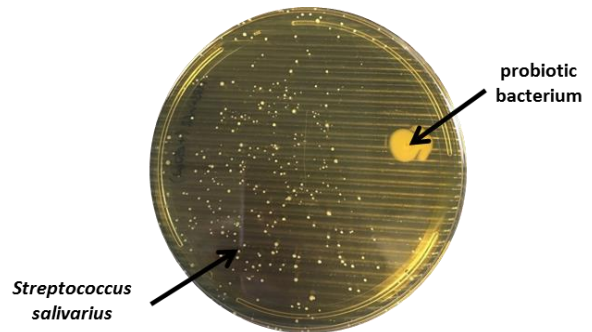
In this project, we systematically screen promising probiotic bacteria for their potential to kill the bacteria that we identified as the most appropriate biomarkers for PPI-related changes in the microbiome (*Streptococcus salivarius* and *Veillonella parvula*). For this screening, we use an adaptation of a technique developed by CBmed (patent pending).

SUCCESS STORY

This guarantees the creation of an evidence-based, precision therapy for the often neglected, detrimental side effects of the common and often carelessly prescribed PPIs.

Impact and effects

Besides scientific publications, the results from the early stages of this project have also been made available for the general public. Popular news outlets, including orf.at, standard.at and “Kleine Zeitung”, as well as medical magazines, e.g. “GastroHepatoNews” have reported about the detrimental effects of PPI on the gut microbiome based on our work and thus informed the Austrian people and medical personnel about the danger of careless prescription and use of drugs, including PPIs.



Probiotic bacterium inhibits *Streptococcus salivarius* growth on an agar plate (above). Growth of *Streptococcus salivarius* is considerably repressed by the presence of probiotic substances (black) compared to normal conditions (blue).

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Project partner

- Institut Allergosan, Austria
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This success story was provided by the CBmed GmbH and by the mentioned project partners for the purpose of being published on the FFG website. CBmed GmbH is a COMET Centre / Project 3.23 within the COMET – Competence Centers for Excellent Technologies Programme and funded by BMK, BMDW, Steirische Wirtschaftsförderung GmbH (SFG) and Wirtschaftsagentur Wien (WAW). The COMET Programme is managed by FFG. Further information on COMET: www.ffg.at/comet