

THE HOST SELECTS MUCOSAL AND LUMINAL TEAMS OF CO-EVOLVED, SUBMISSIVE GUT MICROBIOTA

Van den Abbeele Pieter¹, Eeckhaut Venessa², Marzorati Massimo¹, Possemiers Sam¹, Vanhoecke Barbara³, Verstraete Willy¹, Filip Van Immerseel² and Van de Wiele Tom^{1}*

¹ Laboratory of Microbial Ecology and Technology (LabMET), Ghent University, Coupure Links 653, B-9000 Ghent, Belgium; ² Research Group Veterinary Public Health and Zoonoses, Ghent University, Salisburylaan 133, B-9820 Merelbeke, Belgium; ³ Laboratory of Experimental Cancer Research, Ghent University, De Pintelaan 185, B-9000 Ghent, Belgium; e-mail: pieter.vandenabeele@ugent.be

Introduction and objectives

The host has developed a mucosal defense barrier consisting of a mucus layer which traps immune molecules, thus selecting specific microbes. Moreover, microbes themselves differ in their adhesion capacity to mucus, resulting in a unique mucosal microbiota with a great potential to interact with the host. Because human studies are restricted to end-point samples of mucosal microbes, we incorporated a mucosal environment in a dynamic *in vitro* gut model (SHIME) and assessed its importance for colonization of lactobacilli.

Materials and Methods

While a first SHIME-unit consisted of a conventional setup with only luminal microbes (L-SHIME), a mucosal environment containing mucin type II-covered microcosms was incorporated in the second one (M-SHIME).

Results and Discussion

Lactobacillus mucosae (99.9%) and *Pediococcus acidilactici* (99.7%) were the dominant resident lactobacilli. Whereas both species were present in the lumen, only *L. mucosae* was detected in mucus. Also the strongly-adherent *Lactobacillus rhamnosus* GG specifically colonized the mucus upon inoculation. The involved adhesion mechanisms (mucus-binding protein - *L. mucosae*; mucus-binding pili - LGG) validate that specific mechanisms are responsible for the colonization of the *in vitro* mucosal environment. The mucosal environment influenced the long-term colonization of *L. mucosae* and enhanced its stability upon antibiotic treatment. Moreover, the antibiotic-resistant *P. acidilactici* increased in abundance during an antibiotic treatment, suggesting that *P. acidilactici* might be used during antibiotic treatments in order to maintain the *Lactobacillus* community and its associated functionality. Finally, *L. mucosae* was the only species with strong adhesion capacity to Caco-2 cells, and thus has a great potential to closely interact with the host.

Incorporation of a mucosal environment thus allowed colonization of specific microbes, in correspondence with the *in vivo* situation. It will be interesting to unravel how microbial groups of the normal microbiota colonize this *in vitro* model in order to obtain a more *in vivo*-like overall microbial community composition and activity.