Protection of the mouse gut by mucus depends on microbes

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The quality of the colon mucus in mice depends on the composition of gut microbiota, reports a Swedish-Norwegian team of researchers from the University of Gothenburg and the Norwegian University of Life Sciences in Oslo. The work, published in EMBO reports, suggests that bacteria in the gut affect mucus barrier properties in ways that can have implications for health and disease.

"Genetically similar mice with subtle but stable and transmissible intestinal microbiota showed unexpectedly large differences in the inner colon mucus layer. The composition of the gut microbiota has significant effects on mucus properties," says Malin E.V. Johansson from the University of Gothenburg who led the study.

By sequencing the microbiota and examining the 16S ribosomal RNA genes, the researchers discovered that two mouse colonies maintained in two different rooms in the same specific pathogen-free facility had different gut microbiota. They also had a mucus structure that was specific for each colony. Whereas one colony developed mucus that was not penetrable to bacteria, the other colony had an inner mucus layer permeable to bacteria.

Each group of mice had a stable population of bacteria that could be maternally transmitted: The group with impenetrable mucus had increased amounts of Erysipelotrichi bacteria, while the other group had higher levels of Proteobacteria and TM7 bacteria in the distal colon mucus. Free-living mice from the forest had mucus similar in

composition to that found in mice in the non-penetrable colony. The authors also showed that the bacterial composition could be modulated to a small extent through the diet.

"The results from the free-living mice strongly argue for the importance of a well-developed inner mucus layer that efficiently separates bacteria from the host epithelium for the overall health of the mice," says Johansson.

The different mucus properties were recreated by transplanting the microbial communities into germ-free mice. "After recolonisation of germ-free mice with the different microbiota we observed the same structural and functional differences in their mucus properties," added Johansson.

Mucus is our outermost barrier to our microbiota in the gut. If the mucus fails to offer a protective barrier it can allow more bacteria to come in contact with our epithelium in a way that can trigger colon inflammation. Diseases such as ulcerative colitis show an increased incidence in the Western world and this study emphasizes the importance of the composition of the microbiota for an impenetrable protective mucus barrier.

More information: "The gut microbiota composition impairs the colon inner mucus layer barrier" *EMBO Reports* DOI: 10.15252/embr.201439263

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