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Gut flora – insights about an underestimated body part

The exploration of our planet by scientists like Christopher Columbus and Charles Darwin, who discovered continents as well as flora and fauna, has brought unique insight about the earth. Both explorers travelled far but you don't always have to travel far to discover new habitats. Like planet earth, humans and animals are colonized too. Humans and pigs are pretty similar when it comes to structure of organs and skin, and we often forget that we ourselves are a living space for billions of bacteria. In 2007 researchers in the team of Prof. Rob Knight, University of Colorado, published the first atlas of bacteria living in different compartments of the human body. They discovered that even organs like the lung are colonized and the average human nostril hosts over 900 bacterial species. Hence Rob Knight easily counts as the modern explorer of the, "human (gut)" planet.

You may have already heard a lot about the importance of gut health in people as in pigs, within the last few years - **but did you know that?**

- 99% of human and pig bacteria (=Microbiota) live in the gastrointestinal system
- One third of solid fecal components consist of disused bacteria of the gut flora – the rest is water and fibre
- The weight of the whole gut Microbiota is up to 2kg (ca. 100 billions bacteria)
- The gut Microbiome construction plan (DNA) in the intestines has 150 times more genes than the human host itself
- The development of the intestinal flora in humans and pigs is quite similar: Babies and piglets are born more or less abacterial/sterile. Colonization starts with the process of birth via contact to the vaginal-/gut-/skinflora of the mother, and then with contact to the environment in the first weeks of life – whether it is the bacterial flora of the hospital, or just the farrowing house flora.
- Every individual has it's own specific bacterial gut flora. Even identical human twins don't share the same genes for their gut flora (Microbiome), and likewise piglets out of the same litter do show similar bacteria in the intestines but, not an identical pattern of colonization after stimulation with the same plant nutrients.

What is the job of the gut flora?

- Care and protection of the mucosal gut cells mainly through production of short chain fatty acids like butyrate and propionate
- Suppression of "unhealthy" pathogenic bacterial concurrence as they create an uncomfortable environment for them to survive and compete for the pathogen's food
- Absorption and digestion of nutrients, and stimulation of gut peristaltic waves
- Production of vital vitamins as vitamin B1,B2, B6, B12 as well as Vitamin H (Biotin) and K
- Detoxification of substances which are foreign to the body

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- Immune stimulation: as 80% of the immune system is present in the gut, and it's attached tissue in form of lymph nodes (GALT -gut associated lymphoid tissue) it can easily check substances and cells that are foreign to the body and can react with an appropriate immune answer
- Achieving a healthy balance between helpful "healthy" non pathogenic, and pathogenic bacteria (= *Eubiosis*)

And what is it about prebiotics and probiotics? Do they belong to the good and "healthy" intestinal flora? Yes indeed!

- *Probiotics* do belong to the good bacterial species which support the gut digestion and enable the intake of nutrients. You may know them as the bacteria which help to produce your yoghurt, cheese orsauerkraut! These microbes like *lactobacilli* *bifidobacilli* and *streptococci* prevent the replication of pathogenic bacterial species via production of lactic acid. This enhances a sour setting in the gut that pathogenic bacteria don't like. To do their job properly these probiotics need food and this is where prebiotics can help.
- *Prebiotics* are dietary fibres which are indigestible and serve as food for the probiotics. If the good bacteria don't get enough food themselves the gut flora easily gets out of balance, and pathogenic germs grow stronger and dominate the whole system. Consequences of this bacterial overgrowth can be indigestion and a cause of gastrointestinal diseases in humans (for example Colitis Ulcerosa), and pigs (for example weaning scour and edema disease caused by E.Coli)

Influencing factors on the intestinal flora:

- *Age*: between week 11 and 22 in pig life, the pattern of bacteria that would digest carbohydrates is fundamentally changing depending on age and part of the intestines.
- *Diets* having a high content of crude fibre increase the amount of cellulose metabolising bacteria and zinc oxide included in the diet changes the microbial flora actually at the genetic level of the pigs' microbiome. In humans, diet composition likewise influences the bacterial flora: for example daily alcohol consumption has been proven to change the composition of the normal bacterial flora and cause overgrowth of pathogenic microbes in the small intestine of alcoholics. People battling with obesity seem to own a certain pattern of bacteria with low variation of *lactobacilli*.
- *Medication* is a huge influencing factor for gut colonization: some antibiotics, such as Tylosin and Chlortetracycline, are known to decrease the amount of "healthy" bacteria like *lactobacilli* and *streptococci*.
- Pigs infected with *pathogens* like *Brachyspira hyodysenteriae* showed clear differences to non-infected pigs - the negative pigs possessing a higher content of the "healthy" flora. Pigs infected with *Lawsonia intracellularis* are more likely to suffer from co-infections with pathogens as *Salmonella* than non - infected ones.

Considering all these points I am much more appreciative towards this amazing body part called the gut, and do value that it is actually keeping me, and the pigs we care for, alive and delivering many tasks. Hence let me finish with a respectful citation by Giulia Enders the author of the book: Gut: the inside story of our body's most under-rated organ× „ *someone who never breaks wind is starving his gut bacteria and not a good host*“

×BOOK OF THE YEAR 2014 IN GERMANY, TRANSLATED INTO 40 LANGUAGES, SHORTLISTED FOR THE 2016 BRITISH BOOK INDUSTRY AWARDS, NON-FICTION BOOK OF THE YEAR

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