Antibiotic treatment affects intestinal permeability and gut microbial composition in female Wistar rats dependent on antibiotic class

Tulstrup, Monica Vera-Lise; Christensen, Ellen Gerd; Carvalho, Vera; Licht, Tine Rask; Bahl, Martin Iain

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Antibiotic treatment affects intestinal permeability and gut microbial composition in female Wistar rats dependent on antibiotic class

Monica Vera-Lise Tulstrup, Ellen Gerd Christensen, Vera Carvalho, Tine Rask Licht, Martin Iain Bahl

Introduction
Antibiotics are frequently administered orally to treat both systemic and localized bacterial infections in almost any body location. As a consequence of this, the commensal gut microbiota is very often affected as well. This may disrupt the normal balance and subsequently affect intestinal integrity and host health.

Methods
Female Wistar rats (n=60) were dosed with amoxicillin (AMX), cefoxaxime (CTX), vancomycin (VAN), metronidazole (MTZ), or water (CON) every day for 10-11 days (n=12 in each group). Changes in bacterial composition in faecal and caecal content were determined by partial sequencing of the 16S-rRNA gene. Intestinal permeability was determined in vivo by measuring permeability of 4kDa FITC-dextran.

Results
Intestinal permeability was increased by administration of MTZ, while CTX and VAN decreased intestinal permeability. Bacterial composition and alpha diversity in faeces and caecum was significantly influenced by AMX, CTX and VAN but not by MTZ. In all groups with significant changes compared to CON, Firmicutes was reduced while Bacteroidetes and Proteobacteria were increased. For CTX, the abundance of Bifidobacteriaceae and Lactobacillaceae decreased significantly while in the VAN group, Lactobacillaceae increased in both caecal and faecal samples. Administration of AMX, CTX, and VAN resulted in increased water intake, while only AMX affected feed intake. Caecum weight was increased by AMX and VAN and the latter also increased caecum pH.

Conclusion
Specific antibiotics were shown to affect intestinal permeability and gut microbial composition in female Wistar rats depending on the class of antibiotic. Changes in gut microbiotal composition and alpha diversity, which were also observed, could be linked to intestinal permeability, although changes in permeability did not always result from major changes in microbiota and vice versa.