Concentrations of selected antimicrobials in caecum, colon and manure of pigs due to a 3% cross-contamination of the feed

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Materials and methods

1. Preparation of 3 batches of experimental feed with a 3% carry-over level of the recommended therapeutic dose of following antimicrobials: doxycycline, sulfadiazine, trimethoprim and chlortetracycline. For each batch, 10 samples were analysed using in-house developed and validated LC-MS/MS methods.

2. Animal experiment

Twenty-four pigs were equally divided into one control group and three experimental groups receiving experimental feed during 10 days. Every two days, individual manure samples were taken and individual colon and caecum content was sampled on day 11. Samples were analysed using in-house developed and validated LC-MS/MS methods.

Results

Antimicrobial concentrations in manure

Mean concentrations (± SD) of each antimicrobial rose to a steady state on day 4 of:
- 4 mg/kg wet weight (w.w.) for doxycycline
- 10 mg/kg w.w. for chlortetracycline
- 500-700 μg/kg w.w. for sulfadiazine
- Trimethoprim: all values were below the limit of detection, no quantification

Concentrations of selected antimicrobials in caecum and colon content

- Mean concentration of 5 observations/sampling site
- CI 95%
- Mean concentration end colon = mean concentration manure for all antimicrobials tested
- Tetracyclines concentrations are relatively high in general and highest concentrations are found in end colon
- Sulfadiazine concentrations are relatively low in general and highest concentrations are found in middle colon
- Trimethoprim: all values were below the limit of detection, no quantification

Transfer ratio’s (TR)

- TR manure = Mean concentration manure (mg/kg)
- TR caecum and colon content = Mean concentration caecum and colon content
- Mean concentration feed

Antimicrobial assay

<table>
<thead>
<tr>
<th>Antimicrobial</th>
<th>TR Caecum/colon content</th>
<th>TR Manure BA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlortetracycline</td>
<td>64% 96% 9%</td>
<td>20% 80% 80%</td>
</tr>
<tr>
<td>Sulfadiazine</td>
<td>30% 60% 30%</td>
<td>40% 5% 5%</td>
</tr>
<tr>
<td>Trimethoprim</td>
<td>ND ND 80-90%</td>
<td>ND ND 80-90%</td>
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</tbody>
</table>

Conclusions

These data show that the poor oral bioavailabilities of tetracyclines may result in rather high concentrations in caecum, colon and manure, even at 3% cross-contamination of the feed. As expected, the high oral bioavailabilities of sulfadiazine and trimethoprim appear to result in very low gut concentrations. Research on the effects of these concentrations on the gut flora is ongoing.

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