

Usefulness of a Vancomycin pretreatment when challenging chickens in order to evaluate anti-*Salmonella* preparations

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Introduction

Need of “challenge models” in poultry research: Describe how the infection develops and persists in animals under specific conditions.

→ allow the evaluation of intervention strategies in a controlled environment (vs in field experiments)

A good bacterial challenge model should: - achieve an infection that last until slaughter age;

- with counts of the targeted bacteria as stable as possible;

- and infection of the vast majority of birds among the challenged population.

We investigated the effectiveness of an antibiotic pretreatment (vancomycin hydrochloride, 25 mg/bird, 3 hours prior to bacterial inoculation) to promote *Salmonella* colonization of the gut, with the aim of evaluating anti-*Salmonella* preparations in both young and more mature broilers.

Materials and methods

Animals

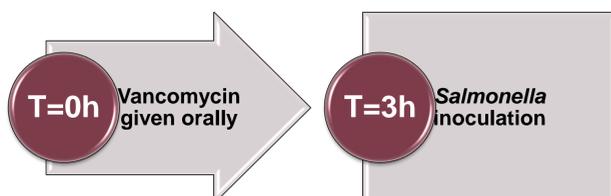
- *Salmonella*-free chicks (♂, Ross breed)

Bacterial strain

- *Salmonella enterica* serovar Typhimurium, O5+ strain, CWBI-B1501 (Walloon Center of Industrial Biology, Gembloux, Belgium)

Experimental designs and inoculation

Inoculation timeline



Experiment 1. Inoculation at 21 d of age

- 4×2 factorial completely randomized block design. Studied effects:

- *Salmonella* inoculum dose (0, 3×10³, 3×10⁶, or 3×10⁹ cfu/bird), see full text;
- Vancomycin (0 or 25 mg/bird).

Experiment 2. Inoculation at 7 d of age

- 25 mg vancomycin pretreatment prior to 10⁸ cfu *Salmonella* per bird

Analyses

- Cloacal swabbing: Presence/Absence
- Counts in fecal (Exp.1) or cecal (Exp.2) samples

Results

Experiment 1. Inoculation at 21 d of age [1]

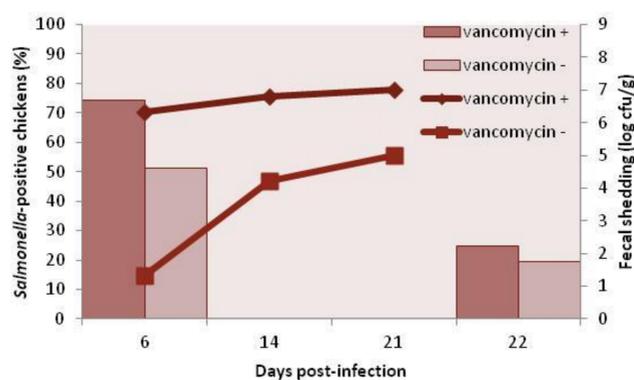


Figure 1. Evolution of the percentage of *Salmonella*-positive chickens (line graphs) and fecal shedding (bar graphs) after experimental infection of 21 d old broilers with or without vancomycin pretreatment.

The oral administration of vancomycin **increases the proportion of colonized birds** in the challenged population ($p < 0.05$).

The vancomycin pretreatment also **enhances the fecal shedding**. Even if we observed a decrease in counts over the 3 weeks measurement period for both vancomycin-treated and untreated groups. This could limit the time post-infection during which the model would be useable (as for conventional models!). **Cloacal swabbing** can cope with this problem, at least partly.

Experiment 2. Inoculation at 7 d of age

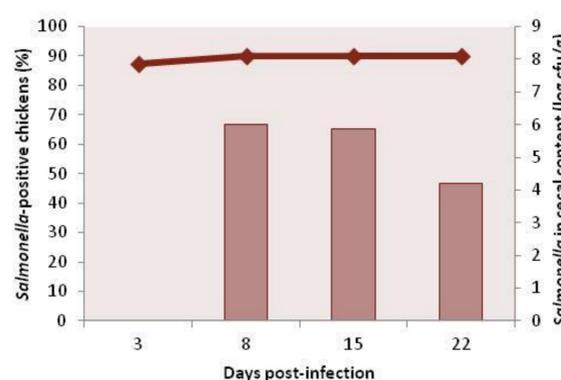


Figure 2. Evolution of the percentage of *Salmonella*-positive chickens (line graphs) and counts in cecal contents (bar graphs) after experimental infection of 7 d old broilers following a pretreatment with vancomycin.

In younger chickens, the enhancement due to vancomycin is **less evident** since our results (90 % of *Salmonella*-positive chickens among the inoculated population) can be achieved with conventional protocols without vancomycin [2].

This can be explained by the **higher sensitivity of young chicks** to *Salmonella* infection, with a less established microflora.

Vancomycin acts as an infection promoter in challenge experiments by releasing sites at the intestinal epithelium.

- Facilitate the detection of an effect of the studied anti-*Salmonella* product
- Particularly relevant to evaluate the effects of curative products at the end of the grow-out period

Main limitations: Vancomycin targets Gram positive bacteria and its use is then irrelevant when studying the effects of probiotics in prophylactic approaches. It does not avoid the natural clearance of the gut following the inoculation.

References

1. MARCQ *et al.* 2011. *Salmonella* Typhimurium oral challenge model in mature broilers: bacteriological, immunological, and growth performance aspects. *Poultry Science*. **90**:59-67.
2. FERNANDEZ-RUBIO *et al.* 2009. Butyric acid-based feed additives help protect broiler chickens from *Salmonella* Enteritidis infection. *Poultry Science*. **88**:943-948.

For further information

Please contact christopher.marcq@ulg.ac.be. More information on this and related projects can be obtained at www.fsagx.ac.be/zt.

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