Medium-chain fatty acids and plant-derived antimicrobials to prevent *Campylobacter* colonization in broiler chickens

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**Aims**

*Campylobacter jejuni* is the most common cause of bacterial-mediated diarrheal disease worldwide. Because poultry products are a major source of *C. jejuni* infections in humans, efforts should be taken to develop strategies to decrease *Campylobacter* colonization of poultry during primary production. Medium-chain fatty acids (MCFA) and plant-derived antimicrobial compounds possess marked bactericidal activity toward *C. jejuni in vitro* and might therefore have potential as feed or drinking water additives to control *C. jejuni* colonization in broiler chickens. For this purpose, the *in vitro* and *in vivo* anti-*Campylobacter* properties of a selection of compounds were analyzed.

**Experimental design and results**

1. **MCFA and trans-cinnamaldehyde show marked anti-*C. jejuni* activity *in vitro***

Mueller-Hinton broth was supplemented with the test compounds. Solutions were adjusted to pH 6 and inoculated with *C. jejuni*. Determination of minimal inhibitory concentrations (MIC, Table 1) and bacterial counts over a 24-h period (Fig. 1) revealed marked anti-*C. jejuni* activity especially for trans-cinnamaldehyde and capric acid.

2. **MCFA and trans-cinnamaldehyde reduce neither *C. jejuni* transmission nor cecal *C. jejuni* colonization in broiler chicks**

To examine the effect of MCFA and trans-cinnamaldehyde on *C. jejuni* transmission the compounds were added to the feed or drinking water from day-of-hatch. At two weeks of age, 3 out of 10 birds per group were orally inoculated with *C. jejuni*. Five days after inoculation, cecal *C. jejuni* numbers were determined. Neither MCFA, nor trans-cinnamaldehyde (Fig. 2A) significantly (*P > 0.05*) reduced bacterial counts.

3. **MCFA and trans-cinnamaldehyde fail to target *C. jejuni* in the broiler chicken cecum**

A cecal loop model (Fig. 3A) allows direct comparison of *C. jejuni* numbers in both ceca of the same animal. In this study, MCFA and trans-cinnamaldehyde (Fig. 3B) reduced bacterial counts compared to the control ceca.

4. **MCFA supplementation increases *C. jejuni* colonization treshold of broiler chicks**

Day-old broiler chicks (*n = 60*) were randomly assigned to 6 groups and housed individually. Birds received control or MCFA-supplemented drinking water. After two weeks, chicks were orally inoculated with *C. jejuni* strain KC 40. After 24 h all birds were euthanized and their cecal colonization status was determined (Table 2).

To analyze the therapeutic effect of MCFA, all animals were orally inoculated with *C. jejuni* at two weeks of age. After inoculation, the feed compounds were added to the feed or drinking water for the last 25 h of the trial and cecal *C. jejuni* numbers were determined. Both MCFA-treated drinking water and in-feed (Fig. 2B) MCFA failed to significantly (**P > 0.05**) reduce cecal *C. jejuni* counts.

**Conclusion**

Despite the marked bactericidal effect of medium-chain fatty acids and trans-cinnamaldehyde in vitro, supplementing these compounds to the feed or drinking water did not prevent *C. jejuni* transmission nor reduce cecal *C. jejuni* colonization in broilers. These compounds are not capable to target *C. jejuni* in its cecal niche, probably by the protective effect of intestinal mucus. In contrast, preventive MCFA supplementation reduced the colonization treshold of broiler chicks, probably by exerting a bactericidal effect in the crop. Therefore, MCFA supplementation might be a valuable tool to prevent *Campylobacter* colonization of broiler chicken flocks.

**References**


Acknowledgements: This study was sponsored by grant 1509/F/08 CAMPOOS of the Belgian Federal Public Service for Health, Food Chain Safety and Environment. The author’s laboratory was further sponsored by bank A.I. International NV (Poperinge, Belgium).

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