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IN-FEED RESIN ACIDS IMPROVE SMALL-INTESTINAL MUCOSAL CHARACTERISTICS OF BROILER CHICKENS DURING DYSBIOSIS CHALLENGE

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INTRODUCTION

In-feed coniferous resin acids had previously shown to reduce both duodenal inflammatory T cell infiltration and small intestinal matrix metalloproteinase (MMP) activity towards collagen type I and type IV in the ileum of non-challenged broiler chickens^{REF}. This indicates a protective effect of resin acids on intestinal barrier integrity by preservation of the basal membrane and the extracellular matrix.

Here we studied whether resin acids affect mucosal histology and collagen-degrading activity in dysbiosis-challenged broiler chickens.

MATERIAL AND METHODS

Male Ross 308

- 3 treatments
- 10 pens/tr.
- 28 chicks/pen

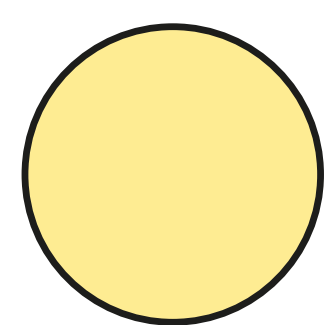
Dietary phases:

- Starter d1-13
- Grower d14-26
- Finisher d27-39

Performance for each pen and phase

- Feed intake
- Daily weight gain
- Feed conversion
- Mortality

DIETARY TREATMENTS



NCC

Non-challenged control diet



CC

Dysbiosis-challenged control diet containing 7.5 % rye



RAC

CC + coniferous resin acids (40 %) in wheat flour at 250 g/ton

Day 26: Sampling one bird/pen for tissue from duodenum, jejunum and ileum. Duodenal samples were processed by routine histology into haematoxylin-stained slides and measured by light microscopy for the length of villi and the depth of crypts. Homogenized tissue samples from all intestinal areas were measured for the relative activities of collagen type I and type IV degradation by EnzChek™ kit (Thermo-Fisher Diagnostics, USA).

PERFORMANCE RESULTS

- The challenge impaired bird performance, as measured by weight gain and FCR
- RAC improved FCR in the starter period compared to CC ($p < 0.05$)
- Mortality was unaffected by the dietary treatments

SUMMARY AND CONCLUSIONS

- Dysbiosis challenge increased relative collagen-degrading activity in the ileum, and altered gut histology
- Mucosal characteristics in RAC-group remained similar to those in nonchallenged birds
- Dietary resin acids may partly protect intestinal mucosa of broiler chickens during dysbiosis by preservation of the basal membrane and the extracellular matrix

RESULTS

The relative ileal activity of collagen type I and type IV degradation was higher for CC than NCC (Table 1). In RAC, the activity of collagen degradation was similar to NCC. In duodenum and jejunum, the collagen-degrading activity was unaffected by the treatments.

TABLE 1. Relative ileal activity of collagen degradation; mean $\pm$ SE, N = 10; * difference to NCC, $p < 0.05$

Relative breakdown (RLU) of		
Diet	Collagen type I	Collagen type IV
NCC	67.39 $\pm$ 5.07	21.36 $\pm$ 2.85
CC	93.12 $\pm$ 4.43*	39.83 $\pm$ 3.19*
RAC	68.77 $\pm$ 5.87	21.81 $\pm$ 2.71

Histology: CC but not RAC decreased the length of duodenal villi (Fig. 1). The depth of crypts was reduced by CC and RAC, compared with NCC ($p < 0.05$; data not shown).

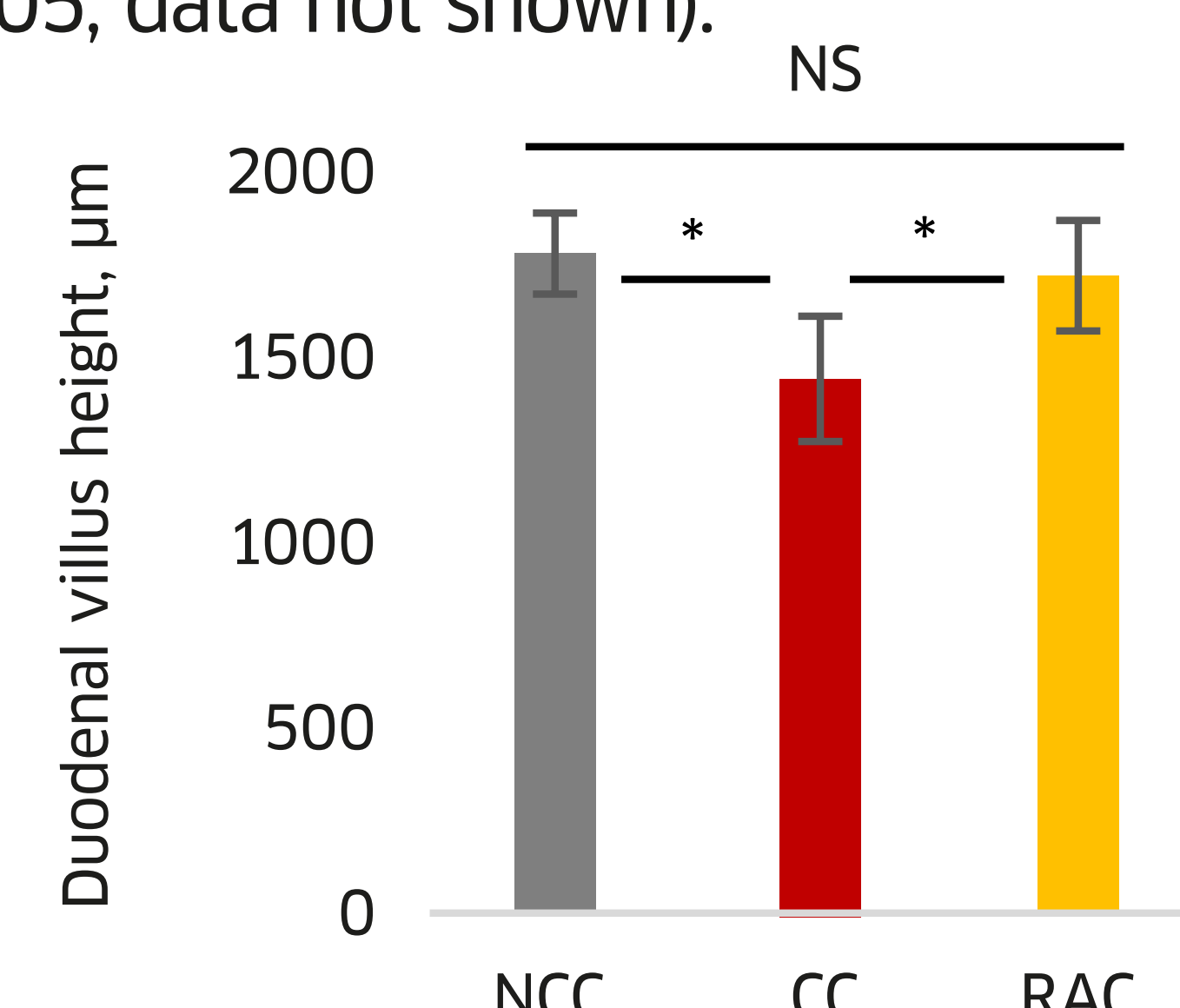


FIGURE 1. Effect of the diets on the length of duodenal villi (N= 10, mean $\pm$ SE); * $p < 0.05$

^{REF} Aguirre *et al.*, 2019. Vet Res 50:15