

AVIATOR reduced adhesion of *Salmonella* and *Campylobacter* to poultry epithelial cells *in vitro*.

This research note summarizes original data presented as abstract #216 at IPSF, Atlanta 2020 by Laney E. Froebel, Lindy K. Froebel, and Tri Duong, Department of Poultry Science, Texas A&M University, College Station, TX.

INTRODUCTION

Most, if not all, interactions of microbial pathogens with their hosts are influenced to an important degree by the pattern of glycans (polysaccharides) and glycan-binding receptors that each expresses.¹ One of the most studied and reported interactions is between gram negative bacteria with type 1 fimbriae and mannan oligosaccharides (MOS) and its effect in reducing colonization in animals under *in vivo* conditions.

However, at the cellular level, this interaction has not been well studied. This study² examined the effect of MOS and other similar prebiotics (fructooligosaccharide (FOS), galactooligosaccharide (GOS) and raffinose (RAF)), as well as the effect of mannose, MOS and beta 1-3, 1-6 glucans individually, to reduce adhesion of *Salmonella* and *Campylobacter* using a chicken epithelial cell line *in vitro*.

STUDY OVERVIEW

- An adhesion inhibition assay was performed where both prebiotic and *Salmonella typhimurium* or *Campylobacter jejuni* were added concurrently for co-incubation with the chicken LMH epithelial cell line.
- Adherent *Salmonella* and *Campylobacter* were enumerated using XLT-4 and Campy Cefex agar, respectively.
- The prebiotic adhesion inhibition was calculated relative to untreated cells as a percentage.
- Experiment 1 was a dose study with AVIATOR™ Refined Functional Carbohydrates™ (RFCs™). Experiment 2 tested independent components of AVIATOR, and experiment 3 tested common prebiotics, including AVIATOR.

FIGURE 1: Dose effect of AVIATOR on inhibition.

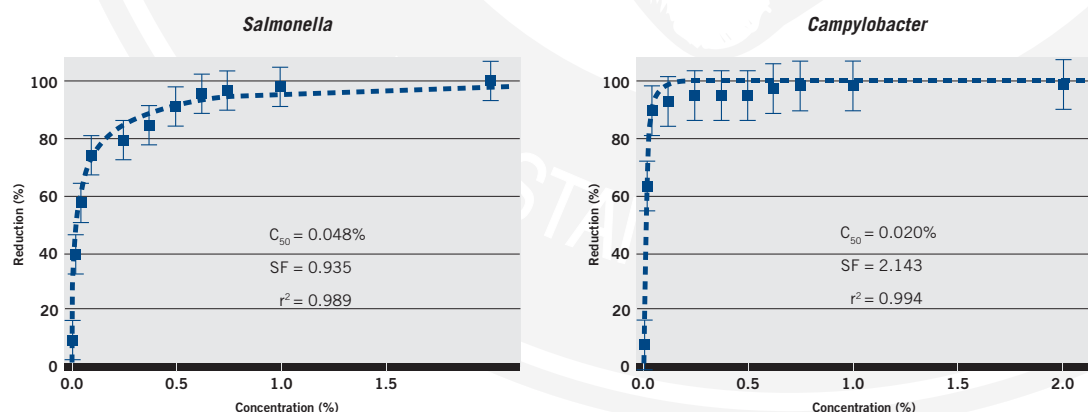


FIGURE 2: Effect of individual components of AVIATOR on inhibition.

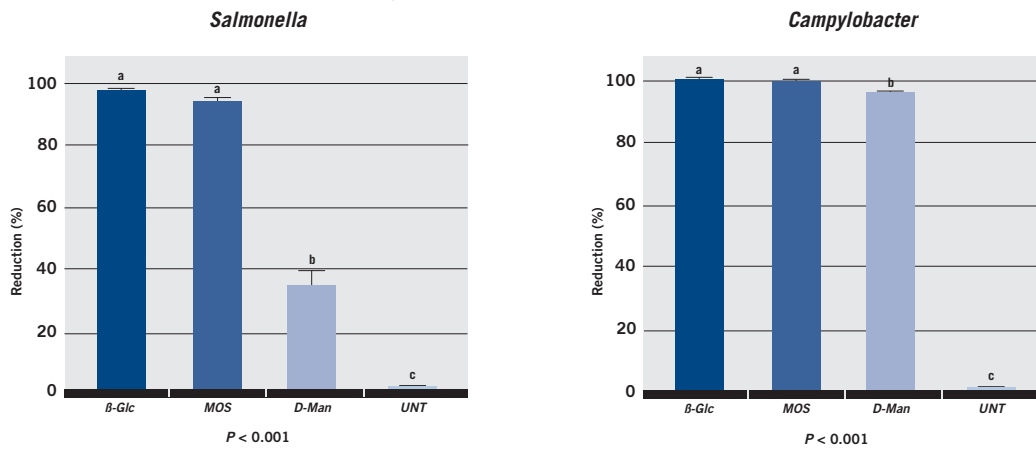
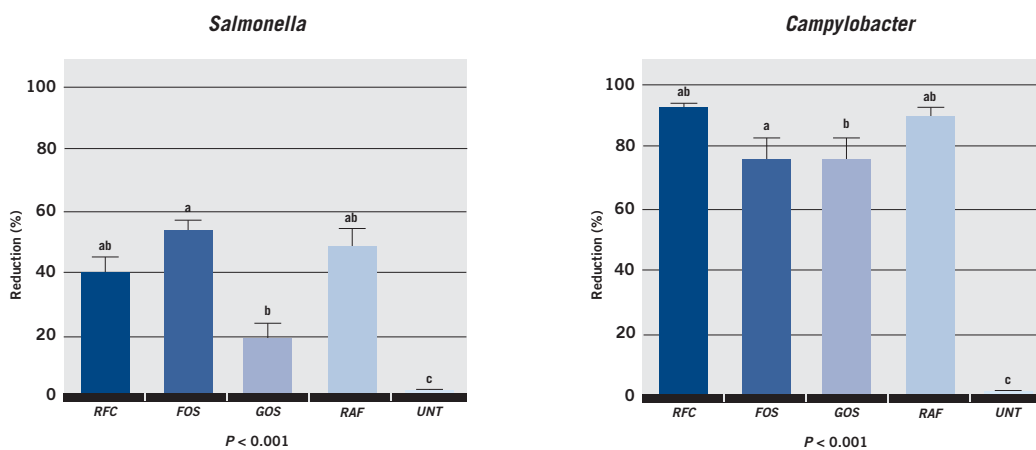


FIGURE 3: Effect of prebiotics on inhibition.



RESULTS

- **Experiment 1:** A direct dose dependent effect of AVIATOR™ was noted on reduction of adhesion of both *Salmonella* and *Campylobacter* to LMH cells (Fig. 1). The half maximum inhibitory concentration of AVIATOR for *Salmonella* and *Campylobacter* was 0.048% and 0.02%, respectively.
- **Experiment 2:** When the individual components of AVIATOR were tested, inhibition was highest with β 1-3, 1-6 glucan and MOS and intermediate with D-Mannose compared to untreated cells (Fig. 2).
- **Experiment 3:** When inhibition property of four prebiotics (AVIATOR, FOS, GOS, RAF) was tested, all prebiotics inhibited *Salmonella* and *Campylobacter* compared to untreated cells. Inhibition of *Salmonella* was greatest with FOS, AVIATOR and RAF, with GOS being intermediate. Inhibition of *Campylobacter* was greatest with AVIATOR and RAF, with FOS and GOS being intermediate (Fig. 3).

CONCLUSION

AVIATOR™, its individual components, and the other prebiotics tested reduced adhesion of *Salmonella* and *Campylobacter* to chicken LMH epithelial cell line in this trial. The IC⁵⁰ for AVIATOR observed for *Salmonella* (0.048%) and *C. jejuni* (0.02%) in this study falls reasonably within the label recommended rate of AVIATOR.

The ability of MOS to inhibit *Salmonella* seen in this study aligns with the literature,³ but its ability to inhibit *Campylobacter* has not previously been observed. In this trial, β 1-3, 1-6 glucan was found to have as good an adherence inhibition effect of *Salmonella* and *Campylobacter* as MOS.

The adherence inhibition appears to be a property of other prebiotics besides MOS. However, the efficacy and pathogen specificity were different for each prebiotic. This study explains a potential mechanism for the reduction in *Salmonella* and *Campylobacter* colonization reported in AVIATOR-supplemented poultry and livestock in previous studies.⁴⁻⁹



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