



Limited effects of fecal microbiota transfer on the fecal microbiome composition of laying hens

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Introduction

- Wild birds (e.g. wild ducks) can transfer pathogens, like avian influenza, to laying hens via their feces.
- Laying hens with free range access are at greater risk of infection.
- If transfer of fecal microbiota from wild ducks can be detected in laying hens, this could be a useful indicator of exposure of laying hens to feces of wild ducks.

Aim

The aim of this study was to determine if gut microbiota from wild ducks can be transmitted to the gut of laying hens with fecal microbiota transfer (FMT).

Groups

- Three groups were used with 18 laying hens each.
- 1) Negative control – no FMT
 - 2) Auto inoculated – FMT with own chicken feces
 - 3) Duck inoculated – FMT with wild duck feces

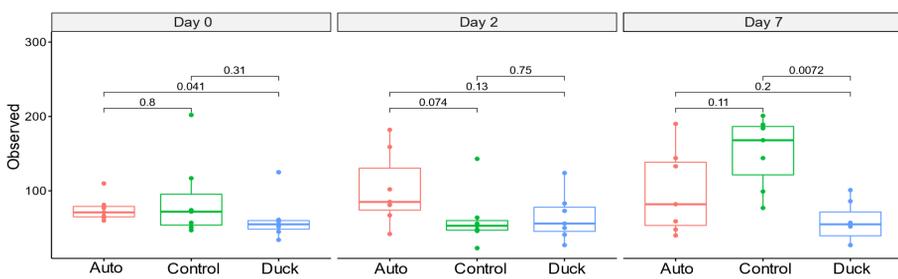
Experimental procedures

- Inoculation on day 0
- Cloacal swabs days 0, 2 and 7

Analyses

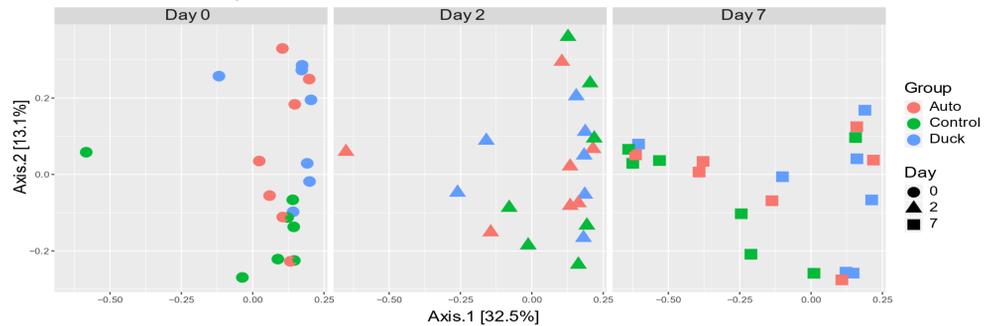
The microbiota composition of the cloacal samples of 7 animals per treatment was assessed using 16S rRNA sequencing and analyzed with R 3.5.1 (R Core Team 2018) and the vegan package.

Observed species diversity: ANOVA

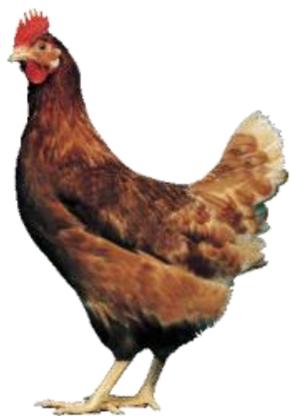


Observed species diversity. There is an increase of alpha diversity in auto inoculated group on day 2, and in the control group on day 7. A significant difference is found on day 7 between the control and duck inoculated group.

PCoA on Bray-Curtis distances: PERMANOVA



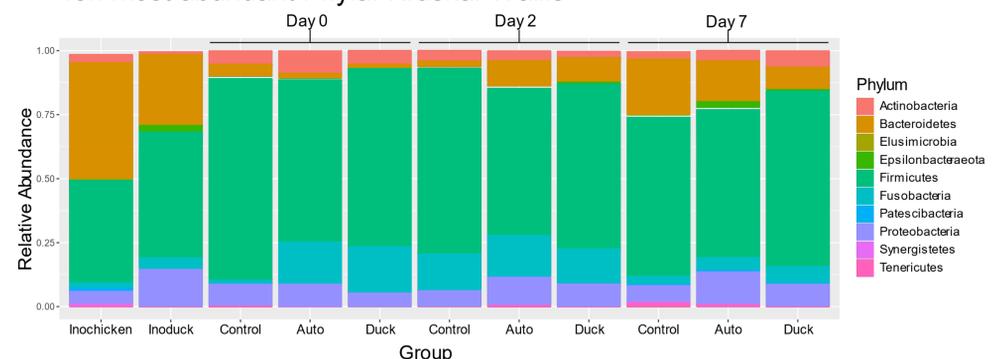
Bacterial community structure shown in a Bray-Curtis PCoA plot grouped per timepoint. PERMANOVAs show no significant results across treatments on day 2 or day 7.



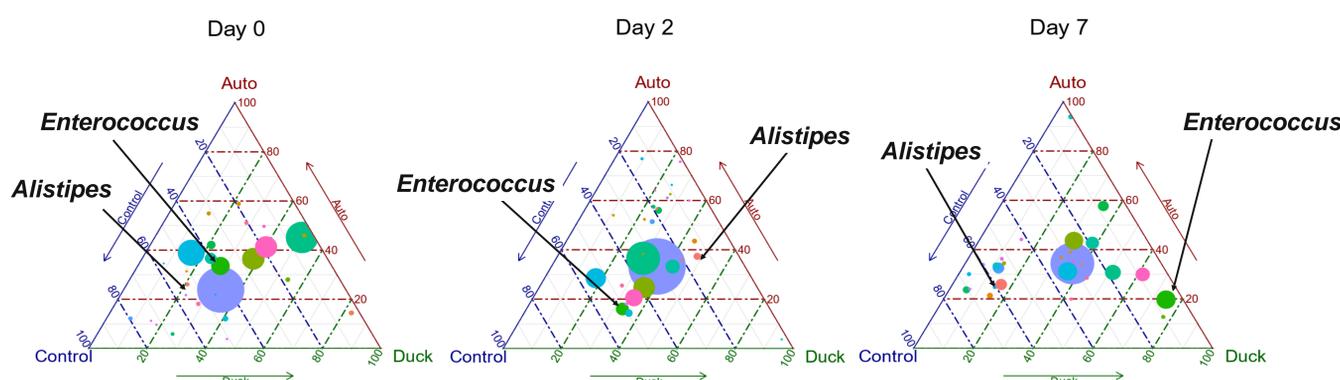
Relative abundances of ten most abundant phyla shown per treatment and timepoint.

The inocula comprised mainly the phyla *Firmicutes* (Inoduck 49.2%; Inochicken 40.0%) and *Bacteroidetes* (Inoduck 27.6%; Inochicken 45.5%). In the swabs of the hens *Firmicutes* (66.4%) was dominant across all samples. On day 2 the abundance of *Bacteroidetes* is higher in the duck and auto inoculated groups compared to the control group ($p = 0.028$ and $p = 0.014$ respectively).

Ten most abundant Phyla: Kruskal-Wallis



Ternary plot 0.5% most abundant taxa: Kruskal-Wallis



Ternary plot of treatments per timepoint. Circle size indicates the relative abundance found for that genus in the three groups. On day 2 genus *Alistipes* is higher in duck and auto treatments compared to the control ($p = 0.009$). On day 7, no difference was found in *Alistipes*. On day 7 the *Enterococcus* genus is more abundant in the duck inoculated group compared to the control and auto group. However the *Enterococcus* genus is not present in the duck inoculum.

Conclusion

1. FMT with duck feces had no distinguishable effect on the fecal microbial community of laying hens compared to the control and auto treatments.
2. A significantly higher relative abundance of the genus *Alistipes* (Phylum *Bacteroidetes*) in the inoculated laying hens was found compared to the control group on day 2, but not on day 7. This suggests that the detected increase of *Alistipes* may be an effect of temporal fluctuation or of the inoculation procedure itself.