

In ovo injection of synbiotics influences immune system development in chickens

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Introduction

The gut microflora is crucial for functioning and homeostasis of both immune and digestive systems. In chickens it is possible to early influence its composition - through *in ovo* technology. We proved the positive action of RFOs (*Raffinose Family Oligosaccharides*) applied *in ovo* on mortality and fitness in chickens. Still the mechanism of this phenomenon remains unknown.

Objectives

To analyze impact of *in ovo* delivery of synbiotics on the immune system development of the growing chicken embryo.

M&M

The experiment was performed on two distinct genotypes of chickens:
1. Ross (meat-type chicken)
2. Green-legged Partridge-like (GP), general-purpose chicken.

The hatching eggs were injected *in ovo* at 12th day of embryonic development with:

- S1** - *Lactococcus lactis* subsp. *lactis* IBB SL1 with with RFOs,
- S2** - *Lactococcus lactis* subsp. *cremoris* IBB SC1 with RFOs
- S3** - *Lactobacillus acidophilus*, *Streptococcus faecium* with lactose
- P - RFOs prebiotic,
- C - physiological salt (control)

The colonization of the chicken intestine with the injected bacteria was controlled at three timepoints (1d, 21d and 42d).

The analyses included:
Measurement and histopathology of lymphatic organs (bursa of Fabricius, thymus and spleen) at two timepoints (21d and 42d).

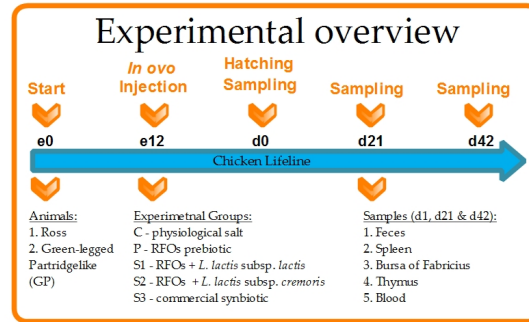


Figure 1. The histological patterns of the chicken lymphatic organs (bursa, thymus and spleen)

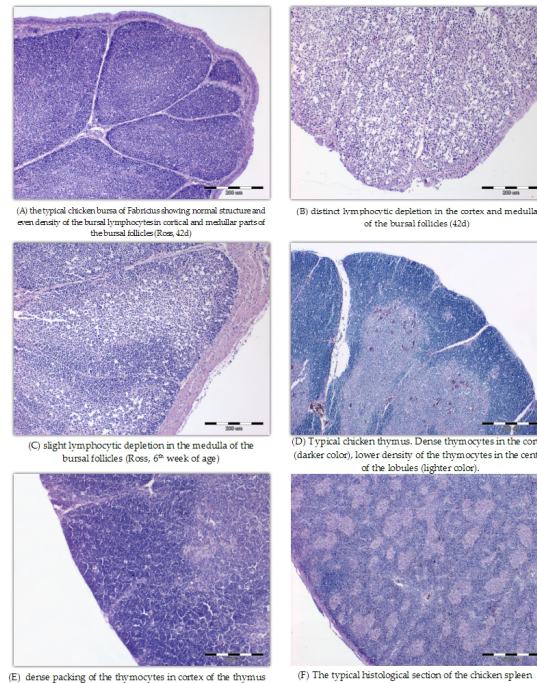
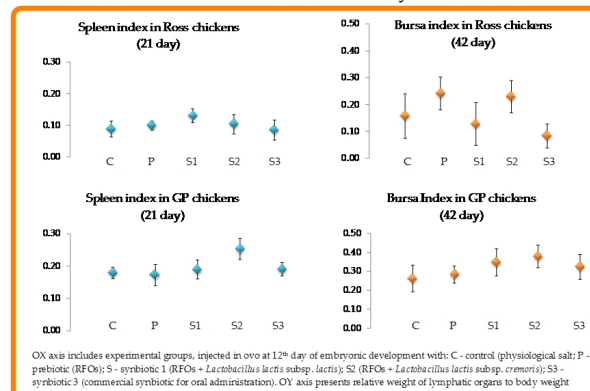


Figure 2. Relative size of lymphatic organs in chickens treated *in ovo* with synbiotics



Results

Development (size and morphology) of the lymphatic organs (bursa, spleen and thymus) was significantly affected by *in ovo* treatment.

In broilers P and S2 groups developed higher relative weight of bursa of Fabricius than S3 ($P < 0.05$) at both timepoints (21d and 42d).

GP chickens at 21d had significantly higher spleen index was higher in S2 group ($P < 0.05$) when compared to C.

Histological picture of the thymus in Ross and GP chickens displayed increase of the thymocytes in the cortex in all synbiotics-treated groups (S1, S2, S3).

Discussion

The impact of *in ovo* injection of synbiotics on the immune system of neonatal is indirect and it works through stimulation of microbiome development and activation of the common mucosal system. GALT (*gut-associated lymphatic tissue*) of the neonate chicken contains functionally immature T and B lymphocytes, which can be early activated by immunomodulatory pre- and synbiotics delivered *in ovo*.

Conclusions

In ovo administration of selected synbiotics is a promising approach in chicken immune system enhancement. However, the effect is based on the synbiotics used. In this study S2 synbiotic performed best.

