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Interaction of hatching systems and starter feeding strategies

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The Problem

At the hatchery, chicks do not all hatch at the same time but over a period of 24-48h. Once hatched, handling practices such as sexing, vaccination and the transport to the farm only lengthens the time to first intake of feed and water. The latter has negative consequences on nutrient absorption or the immune system development. However, early nutrition strategies with low Ca levels or highly digestible ingredients (e.g. spray-dried porcine plasma) have been reported to improve gut development, immunity and overall growth of the bird. The current study aimed to evaluate such starter feeding strategies on 2 contrasting hatching systems.

How we investigated the problem

A total of 2880 18d-incubated eggs were housed in 48 pens (Room 1; 60 eggs/pen). Once hatched, chicks were redistributed to keep females and males separated but with the same initial diet. From the same flock, 1872-day-old Ross 308 from the hatchery were randomly distributed over 48 pens (Room 2) being females and males housed separately. The study followed a 3-way factorial in which 2 0-10d starter programs (standard; enriched) by 2 hatching systems (traditional [hatchery + transport to the farm]; barn-hatching with immediate access to feed and water) by 2 genders (female; male) were evaluated. After 10d, all birds received a common 2-phase feeding program (10-28d and 28-42d). The effects on early growth, carry over effects up to market age and gene expression in the jejunum and ileum (21 d-incubation and 4, 10 and 21 d of life) were evaluated. Gene expression was assessed through a panel of 48 genes selected to evaluate the barrier function, immune response, antioxidant enzymes, nutrient transport, gut hormones, and metabolism mediators (n=8; High throughput RT-qPCR).

Results

At placement, chicks coming from a traditional system had a lower BW compared to those from barn-hatching (44.3g *vs.* 49.6g), being this effect maintained over the first 10d ($P<0.001$). During the grower phase (10-28d), birds coming from a traditional system showed better ($P<0.05$) BW and FCR, however, at the end of the cycle no differences were observed between hatching systems ($P>0.05$). The enriched diet improved ($P<0.05$) BW and FCR compared to the standard diet along the entire cycle in both systems. Results of gene expression at 21 d-incubation showed a higher expression in genes involved in barrier function (e.g. *OCLN*), immune response (e.g. *HSPA4*) and nutrient transport (e.g. *SLC1A1*) in chicks from the traditional system. On the other hand, at 4 and 10d barn-hatched chicks showed a higher expression in genes involved in barrier function (e.g. *TJP1*), nutrient transport (e.g. *SLC15A1*) and metabolism (e.g. *4EBP1*). The enriched diet showed an up-regulation of *SLC34A2*, involved in the intestinal phosphate absorption and tight junction proteins *JAM2* and *TJP1*.

Conclusions and implications

Barn-hatching resulted in an optimized performance during the first days of life of the chick and also showed improvement in gut integrity. In both, traditional and barn-hatching systems, enriched starter diets improved growth in the starter period, being this effect maintained until the end of the cycle. Enriched starter diets also exhibited an improved P absorption and strengthened gut barrier function.