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The use of starter feeding strategies as an alternative to the use of antibiotics

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The Problem

Antibiotics, mainly used for therapeutic purposes to combat infectious agents, have also been used as growth promoters or as preventive medication in poultry for years. However, due to concerns about bacterial resistance to antibiotics there is an urgent need to identify safe non-antibiotic alternatives. Early nutrition strategies such as low Ca levels or the use of 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 elucidate the potential of starter feeding strategies as alternatives to the use of broad-spectrum antibiotic (e.g. tylosin phosphate).

How we investigated the problem

A total of 1056 male day-old Ross 308 were allocated over 48 collective pens in 2 rooms and randomly assigned to experimental treatments. The study followed a 2-way factorial in which 3 contrasting 0-10d starter programs (standard; standard+antibiotic; enriched) by 2 scenarios (challenging conditions [reused litter + 5x *Eimeria* vaccination]; no challenge) were evaluated. After the starter phase, all birds received a common 2-phase feeding program (10-28d and 28-35d), birds fed the standard+antibiotic received antibiotic treatment in the feed throughout the complete cycle (0-35d). The effects on early growth at 4 and 10 d of age, the potential carry over effects up to market age and the bacterial diversity from caecum samples (n=16; 16S rRNA gene sequencing) at 4, 10 and 21 d were assessed.

Results

Regarding performance, no interactions between challenge scenarios and the starter diets were observed. The enriched starter diet improved (P<0.001) BW and FCR during 0-10d period compared to standard and standard+antibiotic diets. After the 0-10d phase, the standard+antibiotic diet caught up the BW of the enriched starter group and considering the whole cycle (0-35d) the enriched and standard+antibiotic groups improved (P<0.001) BW and FCR compared to the standard. Non-challenged chicks improved (P<0.05) BW and FCR compared to those challenged up to 21 d, thereafter there were no differences between them. Higher richness and higher diversity were observed in challenged birds compared to non-challenged birds. Under challenging conditions, chicks fed the enriched diet during the starter phase led to higher relative abundance compared to standard+antibiotic (P<0.05) of SCFA-producing bacteria (e.g. *Blautia*, *Eubacterium hallii* or *Ruminococacceae NK4A214*), energy producers (e.g. *Alistipes* or *Ruminococcus torques group*), high productivity-associated bacteria (*Bilophila*), considered ideal probiotics (*Anaerostipes, Butyricicoccus pullicaecorum* or *Lactobacillus salivarius*), and biomarkers of healthy gut (*Akkermansia*). At 21 d chicks fed the enriched diet led to higher relative abundance compared to standard and standard+antibiotic diets of *Enterococcus*, considered an ideal probiotic.

Conclusions and implications

Enriched starter diets might be an interesting strategy to cope with challenging conditions and might be a good alternative to the use of antibiotics, administered throughout the entire production cycle, enhancing bird performance. This could have been due to its beneficial effects on gut microbiome such as SCFA-producing bacteria regulating intestinal homeostasis, the intestinal barrier function or bacteria considered probiotics because of their potential effect against pathogens.