

US broiler performance comparison between different coccidiosis control programs

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Coccidiosis, caused by several *Eimeria* species, is a real economic threat to the poultry industry worldwide. Even without clinical signs such as mortality, diarrhea, and dehydration, subclinical coccidia infection is more widely present on the farm and can cause economic losses by reducing feed efficiency in chickens. To prevent coccidiosis, two approaches are broadly used in the poultry industry: 1. Anticoccidial drugs administered as a feed medication program, and 2. Live coccidia vaccines. Anticoccidial drugs can be classified as either chemical compounds or ionophores, and various combinations of these drugs are used in the field to improve the program's effectiveness of treatment. In the US, ionophores are categorized as nonmedically important antibiotics. Due to growing concern over antibiotic resistance, the US consumer demand pushed the industry toward adopting no antibiotics ever (NAE), now more than 50 percent of broilers are under the NAE program. A live coccidia vaccine is a prophylactic approach that can induce long-lasting protective immunity in the chicken and is also considered more sustainable for long-term use. To understand the real field performance of broilers under different coccidiosis control programs, aggregated de-identified U.S. field data of one year period were obtained. The individual reporting unit of the dataset was a processing plant (or a complex) as the majority of the US producers are vertically integrated and manage operations consisting of multiple complexes (a complex includes a hatchery, growing farms, a feed mill, and a processing plant). In this analysis, only programs with pure chemical compounds, or ionophores in starter and grower feeds, and naked vaccination programs were considered. Maxiban® (Elanco), a combination of an ionophore (narasin) and a chemical compound (nicarbazin), was classified as an ionophore in this study. The market bird sizes were divided into three weight ranges: small birds less than 4.4 lbs. (< 2kg), mid-size birds weighing between 4.4 lbs. and 6.8 lbs. (2-3 kg), and large birds weighing more than 6.8 lbs. (> 3kg). The dataset included approximately 6.5 billion heads of broilers from 1404 processing plants, which represented 70.5% of 2020 US production. Of these, 21% of plants produced birds were of smaller weight range (< 2kg), and 34% and 45 % for mid-size (2-3 kg), and large size (> 3kg) respectively. Weekly mortalities of all weight ranges were combined and compared between the treatment groups. From 1st week through 7th week, except the 3rd week, the birds treated with the vaccine-only program showed significantly lower mortality than the chemical-only program. While weekly mortalities for both the ionophores-only and the vaccine-only programs were comparable until 5th week, the ionophores-only program showed an increase in mortality during the 6th and the 7th weeks ($p < 0.01$). While there was no statistical difference in total mortality (%) between the three treatment groups for small birds (< 2kg), the vaccine-only program showed significantly lower mortalities in both the mid-sized (2-3 kg) and the large birds (>3kg) compared to the chemical-only program. The total live production cost of plants with the chemical-only program was significantly higher than those of the ionophores-only program and the naked vaccine program ($p < 0.01$). There was no statistical

difference between the total live production of the ionophores-only and the naked vaccine programs. Adjusted calorie conversion is a measure of feed efficiency. When compared within the same weight range, all treatment groups in both small and large birds showed no difference. However, the mid-sized birds (2-3kg) on the naked vaccine program had a significantly lower adjusted calorie conversion compared to the birds on the chemical-only program. In summary, the results showed that the birds treated with the chemical-only program had statistically higher total live production cost, and weekly and total mortality (%) compared to the birds treated with the ionophore-only or the vaccine-only programs which were comparable to each other. The current data showed that the performance of the birds treated with chemicals in the starter and the grower feed did not surpass the performance of the vaccinated birds.