Field Experience in the U.S.A. of a Concurrent Use of Coccidiosis Vaccine in Combination with Ionophores in the Feed of Broiler Chickens

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ABSTRACT

In the U.S.A., coccidiosis vaccine and chemotherapy are widely used to control coccidiosis. Field experiences and research trials have showed that performance in broiler chickens can improve by the combination of a coccidiosis vaccine followed by a coccidiostat in the grower and finisher feed. Control of coccidiosis has traditionally been by the use of either anticoccidial program or a coccidiosis vaccine. In the last year, companies in the U.S.A. have been using a "Bio-shuttle program" that consists of the use of a coccidiosis vaccine at day of age, followed by an anticoccidial in the grower feed around 14 days to 28 days of age, followed by either the same anticoccidial or a different anticoccidial during the finisher feed from 28 days to 38 days of age at low dose. In some countries, coccidiosis vaccines have been widely adopted, but in the U.S.A. in the last few years, the use of coccidia vaccine has increased and has become part of a program to control coccidiosis. Broiler chickens that were evaluated included flocks from the three bird sizes. The vaccine was the coccidiosis vaccine used during the Bio-shuttle program with low levels of ionophores in the grower and finisher feeds. ADVENT® coccidiosis control contains viable oocysts of *E. acervulina, E. maxima* and *E. tenella* for use in broilers chickens.

INTRODUCTION

Avian coccidiosis is a common parasitic disease of broiler chickens caused by single protozoan parasite of the genus *Eimeria* that infects the intestinal tract and is transmitted among the birds via ingestion of infective oocysts during feeding. Coccidiosis causes a substantial economic cost to the poultry industry that is calculated on more that $800 USD million in annual losses (10). Losses are attributed to feed medication for prevention and treatment, mortality, malabsorption, inefficient feed utilization, and impaired growth rate. There are two types of coccidiosis: a clinical coccidiosis in which the birds affected show typical symptoms of the disease, and a subclinical coccidiosis in which the affected birds do not show any visible symptoms of the disease. In the Annual Report of the United States Animal Health for 2012, coccidiosis ranked number one out of ten of the diseases that are concern for the poultry industry. In the report, the Association of Veterinarians in Broiler Production commented, "Coccidiosis always remains a concern for the broiler industry and is the top disease concern by a wide margin. The clinical and subclinical disease costs the industry a tremendous amount of money. Over the past several years, the industry's use of coccidia vaccines has increased due mostly to side effects associated with ionophores."

In broiler chickens, coccidiosis prevention and control has been achieved since the 1950s by the use of two main tools: anticoccidial agents through the feed (2) and live vaccines, either attenuated or non-attenuated live oocysts (5). Both methods of prevention and control rely on immunity development. The use of anticoccidial drugs, chemical and ionophore, in shuttle or rotation programs with each production cycle have extended the life of many of these drugs. However, numerous reports have showed a reduced of sensitivity and resistance to all-in feed anticoccidial drugs used in the poultry industry. Through a very extensive usage, increased demand for natural and organic chicken products, lack of new anticoccidial drugs and an increase in the incidence of gangrenous dermatitis, the use of coccidiosis vaccines for control is now common in the U.S.A.

In the U.S.A., the use of coccidiosis vaccine and ionophores is widely used to control coccidiosis in broilers. Each one has been traditionally used depending of the season of the year. It is documented that production performance will improve after the use of coccidiosis vaccines due to the replacement of drug-resistant oocysts with a more drug-sensitive oocysts population. Prior to 2011, producers in the U.S.A. had used coccidiosis vaccine without the addition of coccidiostat in the grower and finisher feed. The addition of Bacitracin Methylene Disalicylate (BMD®) and the feed additive 3-nitro-4 hydroyphenlarsonic acid (Roxarsone®) as prevention and control of necrotic enteritis, increased rate of weight gain and improved feed efficiency in poultry when a coccidiosis vaccine was used. Roxarsone® was voluntarily removed from the U.S. market in 2011 as response to a request by the U.S. Food and Drug Administration (FDA) based on a study by the Agency. Feed additive alternatives such as amprolium, essential oils, yuca extracts and combinations have been investigated. Dr. Mathis at Southern Poultry Research, Inc. showed that Roxarsone® was better in bird performance, but with Roxarsone® not being available, the feed additive alternatives improved when compared to no additive. Looking for different alternatives, most recently producers in the U.S.A. have tried combinations to reduce the impact on performance and body weight especially during the first cycling on coccidiosis vaccine to transition from anticoccidial medication to non-anticoccidial in the starter feeds. In the U.S., there are today four commercially coccidiosis vaccines available for the prevention and control of coccidiosis in broiler flocks. ADVENT® is a coccidiosis vaccine that contains sporulated viable oocysts from three commercially relevant species in broilers, *E. acervulina* (strain VND-A10), *E. maxima* (strain VND-M27) and *E. tenella* (strain LPRL-49) suspended on a Phosphate Buffer Solution. The strains have been selected to have the robust protection necessary, broad immunogenicity and undiminished oocyst yield for today's broiler production. An in vitro potency method (VIACYST® Assay) is used to determine the viability of sporocysts of each of the three Eimeria strains that allow accurate and consistent vaccine formulation.

As long as broiler chickens are continued to be raised in confinement under current production systems the prevention and control methods available today must be optimized in order to minimize the negative impact of coccidiosis, either clinical or subclinical, on broiler performance. Coccidiosis vaccines are an effective tool to prevent and control the disease whether, used year round or in a rotation program with in-feed anticoccidial drugs in the modern poultry industry.

DEVELOPMENT OF THE TOPIC

The purpose of this paper was to compare the production parameters (livability, average weight, feed conversion, adjusted feed conversion, average age to processing) of two programs to control coccidiosis under commercial conditions. The production parameters collected represent an anticoccidial program that was used in 2011 and a program when a coccidiosis vaccine was used in 2012 with the addition of ionophores in the diet within the same company. The company was located in the southern part of the U.S.A total of 30,549,506 broiler chickens were evaluated, includeding flocks whose target weights were eight pounds at 60 days of age. The broiler chickens evaluated included a mix of Hubbard, Cobb and Ross breeders that were using by the company at those points in time. From May to October 2011, a total 15,240,200 broiler chickens were evaluated. The anticoccidial program that was used during this period of time included Nicarbazin-Narasin (70g/ton) in the starter, grower and finisher feeds, and Monensin (90g/ton) in the first withdrawn feed, plus BMD® (25 g/ton) and Virginiamycin (10g/ton) in the second withdrawn feed. A total of 15,309,306 broiler chickens were evaluated from May to October 2012 when a coccidiosis vaccine was used as a method to control coccidiosis. In addition to the coccidiosis vaccine (ADVENT®) that was given at hatch of day by spray cabinet at the hatchery, BMD® (50g/Ton) in the starter feed, BMD® (50g/Ton) plus a Direct Feed Microbial (DFM) in the grower feed, Salinomycin (60 g/ton) in finisher feed, Salinomycin (60 g/ton) in the first withdrawn feed, and Lincomycin (4 g/ton) in the second withdrawn were given in the diet.

Production parameter results are summarized in Table 1. The Bio-shuttle program results in an improvement of 4 points in adjusted feed conversion to eight pounds, 0.43 pounds more in body weight compare to ionophores used in 2011 and a reduction of the average days to process of 2.46 days. All of the improvements noted (Table 1) previous were more than enough to pay for the additional cost of the diet (analysis not presented) when a coccidiosis vaccine is used followed by ionophores in the diet.

Table 1. Comparison of Production Parameters of Two Anticoccidial Programs used in 2011 and 2012

Anticoccidial Program	Total of Birds	Average Age (Days)	Livability %	Average Body Weight	Feed Conversion	Adjusted Feed Conversion 8 lb
Ionophores 2011	15,240,200	62.27	95.20	8.374	2.111	2.070
Coccidiosis Vaccine 2012	15,309,306	59.81	96.36	8.417	2.066	2.033

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