

CONTROLLING COCCIDIOSIS IN BROILERS: EXPERIENCE FROM THE USA

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Use of anticoccidial drugs in the USA

Two categories of drug are employed by broiler producers to control coccidiosis in poultry, ionophore antibiotics and synthetic agents (chemicals). As in other Countries, the compounds most commonly employed in the USA are the monovalent ionophores (salinomycin, monensin, narasin) and occasionally the divalent ionophore lasalocid (1). Whereas ionophores are used in the starter and grower feeds, chemicals (nicarbazin, diclazuril, and zoalene) are mainly employed in the starter feed (1). A mixture of both types of drug (nicarbazin and narasin) is also available. The same drug (single drug program), or different drugs ("shuttle" program) may be incorporated in feeds for a single flock. Most producers also employ a rotation program in which a shuttle program is used in the spring and a single drug program during the summer, fall and winter months. Although ionophores are still widely used, they are not as effective as when first introduced and, if employed continuously, resistant strains of *Eimeria* may develop (2). The choice of chemical is difficult because drug resistance to them is widespread. Medication is most effective when the level of infection is low; proper attention should, therefore, be given to appropriate management and hygiene.

Mode of action

Whereas chemicals destroy parasites developing within epithelial cells of the intestine, ionophores kill the motile parasites while they are free in the gut lumen and before they penetrate host epithelial cells. It is most important that the ionophore is present in the gut at the recommended concentration; management practices that restrict feed intake, or prolonged periods in the dark during which birds cannot feed, may result in drug levels lower than those necessary for maximum efficacy.

Drugs and immunity

Ionophores have been the principal means to control coccidiosis for more than thirty years and are the most widely used drugs for this purpose. They do not completely suppress parasite development, however, and those parasites that do complete their life cycle can induce a protective immune response (3). In the USA some producers withdraw the drugs for two weeks or more prior to slaughter, and rely on such natural immunity to protect the birds thereafter; this results in considerable savings in the cost of medication. However, protective immunity requires repeated exposure to infection and takes five to six weeks depending upon the species of *Eimeria*; if drugs are withdrawn from the feed too early, there is a risk of late infection that will reduce growth rate of the birds. Recent research has shown that medication should be continued for at least six weeks to achieve best performance (4).

Antibiotics and roxarsone

In the USA, anticoccidial drugs are often used with growth promoting antibiotics (e.g. bacitracin, virginiamycin, bambermycins) and roxarsone. As in the EU, however, the use of antibiotics has been declining. Recent data indicates the importance of using an antibiotic and roxarsone in the starter and grower feed to achieve maximum performance in broiler flocks (5). Removal of an antibiotic from the feed results in poorer feed conversion and lower bodyweight. Complexes that utilize roxarsone and an ionophore have lower mortality and better performance than those using an ionophore alone.

Live vaccines

Live vaccines based upon non-attenuated strains of *Eimeria* are widely used in the USA during the rearing phase of broiler breeders and replacement layers; so far they have not been widely used in broilers. Vaccines based upon attenuated strains are not presently available in the USA. Where vaccines are employed in broilers, it is usually in the summer months as part of a rotation program with anticoccidial drugs. Some vaccines contain parasite strains that were isolated many years ago and that are inherently sensitive to drugs; their use in such programs helps restore drug efficacy if resistant strains are present (6). Interest in using vaccines has increased in recent years because of improvements in methods of administration and because they are seen as an alternative to chemotherapy. The present generation of vaccines is not without problems, however, and performance may not be as good as can be achieved with drugs (7,8).

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