Nicarbazin and ionophores both exert anticoccidial activity, albeit differently, through energy depletion in the coccidia. The exact molecular basis for the synergistic anticoccidial activity of the two remains unexplained.

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Nicarbazin is a 1:1 complex of 4,4’-diaminocarbamic acid (DNC) and 2-hydroxy-4,6-dimethylpyrimidine (HDP).

Only the DNC portion of nicarbazin is disintegrated in water to form much smaller crystals of DNC (Rogers et al., 1973). This disintegration probably occurs in the gut of the broiler chicken, leading to much greater absorption of the biologically active DNC portion of the nicarbazin complex and, in turn, resulting in the tenfold increase in anticoccidial activity.

Ionophores are produced through fermentation of Streptomyces sp. and are uniquely capable of forming lipophilic complexes with cations such as sodium and transporting these cations into and through biological membranes (Pressman, 1976).

Sporozoites of coccidia accumulate ionophores in their pellicle membrane (Smith and Strout, 1978), resulting in an influx of sodium into the sporozoite, exceeding the parasite’s ability to remove it and, in turn, leading to the death of the coccidial parasite by an energy depletion and a resultant lethal osmotic imbalance (Smith and Galloway, 1983; Smith et al., 1987). Additional studies on the efficiency and safety of 1:1 ratios of narasin/nicarbazin resulted in the development and regulatory approval of this combination as an anticoccidial premix product for broilers.

The narasin/nicarbazin combination also exhibits outstanding anticoccidial efficacy in floor-pen trials (Garrett et al., 1991; Long et al., 1988; Watkins and Bafundo, 1993), and this combination has now been used extensively by global broiler producers for the prevention of coccidiosis.

Anticoccidial drug resistance problems have been encountered following commercial use of many anticoccidial drugs over the years (Chapman, 1997; Chapman and Hacker, 1994), in turn resulting in reduced broiler performance. Balundu and Jeffers (1990) found it difficult to develop resistance to combinations of monensin and nicarbazin through 60 generations of intentional selection in the laboratory.

Although there have been reports of a loss of sensitivity to the narasin/nicarbazin combination based on the results of short-term sensitivity evaluations in the laboratory (Balundu et al., 2008; Tamas and Wilks, 1989; Tamas et al., 1991), such anticoccidial sensitivity tests are generally not good predictors of the performance of anticoccidial programs in the field (Jeffers, 2013; Watkins, 1997).

To date, a reduction in broiler performance due to drug resistance problems has not been well documented following the use of synergic nicarbazin/ionophore combinations in commercial broiler production.

Aside from the synergistic anticoccidial activity of nicarbazin when combined with ionophores, there are other aspects of the narasin/nicarbazin combination that, no doubt, contribute to its effectiveness in maintaining intestinal integrity.

The narasin/nicarbazin product, established through extensive research, is the ideal ratio of the two components. In order to gain the synergistic anticoccidial benefit of a combination of nicarbazin and an ionophore, the appropriate ratio of the two must first be determined through comparative evaluation of results of studies with the two components (Callender and Jeffers, 1980).

Furthermore, the success of the narasin/nicarbazin combination in maintaining intestinal integrity may be due, in part, to the well-documented activity of narasin against Staphylococcus aureus, thus helping to prevent necrotic enteritis. Among the ionophores approved for use in broilers, narasin is perhaps the most active against C. perfringens in vitro (Watkins et al., 1997) as well as in challenge studies in broilers (Brennan et al., 2001; Collier et al., 1987).

Although narasin is inactive in this regard, the presence of narasin when combined with nicarbazin continues to provide some protection against necrotic enteritis (Lanczkert et al., 2010). This property of narasin is especially valuable to broiler producers in global areas where the use of growth-promoting antibiotics is banned, such as in the European Union.

Narasin is also effective for reducing gizzard erosion and ulceration in broilers (Balkhudal et al., 1998). This may be due to the activity of narasin against C. perfringens since gizzard erosion is associated with increased levels of C. perfringens in broilers (Novoa-Garrido et al., 2006).

What is interesting is that, apart from its anticoccidial activity, narasin in combination with narasin has a significant positive

Molecular techniques aid pet obesity research

According to the World Health Organization (WHO), one out of every three adults in the U.S. are overweight or obese. This is a huge change from the traditional approach to studying obesity, said Maria de Godoy, a postdoctoral researcher in Swanson’s laboratory. “What we are trying to do is change the emphasis of how to look at obesity,” she said. “Our focus is to manage obesity, not to just treat the symptoms of obesity. The ideal situation is to prevent it.”

“We want to know at what point we can intervene and hopefully prevent the development of obesity or help the animals so they don’t have the complications that they currently do,” de Godoy added.