Coccidiosis protection – an essential first step to flock performance

by By Dr Fernando Vargas, Technical Manager Poultry, MSD Animal Health.

Everywhere poultry is produced, flocks are at risk of coccidial infections. Sub-clinical indications of coccidiosis, caused by protozoa of the Eimeriidae family, can be found in nearly every flock around the globe.

Further, coccidiosis is a causative factor of secondary Clostridium spp. infections that can lead to necrotic enteritis and result in devastating health and economic consequences. The pervasive nature and negative impact of these two infections require close attention to prevention and control. Even sub-clinical coccidial infections can negatively impact flock performance.

Subclinical coccidiosis in the finisher phase of a broiler flock, characterised by very mild (+1) lesion scores, even in only part of the flock, has a surprisingly large impact on weight gain, feed conversion, flock uniformity and flock-to-flock performance variability.

Uncontrolled, sub-clinical coccidiosis infections can lead to secondary Clostridium spp. infections that exacerbate economic losses by further reducing nutrient uptake.

The cycle of infection

Clinical infection (lesion score +3 or +4) develops when naive birds are challenged with large numbers of coccidial oocysts shed in the faeces of infected birds. The disease develops rapidly, in 4-7 days, in the epithelial cells lining the villi. Clinical infection is characterised by rapid replication of the parasites in the gut and extensive damage to the intestinal mucosa, resulting in abnormal (bloody, watery, mucoid) droppings and even mortality.

While clinical infection produces visible illness and severe performance loss, most producers maintain good control of the clinical infection. They can be fooled into thinking that they have complete control of the disease. Subclinical infection, however, is ubiquitous and invisible, and it can quietly erode performance.

Flock intestinal health is crucial for optimum broiler performance. Good intestinal health, in turn, requires both disease control and maintaining a proper balance of the beneficial microflora that facilitate satisfactory feed utilisation. The cycle of infection often begins when an imbalance of microflora occurs.

An imbalance of microflora may start with an intestinal irritation, perhaps caused something like the non-starch polysaccharides found in certain feedstuffs. Irritation causes cell damage and production of excess mucus as part of an immune response. Cellular debris, mucus and undigested feed become nutrients for undesirable intestinal microflora, such as Clostridium perfringens. The clostridia accelerate intestinal damage and mucus production by releasing powerful toxins resulting in wet faeces and even necrotic enteritis.

As birds reach 28-35 days of age, increased faecal volume and increased house moisture resulting from watery faeces encourage multiplication of Eimeria spp. populations. Thus, the peak subclinical Eimeria spp. challenge and peak microflora imbalance occur during the most critical time for meat yield growth. Pathogen shedding is greatest right before slaughter, leading to infected litter and increased risk of 'carry over' infection in the next flock.

Prevention and control

Poultry producers utilise a variety of protocols to prevent and control intestinal infections, such as coccidiosis and necrotic enteritis. These range from careful attention to flock husbandry, to vaccination with coccidial vaccines, to the use of antibiotic/ionophore feed supplements. In most cases, flock managers employ a combination of prevention and control measures.

The best infection control practice is to be well ahead of the infection. That includes the best possible hygiene and growth environment, of course, but also using effective tools to control the infections early in the life of the flock. Performance loss is most severe when subclinical infection and microflora imbalance occur just prior to slaughter.

The effectiveness of coccidial vaccines in controlling subclinical infection becomes more noticeable as successive flocks receive them. In the initial vaccinated flock, the carry-over wild strain Eimeria challenge is often significant. This occurs despite a careful cleaning and disinfection of the farm. With each successive vaccinated flock, the challenge lessens until the vaccine becomes the dominant Eimeria strain in the poultry house. Flock performance progressively improves during 2-4 flock cycles of coccidiosis vaccination.

Traditional infection control methods have also involved the use of in-feed medications with ionophores and anticoccidial chemicals. However, prolonged use has caused Eimeria organisms to become partially resistant, creating more sub-clinical coccidial lesions and increased shedding of pathogenic agents. To control clostridial infections, producers may rely upon an antibiotic growth promoter (AGP), such as avilamycin or bacitracin methylene disalicylate (BMD), if they operate in a country where such products are allowed.

Methods not equal

The problem with ionophores and many AGPs is their long and widespread use has resulted in the decreasing sensitivity of the target organisms to the control agent and, even more troubling, the development of resistant strains.

One of the most effective clostridial AGPs is MSD's Enradin brand of enramycin. "Enradin is in a class by itself in its ability to control Clostridium spp.," said Rik Koopman, DVM,

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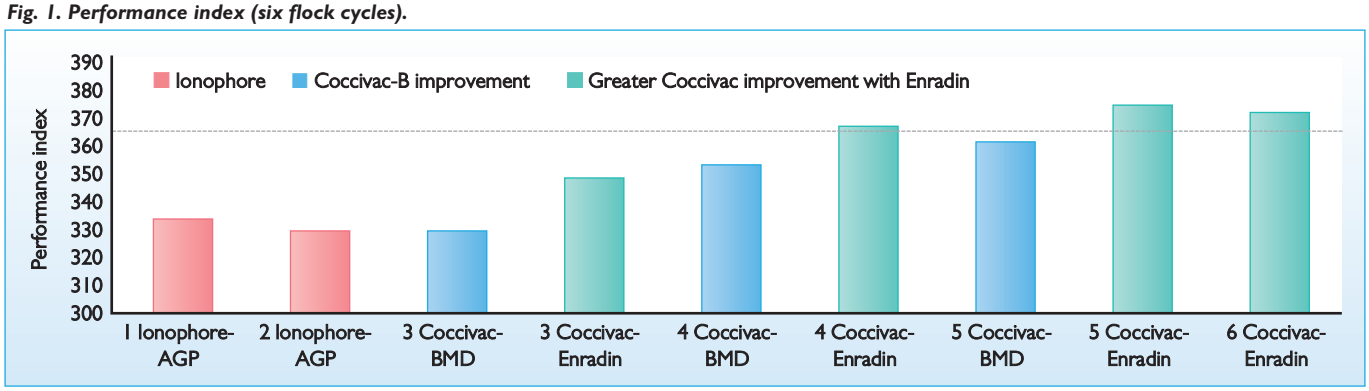
Fig. 1. Performance index (six flock cycles).



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MSD Animal Health's Director of Technical Operations.

"Study after study comparing this product to avilamycin and BMD confirm that it has the lowest minimum inhibitory concentration (MIC) required to control the organism and that the organism is not becoming less sensitive to its effects."

One long term study, begun in 1986 and conducted by the independent Kyodoken Laboratory in Japan, studied the sensitivity of more than 850 C. perfringens isolates to popular feed antibiotics intended to control infection. The study calculated the MIC_{90} (the antibiotic concentration required to control the growth of 90% of the C. perfringens isolate) for Enradin, avilamycin and BMD for each of the 850 isolates.

During the 26 year study Enradin's MIC_{90} was consistently lowest, ranging from 0.05-0.20mcl/mg.

By contrast, corresponding ranges for avilamycin and BMD were 3.13-25.00 and 1.56-50mcl/mg, respectively.

"During the study the clostridial isolates exhibited decreased sensitivity to avilamycin and BMD, but not to Enradin. That has important implications for these products as part of long term control protocols," Rik added.

"As the sensitivity of the disease organisms to avilamycin and BMD decreases, they will need to be rotated regularly to maintain effective control. Producers may use Enradin confidently for effective, long term control of clostridial infections."

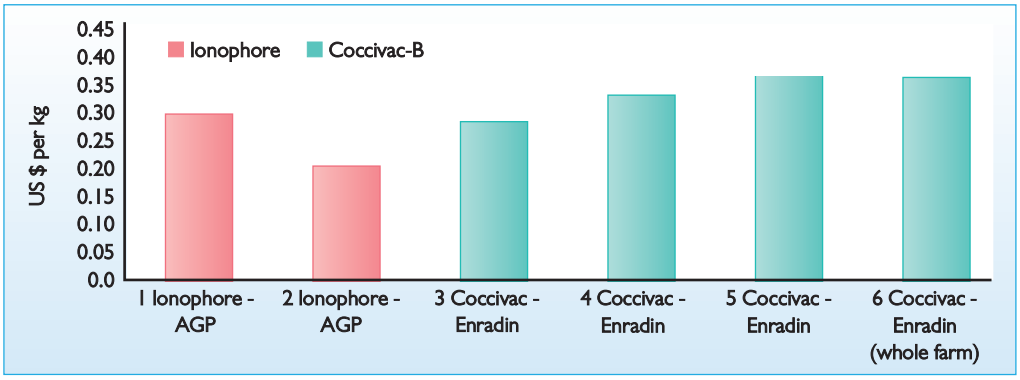

Fig. 2. Net profit (US$/kg).

Flock performance

Given the economic calamity an uncontrolled coccidiosis outbreak can visit upon a flock and the risk a sub-clinical infection can erupt with flock-wide consequences, producers routinely follow an intestinal disease control protocol. But which approach yields the best combination of effectiveness and return on the resources invested in disease control?

A recent study from MSD Animal Health reveals changes in intestinal disease control can result in meaningful improvement in flock performance.

The 2012 study, encompassing 120,000 broilers, revealed successive flocks vaccinated with Coccivac-B vaccine, paired with the antimicrobial Enradin, reduced the level of subclinical coccidiosis, while controlling secondary Clostridium spp. infections during the final, heavy growth phase of the flocks.

The study compared the performance of flocks treated with Coccivac-B and Enradin versus flocks treated with ionophores and the antimicrobial BMD and generic antibiotic growth promoters (AGP).

Using Flock Performance Index (FPI), that considered weight gain, viability (100-mortality rate) and feed conversion (g/g), as a measurement, each successive flock treated with Coccivac-B and Enradin had a higher index than the previous flock treated with the same protocol.

The greatest FPI improvement was noted when Coccivac-B/Enradin flocks were compared to flocks treated with ionophores and BMD.

The FPI improvement for the Coccivac-B/Enradin-treated flocks stabilised at >370 after three flock cycles, while the highest index for the traditional protocol topped out around 335.

Despite higher program costs, net profit for the Coccivac-B/Enradin flocks improved with each successive flock, rising US$ .071 per bird when compared to the best of the traditionally treated flocks.

"Coccivac-B is an investment whose return is improved intestinal health in a flock," explains Luis Etcharren, MSD's Regional Director for Poultry in LATAM.

"Vaccination of consecutive flocks lessens the coccidiosis challenge in the broiler house, allowing sustainable, effective control. In addition, Clostridium spp. control with Enradin represents added value that goes beyond disease control to enhance economic performance." ■

Table 1. Enramycin (Enradin) MIC_{90} of C. perfringens isolated from 1986-2012.

Antibiotic	1986	1990	1995	2002	2004	2006	2008	2010	2012
Enramycin (Enradin)	0.20	0.20	0.20	0.20	0.20	0.10	0.10	0.20	0.10
Bacitracin	–	–	3.13	25.00	–	6.25	25.00	–	6.25
Avilamycin	–	–	1.56	1.56	–	12.50	25.00	–	50.00