Natural alternatives to prevent necrotic enteritis

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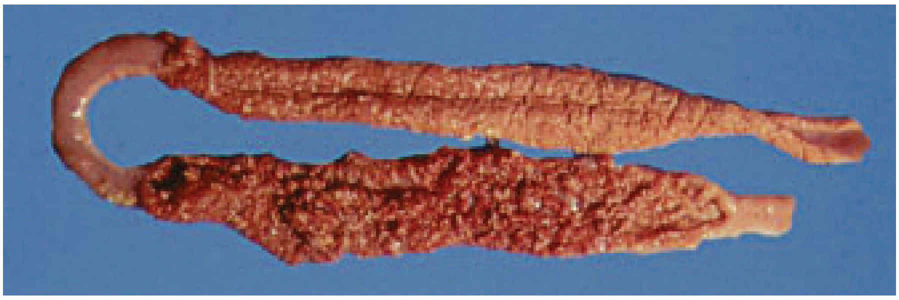

Consumer pressure and legislative action preventing the use of non-therapeutic antibiotics has broiler producers worldwide searching for natural alternatives to control necrotic enteritis (NE), a disease that costs them about $US0.05 per bird, and the global poultry industry an estimated $US2 billion each year.

In the European Union, most non-therapeutic antibacterial feed additives have been banned since 1999. Though no such ban currently exist in the United States, poultry producers with an eye on consumer trends and potential trade barriers also recognise the need to find natural methods to fight NE.

NE is a bacterial disease that destroys the intestinal lining of the digestive tract. Outbreaks generally occur in broilers ranging from 2-5 weeks of age. It is caused by Clostridium perfringens, a spore forming bacterium commonly found in soil, dust, faeces, feed, poultry litter, and in the intestine in small numbers.

Under normal conditions, the C. perfringens bacteria live harmlessly in the gut, as the pH and oxygen content of the healthy intestine does not support organism growth. When gut microecology is drastically altered, however, this delicate intestinal balance is tipped in favour of C. perfringens proliferation. The bacteria secrete toxins that cause the necrosis.

In its most acute form, birds suddenly die, many within a few hours, without showing any clinical signs of disease.

Mortality is usually between 2-10%, but can be as high as 40-50%. As bad as that sounds, birds with a milder, subclinical form of NE may actually cost broiler producers more money. These birds may suffer diarrhoea, appear depressed and have decreased feed intake.

This adversely affects growth rate, feed conversion and uniformity. One form of subclinical NE, a hepatitis or cholangiohepatitis, is found in broilers at processing. It has been estimated that broiler flocks have had losses due to liver condemnations as great as 20%.

The latest strategy in the early detection and treatment of NE involves focusing on enteric health. Its goal is to attain a stable intestinal microflora population.

The primary factors affecting gut environment, and generally regarded as triggering NE, include diet and damage to the intestinal mucosa by such things as mycotoxins and coccidia. Most natural approaches to NE prevention, therefore, involve controlling these factors.

Treatment		Coccidial challenge (25K E.a, 15K E.m)	C. perfringens challenge (10^8 CFU/bird)
1	No medication No challenge	NO	NO
2	No medication No challenge	Day 14	Days 18,19, 20
3	BMD 50g/t	Day 14	Days 18, 19, 20
4	Activate EU 0.04%	Day 14	Days 18, 19, 20
5	Activate US 0.04%	Day 14	Days 18, 19, 20

Table 1. Trial results.

It is thought the slowing down of gut flow during digestion allows C. perfringens bacteria to proliferate. Diets with high levels of fishmeal, wheat, barley, oats or rye, are generally less digestible and increase the viscosity of the gut contents, which may increase the incidence of NE. Though substituting higher concentrations of soybean meal and corn, which are more readily digestible, is one natural method to combat NE, it may not always be possible.

Adding digestive enzymes to barley, wheat or rye based diets aids digestibility and nutrient absorption, thus reducing clostridium growth.

Organic acids are another natural dietary addition that act against C. perfringens and other pathogens such as salmonella, campylobacter and listeria.

The acidic intestinal environment they create suppresses pathogenic bacteria while promoting beneficial bacteria

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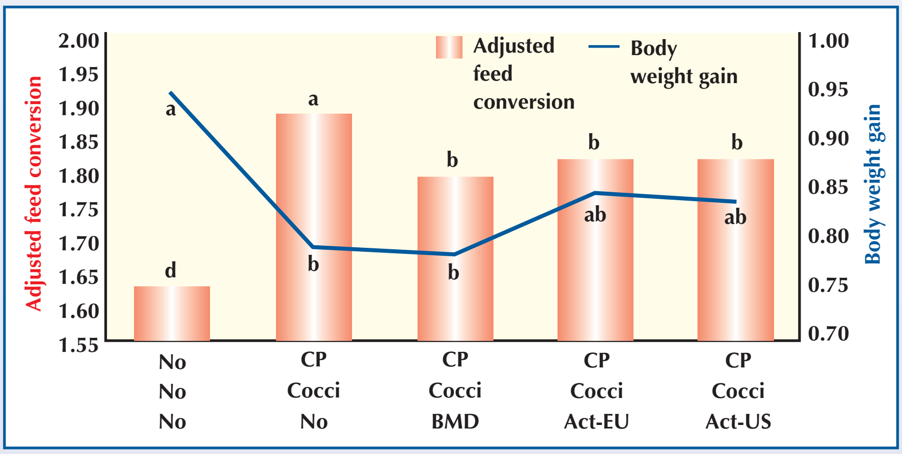
Fig. 1. Adjusted feed conversion and body weight gain at 28 days (a, b, P<0.05).



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growth. The degree of antimicrobial effect varies from one acid to another and is dependent on concentration and pH. Both individual acids and blends of several acids have been used in swine diets for decades and appear to provide many of the benefits of antibiotics.

In a recent research trial to study the effects of organic acids on C. perfringens colonisation and intestinal microbial populations using a NE model, 630 day-old chicks were placed in cages and divided into five treatment groups with nine replicates each.

The first group was the negative control and received no medication and was not challenged with pathogens. The second group received no medication, but was challenged on day 14 with coccidia, (Eimeria acervulina (E.a) at 25,000 viable sporulated oocyst/bird and Eimeria maxima (E.m) at 15,000 viable sporulated oocyst/bird), and on days 18, 19 and 20 with 10^8 CFU/bird of C. perfringens.

The third group was given bacitracin methylene disalicylate at 50g/ton and was challenged with coccidia and C. perfringens on the same days and at the same levels as the second group.

Groups four and five were given an organic acid blend via their drinking water at a 0.04% concentration. Group four received Activate Nutritional Acid Blends EU, an acid blend specifically developed for the EU, while the group five birds were given Activate US, a blend formulated for the US.

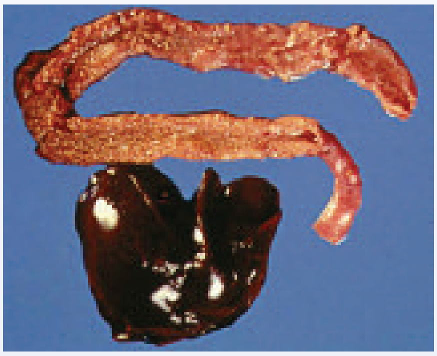
The group four and five birds were challenged with the same pathogens on the same days and at the same levels as the second and third group (see Table 1).

During the course of the trial, adjusted feed conversion, weight gain, lesion scores and mortality data were collected. The three groups receiving treatment three, four and five, showed marked feed conversion improvement when compared to group two, the non-medicated, challenged birds.

Additionally, supplementing the drinking water with the organic acid blend formulas was as effective as bacitracin methylene disalicylate in preventing feed conversion losses due to NE (see Fig. 1).

The two groups receiving the organic acid blends also had better weight gains than the challenged, non-medicated group and the group receiving bacitracin methylene disalicylate (4.6%).

A 4.2% improvement was seen over group two, and a 4.6% improvement over group three.



NE gross lesions were mild in all of the challenged treatments (see Fig. 2). The three medicated treatment groups were not statistically different when compared to the challenged, non-medicated group. A numerical advantage, however, was observed in the birds receiving bacitracin methylene disalicylate.

Similarly, there was no significant difference in mortality rate found among groups two, three, four and five, although a numerical advantage existed for birds receiving bacitracin methylene disalicylate (see Fig. 3).

These trial data provide evidence that organic acids can be used in broilers to decrease the negative impact of NE on performance and that they performed as effectively as bacitracin methylene disalicylate (BMD).

Relatively new to the war on NE are prebiotics. Prebiotics are non-digestible foods or nutrients.

They feed the beneficial bacteria in the gut, causing them to multiply at the expense of harmful micro-organisms.

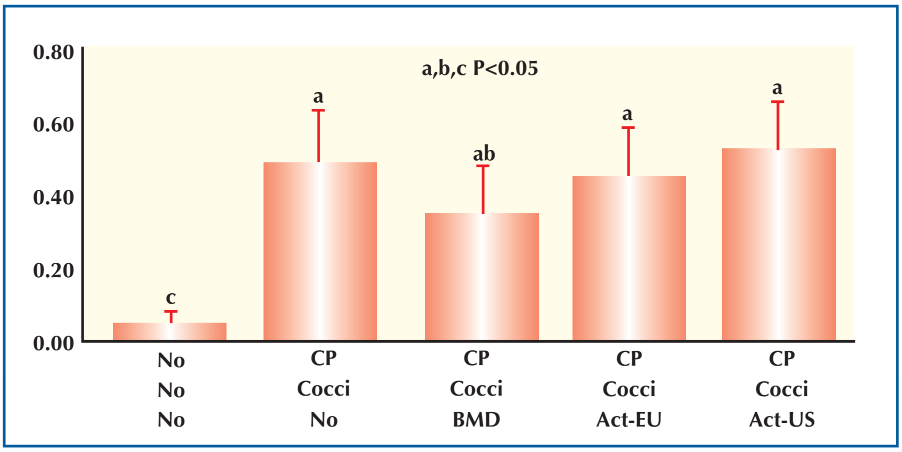


Fig. 2. Necrotic enteritis lesion scores at 21 days.

Prebiotics have been used to decrease salmonella colonisation; and recent research shows they also may be effective in reducing NE lesions in broiler chickens.

Because prebiotics feed beneficial gut microflora, they work hand in hand with probiotics. Probiotics are products that provide nonpathogenic bacteria to the gut, improving digestive tract health and balance. Some of these products lower intestinal pH, thus reducing the number of pathogenic bacteria in the gut.

Research shows feeding chicks a Lactobacillus acidophilus or Streptococcus faecalis probiotic could reduce C. perfringens pathogenicity.

Other products use the natural intestinal microflora of healthy adult chickens. Newly hatched chicks are inoculated with these products through the feed, water or through an aerial spray. The good bacteria travel and attach themselves to the intestinal tract sites pathogens prefer.

There, they multiply and colonise the gut, preventing the establishment of pathogenic bacteria and possible infection. Because the good bacteria out compete the bacteria for these sites, these products are known as competitive exclusion (CE) products.

Research shows using CE cultures from chicken intestinal microflora could lower the incidence of NE and reduce the amount of C. perfringens in the caecum.

CE cultures may also help prevent subclinical NE. It is known that coccidiosis can predispose broilers to NE and that NE can exacerbate coccidiosis.

As a result, coccidiosis control becomes a major concern in areas where preventative feed additive antibiotics are no longer allowed.

Trials show using ionophore anticoccidial agents is beneficial, because they also reduce anaerobic bacteria levels, such as C. perfringens.

With the ban on the use of non-therapeutic antibiotics, natural alternatives for combating NE are being researched and practiced. It appears that methods that focus on stabilising intestinal microflora may work well.

As long as we raise chickens, we will continue to have either clinical or subclinical necrotic enteritis.

This means that we will always need methods of preventing C. perfringens infections even if we lose the ability to use growth promotant antibiotics.

Understanding the multiple factors that can lead to NE will help utilise more natural methods, such as CE, organic acids, enzymes, probiotics and especially coccidiosis control. ■

Fig. 3. Mortality due to necrotic enteritis at 28 days.