NORTH AMERICA ISSUE 3

NEW STRATEGIES FOR

ENHANCING POULTRY VALUE

AND PERFORMANCE

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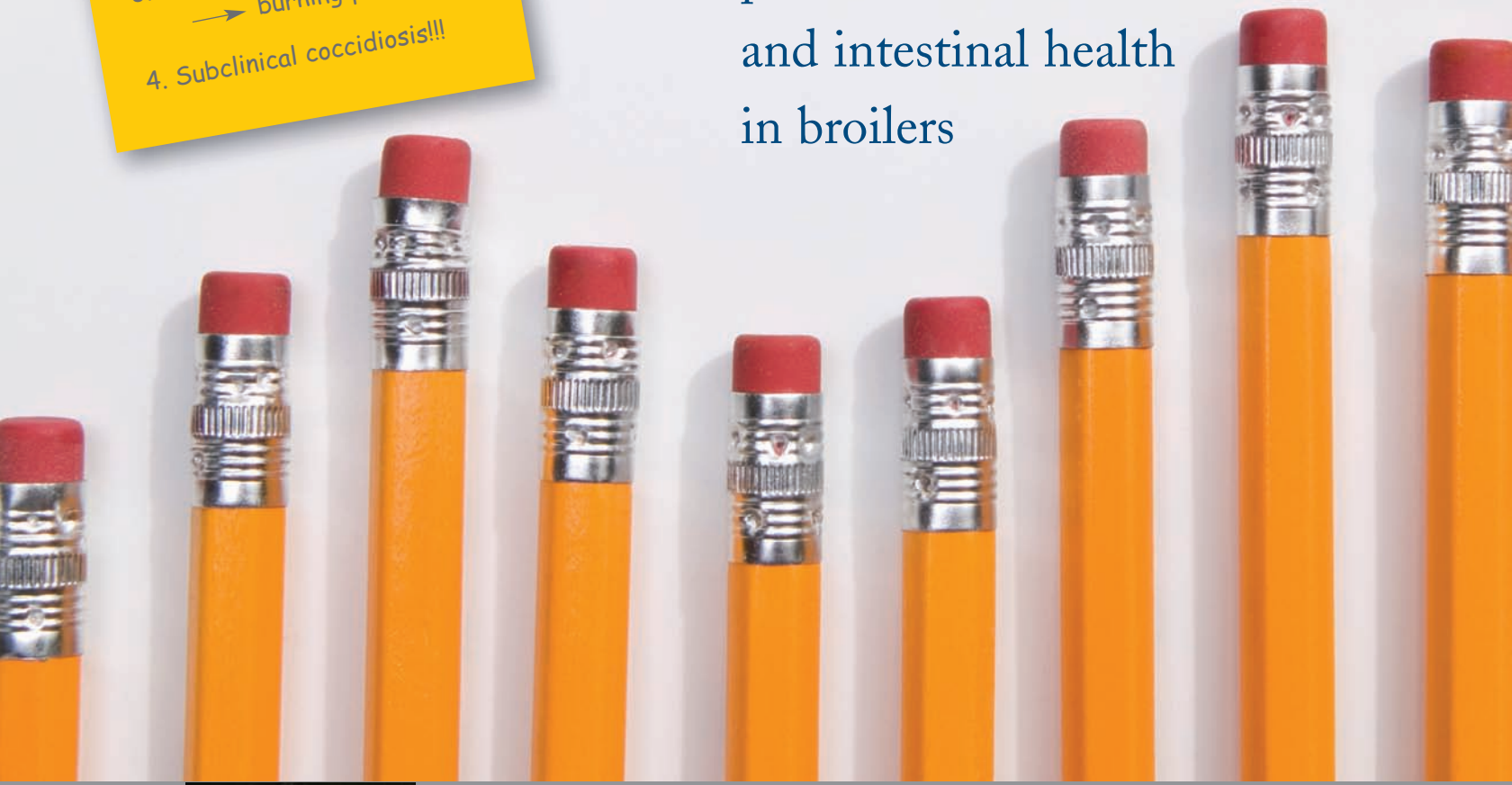
INTESTINAL health



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NEW STRATEGIES FOR
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AND PERFORMANCE

ISSUE 3

INTESTINAL health

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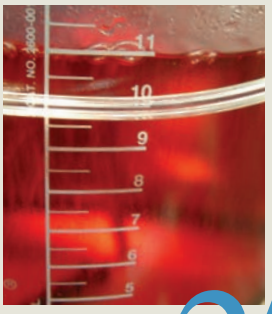
Georgia's Fieldale Farms was among the first US producers to market a line of drug-free poultry. Now, the innovative company is taking lessons learned on the drug-free side of its poultry operation and applying them to its intestinal health program for conventionally raised birds.

special report

What we've learned

The growing use of coccidiosis vaccines over the past decade has helped improve coccidiosis control in broilers while yielding several unexpected practical benefits for producers of both conventional and drug-free broilers.



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(on the cover)

Just as good nutrition can help determine the health of a flock, maintaining good intestinal health can also have a huge impact on nutrition. *Intestinal Health* reporters talked with top nutritionists and a leading US producer to learn how they're combining the best of both worlds. See pages 12 and 16.

Inset photo by Carol Streetman.

opinion: "More than 1 billion served"

Coccivac-B hit a milestone in 2009 and, for that matter, so did the US poultry industry.

For the first time in history, US poultry farms used more than 1 billion doses of the coccidiosis vaccine within a year. Based on USDA figures indicating that over 7 billion broiler chicks have been placed so far in 2009, we estimate that 13% of all US broilers were vaccinated this year with Coccivac-B — nearly double the number vaccinated in 2008.

Why the sudden surge in demand?

Internally, we like to point to our science-driven efforts to educate the market — in meetings, customer-service calls, top-rated technical service, *Intestinal Health* magazine and our new website (see page 5). These endeavors certainly factor into the equation, but more than anything, Coccivac-B is helping to meet our dynamic industry's changing needs.

Today, producers need a sustainable way to control coccidiosis in the face of growing resistance to in-feed anticoccidials. Several studies as well as experience in the field have demonstrated that by integrating Coccivac-B into the coccidiosis-control program, the effectiveness of worn-out anticoccidials can be restored because the vaccine seeds the house with *Eimeria* oocysts that have never been exposed to anticoccidials.

The industry has also needed to respond to public trends, especially the demand for poultry meat from birds raised with fewer drugs. Consequently, a growing number of producers are eliminating the use of in-feed anticoccidials and using Coccivac-B exclusively for coccidiosis control with excellent results.

...we estimate that 13% of all US broilers were vaccinated this year with Coccivac-B — nearly double the number vaccinated in 2008.

Several other factors have boosted the increased use of Coccivac-B. One is the development of the SprayCox II spray unit, which enables day-old chicks to conveniently receive the vaccine at the hatchery and ensures more uniform administration compared to water or spray-on-feed administration. Another factor is simply field experience, which has provided important lessons about how toget better results — like methods for modifying preening behavior to enhance vaccine intake.

In recent years, we've discovered that when immunity against coccidiosis develops early — as it does with Coccivac-B — it has less impact on the producer's bottom line. We've seen how Coccivac-B can simplify procedures at the feed mill since a withdrawal diet is no longer needed. (These and other lessons learned about Coccivac-B are detailed in the article on page 27.)

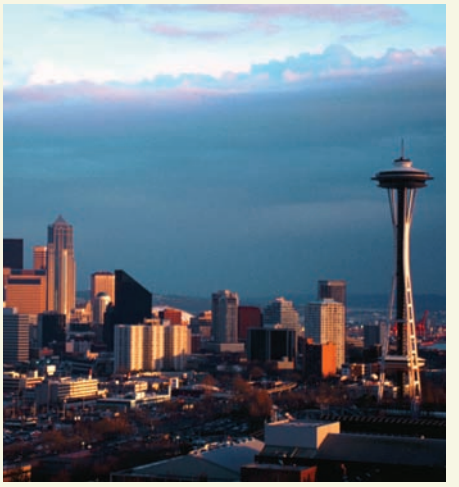
Since coccidiosis will always be with us, and in light of industry needs and public trends, we expect coccidiosis vaccination to continue its upward trajectory. We stand firm in our commitment to help poultry producers achieve optimal intestinal health, performance and profitability.

Rick Phillips, DVM
US Poultry Director
Intervet/Schering-Plough Animal Health

Email: richard.phillips@sp.intervet.com

Seattle

Seattle hosted the 2009 annual convention of the American Association of Avian Pathologists.



***E**imeria acervulina* is the coccidial parasite usually associated with necrotic enteritis, but recent research indicates that *Eimeria maxima* may be the more worrisome culprit.

In a study designed to examine the association between necrotic enteritis (NE) and *Eimeria*, broilers infected with various *Eimeria* species were challenged with *Clostridium perfringens*, the cause of necrotic enteritis.

Damage to the intestinal tract from *E. maxima*, *E. acervulina* and *E. praecox* worsened the pathogenic effects of *C. perfringens*, leading to NE, and except for *E. praecox*, all birds with *Eimeria* and *C. perfringens* experienced significantly decreased weight gain.

Infections with *E. maxima*, however, "greatly increased the probability of NE over the other species," and *E. maxima* had a much higher potential for causing mortality from NE than *E. acervulina*, Dr. Greg Mathis and colleagues found.

"We got almost 45% mortality from NE in broilers with *E. maxima* compared to about 5% in birds with *E. acervulina*," Mathis said in Seattle at the annual meeting of the American Association of Avian Pathologists, where the results of the study were presented.

'You've got to control *E. maxima*'

What are the implications of the findings for broiler producers? "You've got to control *E. maxima* to hold down NE," the researcher said.

If producers vaccinate for coccidiosis control, "get the vaccination program in as early as you can and get it as uniform as you can. By 18 or 20 days, *E. maxima* will be gone and you shouldn't have a problem," Mathis said.

innovations

New ideas, trends, products and technologies

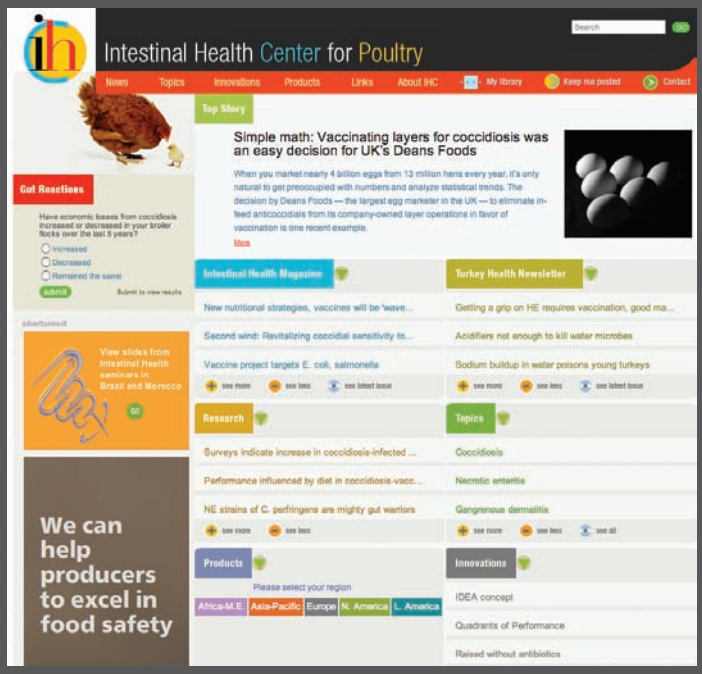
! Intestinal Health Center website offers rich content, dynamic features

Looking for the latest information on managing intestinal health in poultry?

Check out the Intestinal Health Center for Poultry (ihc-poultry.com) — a virtual treasure chest of online information assembled by the editors of *Intestinal Health* magazine and Intervet/Schering-Plough Animal Health.

Over the years, Intervet/Schering-Plough Animal Health has presented and published a wealth of practical, science-driven information and ideas to help producers manage costly gut diseases more effectively through vaccination, nutrition, sanitation and prudent drug use.

"The new website lets you find virtually anything you need, quickly and easily, on specific intestinal health topics and products," says Marcelo Lang, global marketing director for the company's Poultry Business Unit.



The website is driven by a vigorous content-management system that automatically searches the library and creates new dropdown menus every time users select a topic or product. For example, clicking on "Necrotic Enteritis" brings users to a page describing the disease and a menu of 36 articles, five technical papers, one brochure, eight slide presentations and seven podcasts, as well as 15 items produced in Spanish.

Once users find information that interests them, they can read the document online or click on icons to print or email it. They can also create their own library of "favorites" and sign up to be informed about new information on specific topics.

The website also offers a library of past issues of the company's *Intestinal Health* magazine and its predecessor, *CocciForum*, as well as three newsletters — *Broiler Health, Layer Health* and *Turkey Health.*

In addition, the website includes an interactive feature called "Gut Reactions," where visitors can answer a frequently updated survey question related to intestinal health, immediately view survey results and then access links with more information on that topic. There is also a handy product finder to help users locate Intervet/Schering-Plough Animal Health intestinal health products available in their market.

"The Intestinal Health Center for Poultry is another example of Intervet/Schering-Plough Animal Health's commitment to educating the industry about this increasingly important segment of poultry health," Lang says. "We look forward to getting feedback on the site so that we can make it even better."

research watch

NE bacteria same on organic, conventional farms

Clostridium perfringens is the toxin-secreting bacterium most often associated with the development of necrotic enteritis (NE). But what happens to *C. perfringens* organisms when birds are grown without the use of anticoccidials and growth promoters? Do the bacteria mutate to genotypes that might not respond to antibiotic-free strategies, such as vaccination against NE?

Results from a Canadian study indicate this is not the case — that organisms that populate organic houses are likely to be similar to those found in conventional houses, and so are the signs of NE disease they cause.

Jessica Brady and colleagues from the University of Manitoba's Department of Animal Science characterized *C. perfringens* isolates from a naturally occurring outbreak at an organic farm. They found that in terms of cellular structure, the type of toxin secreted and the disease signs the toxins produced, all isolates were similar to conventional houses. *C. perfringens* isolates also remained sensitive to standard antibiotics.

"An outbreak is an outbreak, so you're going to see the same signs," Brady reported recently at the annual meeting of the American Association of Avian Pathologists.

She said it's critical for producers to control factors that predispose birds to the development of NE. Those include pre-existing organisms, feed quality, biosecurity, cleaning and disinfection, and the quality of vaccination programs.

Alpha-toxoid vaccines have been shown to be protective against NE and their use may decrease the intensity of NE, but the best approach is a "multi-factorial system" that also includes good feed quality, biosecurity, and cleaning and disinfection, added Brady, whose colleagues in the study were C. Rodriguez-Lecompte, J.D. Hernandez, J.D. House, C. Bennett and W. Guenter.

Bismuth citrate may help control NE

Bismuth citrate, a citric acid salt, may help control necrotic enteritis in broilers, indicates preliminary research conducted by researchers at Texas A&M University.

Necrotic enteritis (NE) is a costly disease caused by the bacterium *Clostridium perfringens*. The incidence of NE has increased due to the reduced use of in-feed antibiotic growth promoters with anticlostridial activity, they say.

The first of three separate, controlled studies was designed to determine a dose response to bismuth citrate in broilers challenged with isolates of *C. perfringens* obtained from active field cases in Virginia, North Carolina and Georgia. When 100 or 200 ppm bismuth citrate was fed, broilers had reduced intestinal *C. perfringens* colonization and lesion development compared to birds not fed bismuth citrate. Bismuth citrate fed at 50 ppm also reduced intestinal lesions but did not reduce colonization.

In the second study, the investigators also fed the acidifiers lactose or citric acid to determine if they would enhance the effects of bismuth citrate, which was evaluated by *C. perfringens* colonization and pH levels. No significant interactions were found. However, the addition of lactose along with bismuth citrate did significantly reduce intestinal pH when compared only to negative controls — birds that were treated but not challenged, say K. Stringfellow and colleagues.

A third study further evaluated the effect of lactose and bismuth citrate on *C. perfringens* colonization and lesions. Birds challenged with *C. perfringens* had significantly reduced NE lesions compared to birds receiving control diets, the researchers say in the November 2009 issue of *Poultry Science*.

The investigators point out that bismuth compounds have been used to treat gastric disorders in humans for over 300 years, and in poultry, bismuth citrate has been shown to reduce cecal colonization by other pathogens. Lactose has been used to reduce pathogens in poultry, and citric acid was included in the study because of speculations that it decreases the pH of intestinal contents.

"In conclusion, bismuth citrate treatments of 100 ppm and 200 ppm significantly reduced *C. perfringens* colonization and intestinal lesion development," the investigators say.

Waves of Progress

The Delmarva Poultry Industry, Inc., recently sponsored THE 44TH NATIONAL MEETING ON POULTRY HEALTH AND PROCESSING, *held in Ocean City, Maryland.* Intestinal Health*'s news editor, Diana Delmar, attended and provided the following coverage.*

BROUSSARD:

Spray it on

The results of a recent study indicate that the method used to vaccinate chickens for coccidiosis can have a significant impact on the percentage of them that are successfully protected.

A coccidiosis vaccine sprayed on at 1 day of age yielded a vaccine take that was 60% higher compared to an *in ovo* coccidiosis vaccine, said Dr. Charlie Broussard, director of US technical services for Intervet/Schering-Plough Animal Health.

The initial part of the study was conducted at a commercial hatchery in Maryland. Broiler chicks received Coccivac-B with a SprayCox II unit at 1 day of age, or an *in ovo* coccidiosis vaccine was administered to 19-day-old embryonated chicken eggs. Both vaccines contain live coccidial oocysts.

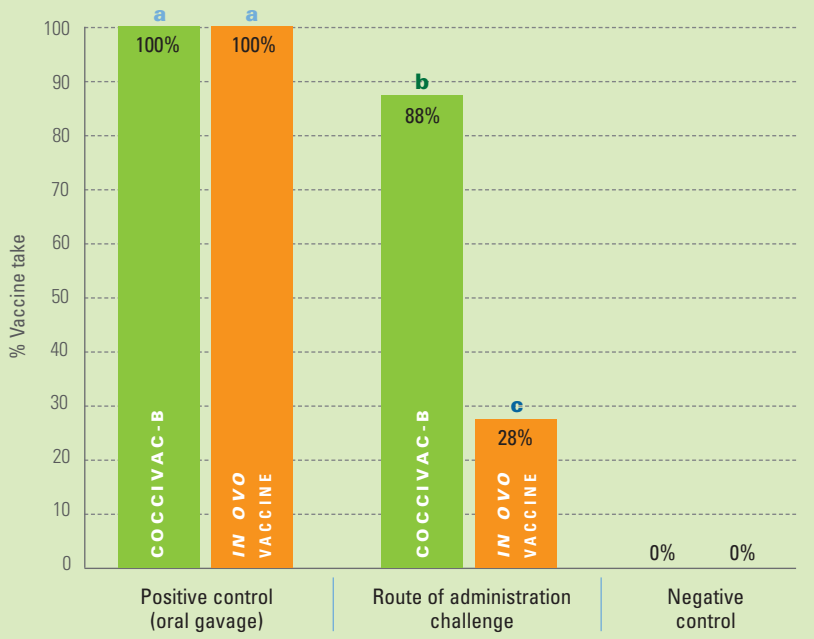
The study also included three controls. One control group received no coccidiosis vaccine. The other two received an oral gavage of either Coccivac-B or the *in ovo* vaccine to demonstrate the effectiveness of both vaccines when a sure-fire method of administration is used.

After vaccination of birds that received Coccivac-B and after hatch of the *in ovo* group, birds in each group were independently segregated to ensure they were not infected with oocysts from hatch-mates, he said.

Investigators measured first-cycle output to determine the effectiveness of the vaccine-administration methods. For this part of the study, they individually numbered and tagged the birds before moving them to segregated units at the University of Delaware's Lasher Lab, where Drs. Dan Batista and Miguel Ruano microscopically analyzed feces.

Dr. Charlie Broussard

Figure 1 **Efficacy of coccidiosis vaccination can vary with administration method.**



Note: Different letters in bar groups represent statistical significance

Figure 1. Vaccine take with the spray coccidiosis vaccine Coccivac-B was significantly better than with the *in ovo* coccidiosis vaccine.

"If one or more coccidial oocysts could be identified on any day of the trial period, which was 5 to 8 days post-hatch, then the bird had a positive vaccine take," Broussard said in an interview after the meeting.

The group sprayed with Coccivac-B on the day of hatch had a vaccine take of 88%, compared to 28% in birds that received the *in ovo* vaccine, he said (Figure 1).

As expected, vaccine take was 100% in birds that received either Coccivac-B or the *in ovo* vaccine by oral gavage. None of the unvaccinated control birds shed oocysts.

Why was vaccine take so much better for spray vaccination than *in ovo* administration?

"*In ovo* administration of a coccidiosis vaccine is a lot more difficult," Broussard said.

With *in ovo* coccidiosis vaccines, live coccidial oocysts need to get to a certain area in the egg where they can be swallowed, then move to the gut, where they infect intestinal epithelial cells and initiate immunity. In addition, unhatched birds don't have digestive enzymes at work to break up and aid the digestion of oocysts releasing the infective sporozoites, he explained.

"With other types of vaccines, such as viral vaccines, it doesn't matter whether you give them *in ovo*, subcutaneously or intramuscularly — you achieve your goal. The margin of success is just a lot better than it is when compared to a coccidiosis vaccine," he said.

"*In ovo* administration of a coccidiosis vaccine is a lot more difficult."

PUTNAM:

'Living on the edge' with coccidiosis control

To get the best results, it's also imperative that the poultry company's live-production staff is "on board" with whatever coccidiosis-control program is implemented.

"If you don't think immunity, you are living on the edge" when it comes to coccidiosis control, said Dr. Marshall Putnam, director of health for Wayne Farms, LLC, Oakwood, Georgia.

Immune-system status is the foundation for any successful coccidiosis-control program, he emphasized.

Putnam cited a study demonstrating that driving oocyst leakage and coccidial cycling late into the production cycle costs money because it's a time when birds grow and eat the most. In addition, late coccidial cycling can leave the house over-burdened with coccidial oocysts, which can be too much for the next flock. Instead, "we want to promote [oocyst] leakage up front," when coccidial cycling has the least impact and enables birds to develop immunity early in life, he said.

One way to achieve early cycling is with coccidiosis vaccination because "you're done with oocyst cycling by 28 days of age," the veterinarian said. The goal at Wayne Farms, which rotates a coccidiosis vaccine with anticoccidials, is to maintain consistent bird performance, flock after flock, regardless of which coccidiosis-control method is used. "No change in performance means we're managing well," he added.

'LOOK AT A WHOLE YEAR'

Putnam advised against making changes in the coccidiosis-control program based on minor fluctuations in performance that might occur over a week or two. "I like to look at a whole year and from year to year, not week by week," he said. This approach can help identify other factors that affect coccidiosis control such as house conditions, litter moisture, old versus new litter, bird density and the immune-system status of the birds.

To get the best results, it's also imperative that the poultry company's live-production staff is "on board" with whatever coccidiosis-control program is implemented, he said. Putnam recommends posting sessions to measure the effectiveness of coccidiosis-control programs.

Dr. Marshall Putnam

HOFACRE:

Coccidiosis called 'primary trigger' for NE

Coccidiosis is a "primary trigger" for necrotic enteritis, a costly but sometimes undetected gut disease that is a risk with any anticoccidial program that allows coccidial oocyst cycling, said Dr. Charles Hofacre of the Poultry Diagnostic and Research Center, University of Georgia, Athens.

Virtually all poultry farms have coccidiosis and coccidial cycling — the reproduction of coccidial oocysts — which cause damage to the intestinal cells, leading to mucus production and disrupting the balance of bacteria in the gut, he said. Mucus is a food source for *Clostridium perfringens*, the organism that causes necrotic enteritis (NE).

ROLE OF ALPHA-TOXIN

Not all types of *C. perfringens* produce the alpha-toxin that leads to NE, but the ones that do cause more gut damage as they proliferate, which leads to more mucus and more *C. perfringens*, he said.

Antibiotics and anticoccidials control *C. perfringens* and prevent NE, but with the pressure on to use fewer drugs in food animals, producers are searching for other methods of controlling NE. One way is to maintain a healthy balance of bacteria in the gut to prevent clostridia from gaining a foothold. This may be accomplished by using coccidiosis vaccines, *C. perfringens* toxoids and competitive exclusion products, Hofacre continued.

Dr. Charles Hofacre

Coccidiosis vaccines contain live oocysts that cycle and produce more oocysts. However, oocyst cycling after vaccination on the day of hatch allows birds to develop immunity to coccidiosis early in life, when the disease has less impact than it does later in the production cycle.

Once vaccinated birds develop immunity to coccidia, they won't have the major trigger for intestinal damage and will have a healthier gut, which makes them less susceptible to NE. "If properly administered," Hofacre added, "coccidiosis vaccination should minimize NE."

PASSING ON IMMUNITY

He pointed out that *C. perfringens* toxoids have been used successfully to control clostridia in several other food animals for many years. Asked about field experience with a *C. perfringens* toxoid that's being commercially developed by Intervet/Schering-Plough Animal Health, he explained that the toxoid is administered to breeders, which pass on immunity against *C. perfringens* to broiler progeny.

"I've not done challenge studies myself," he responded, but "it does seem to work from the results of studies I have seen. It probably modulates the gut flora and keeps *C. perfringens* digestive enzyme toxins in check so that *C. perfringens* doesn't colonize the young chicks' intestines. It may well have a place in NE control."

Competitive exclusion products are another way to help maintain a healthy balance of gut bacteria. Other products being investigated for control of NE include organic and inorganic acids in water and feed, digestive enzymes, essential oils and herbal extracts, he said.

MATHIS:

Immunity development crucial for successful coccidiosis control

Dr. Greg Mathis

The development of immunity against coccidia is crucial for any successful coccidiosis-control program, said Dr. Greg Mathis, president of Southern Poultry Research, Inc., Athens, Georgia.

"With each cycle of coccidia in the host, immunological protection increases," he said. "The development of self-limiting immunity, which eventually protects a flock, is a very critical objective for a coccidiosis-control program, whether [it be] vaccination or an anticoccidial-drug program."

Anticoccidials are still successfully used to control coccidiosis in poultry, but numerous reports have demonstrated that coccidial oocysts are less sensitive to both ionophores and chemical anticoccidials. With ionophores, some coccidial parasites survive and stimulate immunity, while chemical anticoccidials permit only limited immunity development, said Mathis, a coccidiosis expert.

SIGNIFICANT IMMUNITY

Reduced coccidial sensitivity coupled with increased public demand for drug-free birds has led to increasing use of coccidiosis vaccines in the last few years, Mathis continued. With vaccines, a controlled dose of live coccidial oocysts is administered at an early age. Significant immunity develops by 14 days after vaccination, allowing birds to withstand a substantial coccidial challenge by 21 to 28 days of age.

"Vaccination programs can equal effectiveness and performance" of anticoccidial-drug programs, he added.

Vaccines are also used to restore the sensitivity of coccidia to anticoccidials by seeding the house with oocysts that are still sensitive, Mathis said.

The *Eimeria* oocysts in Coccivac-B are not attenuated (altered to reduce their virulence) and are "very sensitive to anticoccidial drugs," Mathis said. The vaccine's oocysts are generally milder than field strains but maintain their reproductive and immune-stimulating characteristics.

TESTING RECOMMENDED

Mathis concluded that even though coccidiosis is ever-present on poultry farms, it can be controlled. When using in-feed medications, he recommended anticoccidial sensitivity testing to determine which ones, or if any, will be effective on a given farm.

If vaccinating to control coccidiosis, he suggested paying close attention to proper vaccine storage, careful vaccine application and good farm management to achieve the best results.

In response to a question about whether oocysts in coccidiosis vaccines could develop resistance to anticoccidials, Mathis and other speakers gave a resounding no. Coccivac-B, for example, was developed in the 1950s, well before anticoccidials were introduced. Oocysts in the vaccine have never been exposed to anticoccidials; each time the vaccine is used, sensitive oocysts are introduced into the poultry house.

‘We take care of the little things’

Georgia’s Fieldale Farms was among the first US poultry companies to begin marketing a line of drug-free poultry. Now, the innovative producer is taking lessons learned on the drug-free side of its poultry operation and applying them to its intestinal health program for conventionally raised birds.

“We take care of the little things,” Dr. David Wicker, director of live operations at Fieldale, says modestly of the company’s success.

Lots of little things, apparently. In a recent visit to Fieldale Farms, *Intestinal Health* sat down with Wicker and his associate, Dr. John Smith, director of health services, to talk about Fieldale’s operation and its winning formula for growing birds, managing disease and meeting the changing needs of consumers.

‘No asterisks’

Wicker, who has been with the company since 1994, says just under a quarter of the 3.2 million birds Fieldale processes each week are for the company’s Springer Mountain Farms brand. Those birds receive no coccidiostats, no chemicals, no antibiotics. “That means not in the feed, not in the water, not by any other route,” Wicker says, adding “There are no asterisks on our birds.”

In addition, all Springer Mountain Farms birds are certified by the American Humane Association.

The rest of their flocks are conventionally raised using a closely monitored rotation of approved in-feed anticoccidials, antibiotics and vaccines.

'Get them started right'

The drug-free Springer Mountain birds are generally in the range of 2.7 kg (6 lbs) when sent to processing, while conventionally raised birds are grown to three sizes: 1.9 kg (4.20 lbs) at 37 days; 2.6 kg (5.85 lbs) at 47 days; and 2.7 kg (6 lbs) at 50 days.

Fieldale processes about 165 million birds each year. “We’re about three times the size of an average complex, so that gives us a lot of flexibility for separating our conventional birds into the various weights when we get them to our processing plants,” Wicker explains. The company does not separate birds by gender.

Like most commercial poultry operations, Fieldale uses four different rations for its birds — a starter, a grower, a finisher and a withdrawal feed. Fieldale nutritionists naturally pay close attention to all their birds’ rations. But, Wicker adds, “That’s especially important with drug-free birds — to get them started right since they don’t have antibiotics to help them along.”

For example, even relatively small differences in the quality of feeds and the way they are milled can make a big difference in how birds start and grow, he says.

continued

Subclinical disease saps profits

The diseases that pose the most significant challenges for Fieldale, in terms of maintaining performance and profitability, are infectious bronchitis, infectious bursal disease (IBD) and, more recently, runting and stunting syndrome (RSS). "IBD and RSS are immunosuppressive, so that means that even at subclinical levels, they're eating away at our bottom line — the performance of our birds," Smith says.

In drug-free birds, Fieldale has been relying primarily on biologicals to bolster immunity, both at the maternal level and at the individual broiler level. In all of their birds — both drug-free and conventional — they use commercial killed vaccines to control IBD. In their breeder hens (which supply chicks for both the drug-free and the conventional brands), they augment that regimen with autogenous bursal vaccines.

Smith explains that the bursal program in the hens is aimed not at controlling IBD in the hens but, rather, protecting their broiler progeny.

They have also been experimenting with some of the new recombinant vaccines derived from turkey herpesvirus — so-called HVT-vectored vaccines — to combat infectious laryngotracheitis and IBD.

"I think that for a grower who's dealing with dermatitis, coccidiosis vaccine would certainly be one of the options he would want to consider."

DR. JOHN SMITH

Smith: "Even subclinical levels [of coccidiosis] impact the growth of our birds."

Coccidiosis is another major concern for Fieldale. "It's something we have to deal with on nearly a constant basis because we know that even subclinical levels impact the growth of our birds," Smith says.

Fieldale's approach to control includes vaccinating against coccidiosis and, in conventional birds, vaccination in rotation with judicious use of ionophores. During winter, when cold and dampness tend to put extra stress on birds, they shuttle in synthetic or chemical anticoccidials plus ionophores. For the remainder of the year they tend to run ionophores only but rotate them as needed.

The impact of late coccidiosis challenge

Recent studies conducted by veteran poultry researcher Dr. Robert Teeter, a nutritionist at Oklahoma State University, show that although coccidiosis is costly at any time in the broiler's life, it is most costly when it occurs late in the production cycle, when more money has been spent on feeding and housing the bird.

Smith has made similar observations, though he arrived at that conclusion from different experience. When the anticoccidial diclazuril became available to the US poultry industry 9 years ago, it had a dramatic effect — not just on coccidiosis but also in opening everyone's

eyes as to how costly subclinical coccidiosis can be. The added control of the new anticoccidial also helped improve feed-conversion rates.

“Frankly, it was shocking to a lot of us,” Smith says. He points out, however, that diclazuril, like other anticoccidials, eventually ran up against problems with resistance, so Fieldale and other growers had to scale back on its use. Still, their brief affair with diclazuril demonstrated to Fieldale and to other producers that they could be more diligent controlling coccidiosis and thus ensure better control late in the growing cycle.

“That’s where coccidiosis vaccine comes in,” Smith says. “It allows you to rest the drug for a period of time. Research has shown that helps you restore some drug sensitivity.”

Maintaining flexibility is key

Smith says that in their conventionally raised birds he rotates drugs and vaccines to make sure birds have especially good protection during winter and spring when coccidiosis pressure is greatest. Oftentimes decisions about which drug or vaccine to use are made case by case, with no set pattern for specific control options. If, for example, moisture and oocyst levels in a house are not favorable in the late winter/early spring, then conventional birds may remain on in-feed anticoccidials longer than usual. If conditions are not so challenging, birds may go on a vaccine sooner.

> “There are no asterisks on our birds.”
>
> DR. DAVID WICKER

“For us, that’s one of the main differences between the conventional and drug-free birds,” he says. “With the conventional birds, litter condition is somewhat less critical. But with drug-free birds, it’s essential you maintain good housing conditions all the time.”

Wicker adds that Fieldale invests considerable time and expense working with contract growers to maintain good housing conditions. That investment has paid off. “The better the growing conditions you have, the more efficient the birds are,” he says.

Necrotic enteritis has not been a significant problem for Fieldale, especially during the past couple of years. Both Wicker and Smith think that may be partly due to the long-time experience the company has accumulated in raising drug-free birds.

Necrotic enteritis (NE) is a complex disease that’s not totally understood, but some researchers believe that intestinal irritation, from coccidiosis or other causes, can provide a portal for the most common causative organism, *Clostridium perfringens*. Wicker and Smith say they think that keeping birds’ intestinal tracts healthy can go a long way toward preventing problems with NE.

continued

Gangrenous dermatitis: an intestinal link?

Some researchers think another profit-sapping disease, gangrenous dermatitis (GD), may, too, be linked to poor intestinal health — specifically, coccidiosis "leakage" that can occur when tired in-feed anticoccidials give way to coccidial organisms late in the broiler's life cycle. Though evidence is circumstantial, experience at Fieldale perhaps adds some credence to that theory.

Fieldale's drug-free birds, which obtain lifelong protection against coccidiosis from vaccination, don't experience problems with GD either, even during the challenging winter months when GD can affect as many as 20% of Fieldale's conventional birds. Smith says, "I think that for a grower who's dealing with dermatitis, coccidiosis vaccination would certainly be one of the options he would want to consider."

Wicker: "You could say we're nimble on our feet."

Another strategy Fieldale has been employing — and one that's been used more steadily in recent years — is using enzymes in their birds' diets to help cut down on phosphorus intake and increase the digestibility of the ingredients that are already in the feed.

The progressive Fieldale operation optimizes the use of alternative ingredients in its feeds — the newest being distillers' grains, a byproduct of the ethanol industry. Pearl millet is another alternative ingredient they have evaluated, though recently it has become less attractive due to price increases. Wicker works closely with the extension service at the University of Georgia to find alternatives that can be grown locally, thus helping cut down on costs of getting ingredients to the mill.

There has been considerable research in recent years showing that certain grains irritate the delicate gut lining of chickens more than others. Researchers have found that that sort of irritation can make birds more susceptible to diseases like coccidiosis, necrotic enteritis and gangrenous dermatitis.

Wicker says Fieldale maintains close scrutiny of how various feed components affect their birds. "We have the best lab in the industry for analyzing our feed," he says, adding that if a problem becomes apparent he's not shy about calling suppliers of ingredients, or purchasing or milling to make sure it gets resolved quickly.

Combining big-company/ small-company traits

So in the view of these two veteran poultry managers, what are Fieldale's greatest strengths?

"We've got a compact, family-run organization," Wicker says. "We're not spread out into seven states." That means that both he and Smith can see any of their flocks within an hour and a half.

But on the other hand, Wicker continues, "We're not too small. We can afford to have a nutritionist here. We can afford to have a veterinarian here." And that blending of big-company/small-company traits, Smith says, allows Fieldale to respond quickly and effectively to rapidly changing situations.

Wicker adds with a smile, "You could say we're nimble on our feet."

Nutrition Notebook

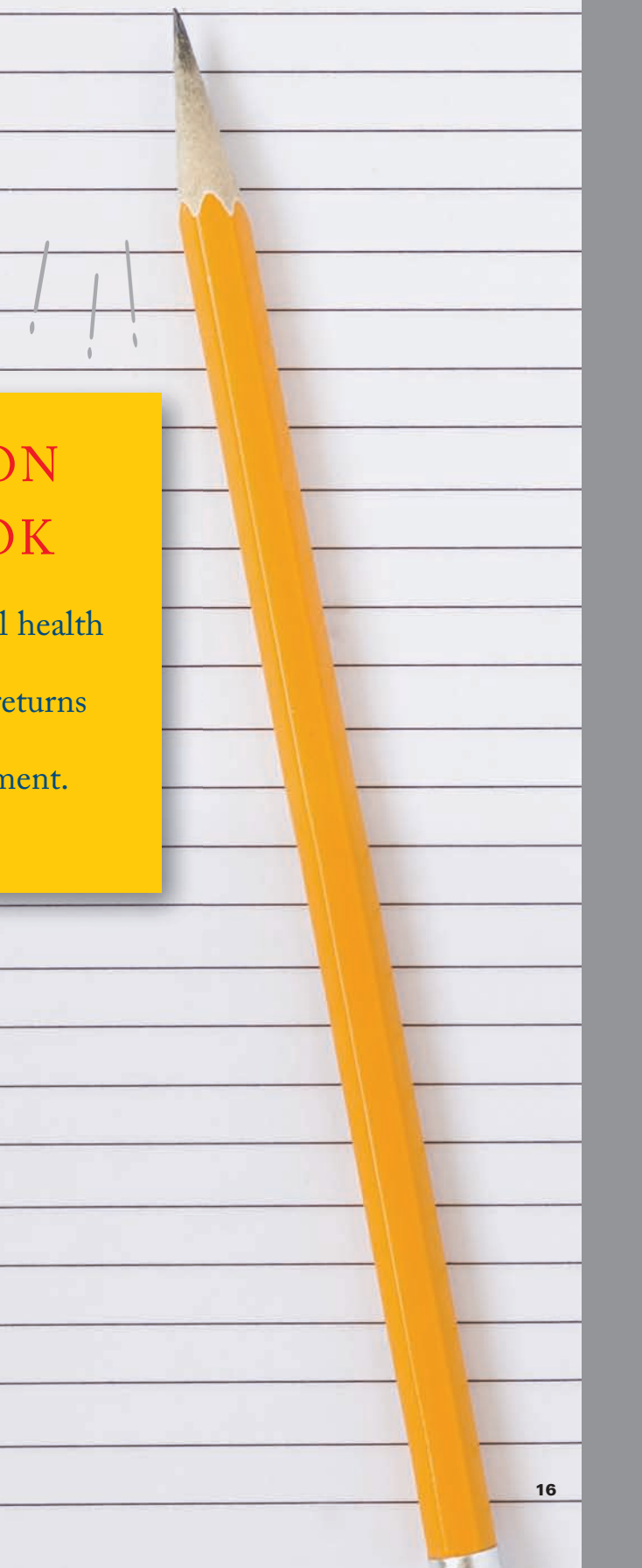
Improving intestinal health can help boost the returns on your feed investment.

About 250 key decision makers from major poultry companies gathered in Mexico recently for an in-depth look at the latest strategies for optimizing intestinal health and maximizing feed absorption in broilers.

The 2-day event in Cancun, organized by Intervet/Schering-Plough Animal Health, featured fact-filled presentations from recognized experts in the Americas.

The first three articles summarize presentations by DR. AMY BATAL, University of Georgia; DR. TOM FROST, Wayne Farms, Oakwood, Georgia; and DR. ROBERT TEETER, Oklahoma State University.

The fourth article is based on a recent interview with DR. PHILLIP HARGIS, a consulting nutritionist in Batesville, Arkansas.



Impact of biofuels on feed poses challenges for producers

Dr. Amy Batal

As the poultry business finds its way in the 21st century, one of the most significant challenges facing producers is how to respond to the rapidly evolving biofuels industry.

Biofuels are a relative newcomer in the poultry industry mix, said Dr. Amy Batal, a professor of poultry nutrition at the University of Georgia, Athens. "It's an immature business, still going through its growth phase, so it's changing quickly."

When ethanol plants make ethanol, they use only the starch from corn and other grains. The remaining mash contains nutrients such as protein, fiber and oil, which are the byproducts used to make feed for poultry and other animals. These byproducts — dried distillers' grains with solubles — are commonly known as DDGS. The solubles portion is the liquid that is separated from the mash during processing but then added back in reduced amounts.

About one-third of the grain used for ethanol production ends up as DDGS; each bushel produces about 2.7 gallons of ethanol and about 18 pounds of DDGS.

Presently, about 6% of the total DDGS produced in the US is fed to poultry, Batal said.

Practical DDGS considerations

A primary concern with DDGS is product consistency. The amount of solubles added back in to DDGS has a direct impact on nutritional value, Batal said. If too much soluble is added, or it is added too quickly, it can bind up the grain and produce syrup balls, which can lead to loss in energy value.

Another factor that affects variability is the quality of grain used to produce the product. Corn from one area of the country may have a significantly different nutritional value than corn from another area.

DDGS may vary depending on how the product is processed, such as how long the grain is left to ferment and which enzymes are used to make the product.

DDGS color is not generally a reliable indicator of energy value, Batal said. However, color can be a clue to a product's content of digestible lysine, Batal said. Products with very dark hues tend to have significantly reduced levels of digestible lysine, but moderately hued products usually contain acceptable levels of lysine, she said.

Drying is a key factor in lysine availability. Higher temperatures and longer drying times tend to reduce

lysine availability. However, it also tends to increase the availability of phosphorus, a vital component.

Batal pointed out, however, that DDGS tends to be high in available phosphorus anyway — much higher than corn — which is one of its main benefits.

Phytase boosts phosphorus

Some growers, Batal continued, are using phytase to enhance the availability of phosphorus in DDGS, and that approach appears to have merit.

Sodium content in DDGS is an important factor, and in recent years varying levels in feed have produced problems, Batal told attendees. Sodium is commonly used to clean fermentation tanks, which often leaves residues.

In her lab, Batal has evaluated samples with sodium values ranging from less than 0.05% to as high as 0.50%. "That's a big range," she said, "and if you don't monitor that and formulate for the right dose of sodium, you can have problems."

Finding the right mix of DDGS

Opinions vary about the optimal inclusion rates for DDGS in poultry feed. That is especially true in broiler production, where DDGS levels vary from 2% to 8%, depending on price and competition with other ingredients. Industry averages for laying hens is more consistent — about 10%. Inclusion rates for turkeys vary from 5% to 15%, with a few growers using as much as 40% DDGS (see Table 1).

Receiving and storing DDGS can present challenges, Batal said. An example: If DDGS still hot from processing is loaded directly into trucks or rail cars, it can harden, making it nearly impossible to unload. But Batal said ethanol plants are becoming more aware of that potential snafu and are allowing DDGS to cool before loading.

Batal also said it's important to monitor the moisture content of DDGS, especially during summer months, since levels above 11% can result in mold.

New DDG products add other options

Ethanol manufacturers are developing new byproducts for the market in an effort to increase their operational profits. Most involve splitting the corn kernel into various components either prior to fermentation or afterwards. Common byproducts, besides DDGS, include food-grade corn oil and bran products that can be burned for energy.

Batal stressed that new ethanol byproducts are a rapidly developing market and that many new feed products — with widely varying nutritional content — are likely to appear over the next few years. "It's important to familiarize yourself with what's new and to make sure you have accurate nutritional values for anything you consider using," she said.

"It's an immature business, still going through its growth phase, so it's changing quickly."

Table 1 **DDGS in poultry diets**

Broilers (industry averages 2% to 8%)	Laying hens (industry averages around 10%)	Turkeys
6% - 9% inclusion rate during starter period	10% inclusion rate during peak production	5% inclusion rate during starter period
12% - 15% inclusion rate during the grower and finisher periods	15% inclusion rate after approximately 36 weeks of age — after peak production	15% inclusion rate during the grower and finisher periods

Soaring feed prices prompt creative ingredients, processing

Dr. Tom Frost

Soaring feed ingredient costs are posing a predicament for producers and forcing many to look for alternative ways to provide birds with the nutrients they need.

"We've never faced a cost dilemma to the extent we're facing one today," said Dr. Tom Frost, director of nutrition at Wayne Farms in Oakwood, Georgia.

Frost pointed out that phosphate rose from $200 per ton in January 2000 to about $1,000 per ton now. Trace minerals rose from $600 per ton to nearly double that currently. Vitamin premixes and poultry fat have doubled in price, and prices for corn and soybeans are up dramatically, too, he said.

One key strategy poultry operations are using to combat high prices is increased use of animal byproducts such as meat and bone meal, feather meal and fish meal. Industry data show that poultry operations in the US are using an average of about 4% animal byproducts in their feed; some are using as little as 1.4%, while others are using nearly 11%, Frost said.

Although it makes sense to take advantage of animal byproducts if they are of high quality and have been stabilized, adding them to feed formulations usually means a decrease in other components such as deflourinated phosphate, which may have a negative impact on pellet quality, he cautioned.

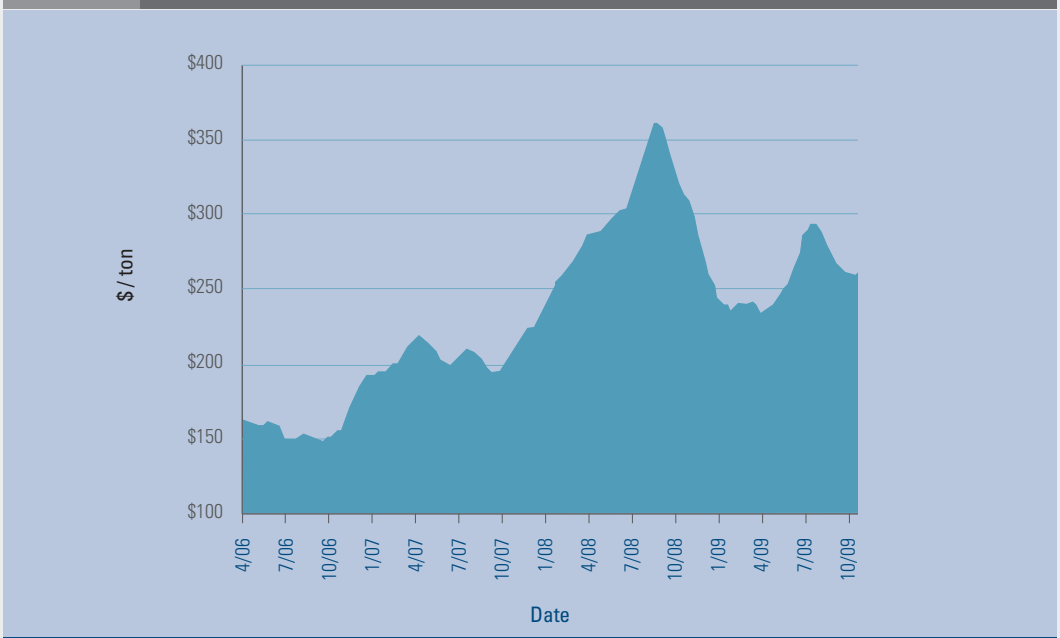
Phytase and NSP enzymes

Adding a phytase enzyme can make nutrients in the ration more digestible and help lower phosphate usage, which is favored by environmental regulators, especially in the US, Frost said.

Reduced phosphate content can have a negative impact on pellet quality. But on the up side, phosphate is abrasive and including it in feed helps continually polish the stainless steel dies used in milling operations. Substituting other ingredients for phosphate, such as phytase enzymes, can cause a build-up of deposits on the dies, sometimes resulting in flow-through problems, Frost said. He stressed the importance of carefully monitoring flow-through when using phytase enzymes.

Non-starch polysaccharide (NSP) enzymes are another feed additive nutritionists are using to combat high costs. Like phytase, NSP enzymes release food energy by making nutrients more bio-available for birds. NSP enzymes vary in nutritional effects, Frost

Figure 1 **Fluctuations in broiler feed cost, April 2006-October 2009**



explained, but added that most produce about 40 kcal/lb (88 kcal/kg) in metabolizable energy release. Other potential advantages include cost savings and improvements in pellet quality, if fat is added downstream. Frost said also that when less fat is shipped into the mill it's easier to monitor quality.

Frost cautioned, however, that heat stability can be an issue with NSP enzymes, especially in feed mills with older equipment.

Alternative ingredients

Dried distillers' grains (DDG) have been used for some time to successfully supplement poultry feeds. Typically they contain 24% to 26% protein, 0.65% lysine, 10% to 12% fat, and from about 0.42% to 0.92% phosphorus, Frost said.

At his broiler operation, Frost currently uses about 5% to 7% DDG. He said that formulation saves about US $2 per ton of feed. In the past, he has fed as much as 10% DDG. But he said that when the proportion of DDG reaches that level, it can have a negative impact on pellet quality.

Flowability remains an issue with DDG, Frost noted. "If we can't get DDG off the truck in less than an hour, then it starts to cost us more money than it's worth," he said. For that reason, Frost said, "I tend to think really long and hard before I bring DDG into our feed mills."

Wheat is another alternative and it improves pellet quality, Frost said. Wheat prices have fluctuated significantly, Frost pointed out, plus it isn't always available, at least in the US. Frost said that only underscores the importance of remaining flexible

continued

"We've never faced a cost dilemma to the extent we're facing one today."

Soaring feed prices prompt creative ingredients, processing

Dr. Tom Frost

continued

"If we can't get DDG off the truck in less than an hour, then it starts to cost us more money than it's worth."

when planning rations. "To take full advantage of prices and availability, you really have to pay attention to the markets and pick and choose different ingredients at different times," he said.

The synthetic amino acid threonine, he noted, has become an increasingly useful ingredient, especially as a protein substitute for pricey soybean meal. Typically, it is fed at a rate of about 0.025% to 0.075% per ton of feed and reduces crude protein content by about 0.50%.

What else can be done?

Besides adjusting nutritional components of feed, there are other steps producers can take to help manage the high price of feed ingredients.

One is paying closer attention to pellet quality, because it affects the amount of time birds spend eating: The higher the pellet quality, the less time and energy birds spend eating and the more time they spend resting and putting on weight. This is especially important with today's low-energy feeds, Frost said.

Conditioning of pellets is another place to look for cost savings, Frost said. He cited a group of studies in which researchers measured the effects of steam-conditioning practices on pellet quality and broiler growth. They showed a dramatic improvement in pellet durability when higher temperatures were used during steam conditioning. That was true regardless of whether conditioning took place at low or high pressure, he said.

The amount of time that pellets spend in the conditioner is also crucial to quality, Frost said. Most broiler companies have retention times ranging from 5 seconds to 15 seconds, but some are using much longer times — up to 80 seconds — with good results.

To increase retention time in the conditioner, the pitch of mixing paddles in the barrel can be adjusted or the rotational speed of the mixing paddle axle decreased, he said.

Frost conceded that increased conditioning costs more, but added, "Those who do allow extra time in the conditioning barrel are going to have better pellet quality."

Management, timing of coccidiosis challenge improves feed utilization

Dr. Robert Teeter

Looking for an edge on competitors, integrators have long sought ways to improve feed efficiency. But with feed prices continuing to soar, making the most of rations is not simply a competitive edge — it's a matter of business survival.

Besides tweaking feed formulations, integrators are realizing there are other ways to get the most from feed.

"It's easy to put an energy value on a nutritive factor, such as corn, soybean or starch," said Dr. Robert Teeter, a poultry nutrition researcher at Oklahoma State University, "but other factors, especially energy expenditure, along with many other factors, are also crucial" (see Figure 1, page 23).

In fact, he said, the amount of heat energy birds expend in their daily activities may be even more important than the actual nutrient value of their diets. Keeping such energy loss to a minimum is vital. Teeter said, "A calorie not expended as heat is money in your pocket."

In lab experiments he conducted, Teeter found that feed-conversion rates for birds raised on the same ration and to the same weights can vary from 1.63 to 2.11, depending on differences in bird behavior that can be manipulated by management changes.

For that reason, Teeter and colleagues developed highly sensitive ways to measure what they call "effective caloric value," or ECV, which is the relative loss of energy — and potential growth — associated with various changes in management that affect bird activity. These include changes in lighting, temperature, ventilation, stocking density and the method by which water is delivered.

"Activity regulation offers integrators an avenue for a competitive edge, if they recognize those opportunities and take advantage of them," Teeter said.

Pellets can increase feed value

For example, simply pelleting feed instead of feeding mash can reduce bird activity associated with eating and, thereby, significantly increase the effective value of feed calories by about 187 kcal/kg of diet, he said. Research by Teeter and others has shown that improvements gained by pelleting are greatest in the latter part of the growth cycle, when birds are consuming the most feed.

continued

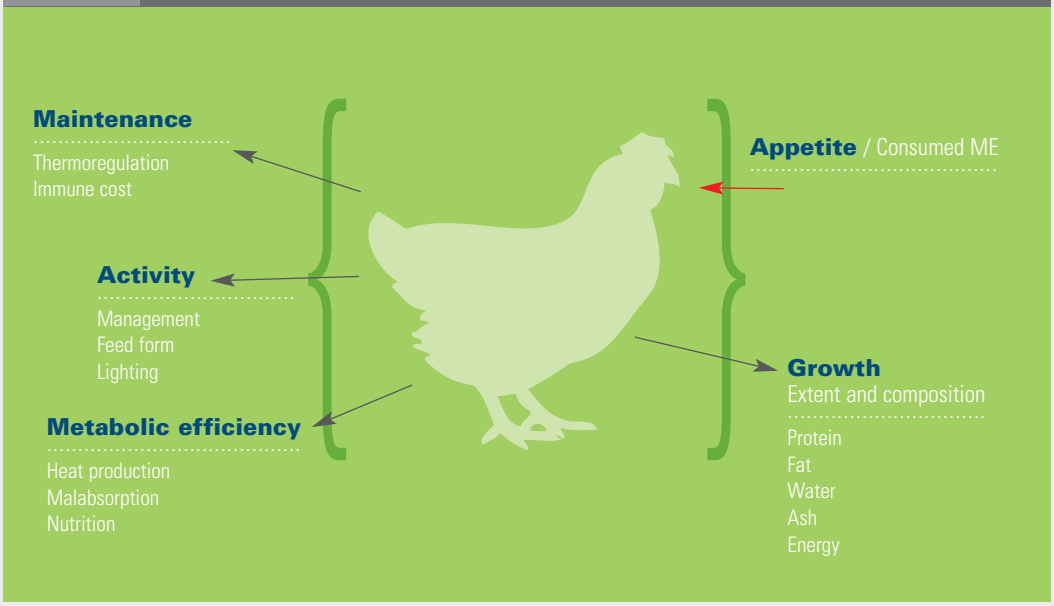
Management, timing of coccidiosis challenge improves feed utilization

Dr. Robert Teeter

continued

The impact on effective caloric value of even low-level coccidiosis can vary dramatically, depending on the age at which challenge occurs.

Figure 1 **Critical energy components**



Lighting programs, too, can be used to increase the ECV of feed, Teeter explained. In one series of studies, he compared the effects on ECV of two lighting programs: 23 hours light/1 hour dark compared to 12 hours dark/12 hours light.

Birds in the 23/1 lighting environment consumed about 3,250 kcal/kg to reach market weight, while birds in the 12/12 environment used only 3,100 kcal/kg to attain the same weight — a savings of 150 kcal.

As Teeter pointed out, instead of increasing the caloric density of the diet to improve FCR, a grower could choose to use reduced periods of lighting to get the same level of performance.

Similar kinds of performance gains can be attained by manipulating the ambient temperature in which birds are raised, Teeter said.

Controlling the timing of coccidiosis challenge

One of the most significant improvements in ECV can be gained by effectively controlling the timing of coccidiosis challenge, he continued.

While it is true that optimal performance would be achieved in an environment completely free of coccidia, it's unrealistic to expect such conditions in the field, given the limitations of currently available anticoccidials. So for years, integrators have been accepting low-level coccidiosis and its associated loss in FCR as a normal part of using ionophores to grow broilers.

However, the impact on ECV of even low-level coccidiosis can vary dramatically depending on the age at which challenge occurs, Teeter said.

In a series of studies, the researcher and his group challenged birds at various points in their life cycle with an orally administered solution containing three common species of *Eimeria*, the parasite that causes coccidiosis. After challenge, Teeter monitored the birds closely, recording changes in factors such as heat production, live weight, retained energy and composition of excreta. After 6 days, the birds were necropsied and their coccidial lesions scored.

Compared with controls that received no coccidial challenge, the birds with coccidial lesions scored lower in live weight and average daily gain, and had poorer FCR. As the size of lesions increased, so did the negative effects on growth and feed conversion.

But what was most significant, Teeter emphasized, was that late in life even minor coccidial lesions exacted a significant toll. "In the grower-finisher phases, the consequence of lesions was markedly elevated, and the closer we got to the end of the growth curve, the more significant the consequences," he said.

Real-world significance

The findings have important real-world significance. In birds grown on a 48-day schedule, for example, about half the total consumption of food occurs during the final 2 weeks, he said. If birds are stressed with coccidiosis lesions during that time, it reduces appetite, elevates maintenance costs, increases malabsorption of nutrients and, therefore, cuts into the ECV of feeds. "Unfortunately, though, birds [with coccidial lesions] don't reduce their appetites to the complete degree that would eliminate feed loss; they continue to eat and continue to consume profits," he said.

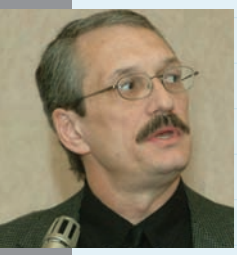
In contrast, his and other studies have shown that early exposure to coccidiosis — such as occurs in birds vaccinated at 1 day of age against coccidiosis — has only a minor negative effect on those same variables. Birds have sufficient time after early challenge to make up for lost performance resulting from exposure, whereas later the consequences are much greater, he said.

Like other management decisions, such as lighting and temperature changes or pelleting versus mashed feeds, the timing of coccidial challenge is a crucial variable that can be manipulated to advantage, and it should be considered in formulating any management strategy, he stressed.

"It's very important to understand the effects of coccidiosis challenge and to avoid these lesions, especially late in the growth cycle, since they significantly reduce flock profitability," Teeter said.

"It's very important to understand these effects of coccidiosis challenge and to avoid these lesions, especially late in the growth cycle, since they significantly reduce flock profitability."

Subclinical coccidiosis is increasing; consequences can be substantial



Broiler producers who think they don't have subclinical coccidiosis or that the disease isn't having a significant impact on their bottom line should reconsider, advises an independent poultry nutritionist.

Covert subclinical coccidiosis is "much, much more common than an outright coccidiosis outbreak, and has been growing slowly in incidence in recent years due to increasing resistance to in-feed anticoccidials, particularly the ionophores," says Dr. Phillip Hargis of Batesville, Arkansas.

Unfortunately, many broiler companies don't recognize it or just ignore subclinical coccidiosis, "but the disease does impact performance, requiring a slight increase in vitamins and trace minerals. It does impact skin integrity and the immune system slightly," he says.

These are subtle changes, but the price to producers can be substantial. "It's costing most of us four, five or more points of feed conversion," Hargis says.

When broiler-house costs were more reasonable, keeping birds a day or two longer in the field didn't make much difference. But with rising costs, "we have to get more birds through the house so the grower can pay his mortgage and make a living or we have to increase contract pay," Hargis continues.

Pushing birds through a house with subclinical coccidioisis, however, is expensive. "Feed conversion lost to subclinical coccidiosis now costs us $15,000 a point today, versus $3,500 yesterday. And never mind the fact that drug costs are increasing. So we are paying more for drugs that are failing more, and we have more feed costs per pound of meat, while we're paying growers more contract pay. Do you think that's a good plan?" Hargis asks.

Resistance to in-feed anticoccidials has resulted from their overuse. "Eventually all drugs lose some of their power and may even refuse to work at all," he says. Several anticoccidial chemicals are no longer available, which has reduced the number of in-feed options. When a coccidiosis break occurs, an anticoccidial may be removed from the rotation, putting even more pressure on remaining anticoccidials.

Understand oocyst leakage

Coccidial oocyst leakage is another subject that Hargis says is important for understanding resistance and subclinical coccidiosis.

About 65% to 70% of all broilers produced in the US have been raised on anticoccidial-drug programs that result in oocyst leakage into the broiler house. Producers tell him that oocyst leakage is "just like using a coccidial vaccine," but there's a huge difference, he emphasizes.

Oocyst leakage that occurs with an anti-coccidial-drug program loads the house with oocysts that are resistant to the drug itself. In contrast, coccidiosis vaccines seed the house with strains of coccidia that are still sensitive to anticoccidials, which extends the life of anticoccidial drugs, he says.

If producers are to control subclinical coccidiosis and the problems it causes, they first need to look for the disease. Visual posting "doesn't tell the story," so schedule microscopic posting sessions, which are provided by the manufacturers of coccidiosis-control programs, Hargis says.

Another way to tell if subclinical coccidiosis is present is if there's a big improvement in feed conversion after switching from an ionophore to an anticoccidial chemical. "We've seen a 10-point improvement in feed conversion" after such a switch, although the chemical may also wear out after a few cycles, he says.

A similar improvement may be seen after switching from in-feed anticoccidials to a coccidiosis vaccine. After a few vaccine cycles, he says, "we've been amazed that for the first time, broiler performance with a vaccine was actually better than the drug program." It was once assumed that coccidiosis vaccines hinder feed conversion and growth rate, but not any more. "Many times today, it is a huge benefit to go to a coccidiosis vaccine," Hargis says.

Check program efficacy

Whether using anticoccidials or a vaccine, the coccidiosis-control program should be checked roughly 5 weeks after starting and 5 weeks after each turn of the program, Hargis says.

If using anticoccidials, rotate drugs three times yearly, using the strongest drug starting in January, and use a coccidiosis vaccine for at least 6 months out of every 24-month period to combat anticoccidial resistance, he recommends. One of the common denominators Hargis sees on farms with subclinical coccidiosis, he notes, is a lack of resolve to change a drug program that is working well, which "may fix the present but mess up tomorrow."

His advice to include a coccidiosis vaccine in the rotation applies regardless of bird size, because smaller birds can do well with a coccidiosis vaccine if fed proper nutrition.

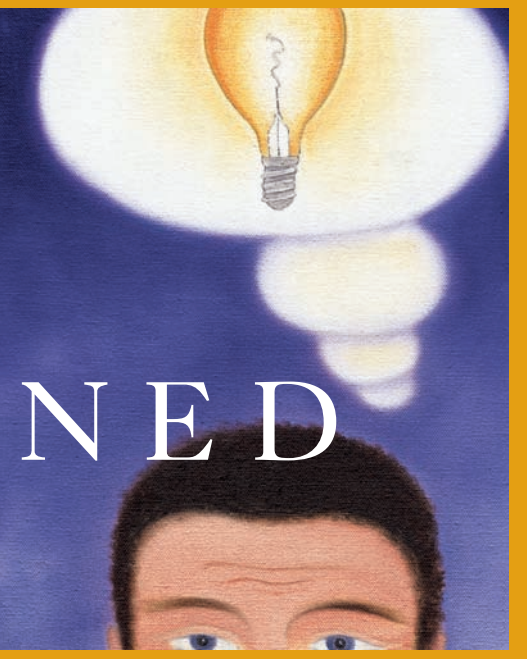
Coccidiosis vaccines do not have to be rotated because resistance with them is not an issue, nor does their use need to be limited to any particular kind of environment as long as birds are fed correctly. Broiler performance improves the longer a vaccine is used, up until 12 months, and then levels out for the duration, Hargis says.

Management practices are just as important in controlling subclinical coccidiosis, he adds. Litter should be of proper depth and moisture. Birds also need proper nourishment to support the gut, enabling it to recover from coccidial cycling.

Remember, Hargis says, "there is never a flock of broilers of any type that benefits from subclinical coccidiosis."

"[Subclinical coccidiosis is] costing most of us four, five or more points of feed conversion."

WHAT WE'VE LEARNED !



The growing use of coccidiosis vaccines over the past decade has helped improve coccidiosis control in broilers while also yielding several unexpected practical benefits for producers of both conventional and drug-free broilers.

"There seems to be an increasing consensus that these products are established methods of control and can be relied upon with great confidence," says Dr. Martin Shirley, director of the Institute for Animal Health, UK. "Live-coccidiosis vaccines appear well able to protect against the spectrum of background species and strains of coccidia, and the industry is not seeing the emergence of parasites that are uncontrollable by vaccination."

Poultry producers have taken note. From 2000 until 2008, the use of the coccidiosis vaccines Coccivac-B (available in the US and Canada) and Paracox-5 increased 250%, according to their manufacturer, Intervet/Schering-Plough Animal Health.

TURNING POINT

Improved administration is one of the major reasons that the efficacy of coccidiosis vaccination has been realized.

Instead of administering the vaccine via water or by spraying the vaccine onto feed, the vaccines are increasingly being administered with an innovative piece of equipment known as the SprayCox spray cabinet, developed by Intervet/Schering-Plough Animal Health, explains Dr. Charlie Broussard, US

poultry technical service director for the company.

The innovation enables producers to vaccinate up to 100 day-old chicks with one pass. A dye in the vaccine lets hatchery managers monitor vaccine coverage; the dye also encourages chick preening, which helps ensure ingestion of the live vaccinal oocysts that help stimulate natural immunity to coccidiosis, he says.

"We also now know from numerous studies," Broussard adds, "that broilers vaccinated with Coccivac-B or Paracox-5 perform as well or better than birds treated with traditional, in-feed anticoccidials."

> "Today's coccidiosis vaccines offer the opportunity for real-world protection that provides an opportunity to meaningfully withdraw drugs from the diet and achieve optimal performance."
>
> DR. ROBERT TEETER

In the latest edition of *Poultry Coccidiosis: Diagnostic and Testing Procedures*, veterinary parasitologists Donal P. Conway and M. Elizabeth McKenzie say that coccidiosis vaccines "provide a very practical and important alternative to the exclusive use of anticoccidial drugs..."

BROAD MANAGEMENT TOOL

Over the years, coccidiosis vaccination has evolved from a relatively simple, dependable way of controlling the disease into a broad management tool with multiple advantages for poultry producers:

Restoration of anticoccidial sensitivity

Rotating live-coccidiosis vaccines such as Coccivac-B or Paracox-5 into the coccidiosis-control program has been shown to restore anticoccidial sensitivity by reseeding poultry houses with *Eimeria* that are still sensitive to anticoccidials; this has been documented in several studies.

"It's been good to see how vaccination decreases the number of anticoccidial drug-resistant isolates [in conventional flocks] and this effect seems to last for several growout periods," notes Dr. Wil Landman of the Animal Health Service in Deventer, the Netherlands.

The restoration of sensitivity is an important benefit, notes Dr. Charles Hofacre, poultry veterinarian and professor, University of Georgia, because it's going to be increasingly difficult to get new in-feed anticoccidials approved for use in food animals. "Not having the resistance problem is a fantastic thing for the industry," he says.

Sustainable coccidiosis control

When coupled with good flock management, coccidiosis vaccination can be used as the sole method of coccidiosis control to enhance food safety — a major bonus for producers who want to meet growing consumer demand for drug-free birds and get premium prices for their products.

"Today's coccidiosis vaccines offer the opportunity for real-world protection that provides an opportunity to meaningfully withdraw drugs from the diet and achieve optimal performance," says Dr. Robert Teeter, a nutritionist at Oklahoma State University who has conducted extensive metabolic studies pinpointing the effects of coccidiosis on growth.

Relief from residue worries

Broussard points out that when vaccination is used instead of in-feed anticoccidials, producers no longer need an anticoccidial-withdrawal diet nor do they need to be concerned about drug residues in the poultry meat they produce.

"There's an advantage for feed mills, too, because when birds are vaccinated, you don't have to clean out manufacturing lines and equipment to prevent unwanted carryover of in-feed anticoccidials," he says.

Flexible marketing

Coccidiosis vaccination brings tremendous marketing advantages to producers who thin their flocks, Broussard continues. Thinning is a practice common in Europe and used by some North American producers; birds, usually females, are removed to leave more space for growing larger males.

"Because there's no withdrawal feed, producers have the flexibility they need to pull light or heavy birds as needed to meet market demand. They

continued

don't have to keep medicated and non-medicated birds separate and they make better use of their poultry houses," he says.

Indirect disease-control benefits

Necrotic enteritis, a disease caused by clostridium that is controlled in conventional flocks with in-feed antibiotics, is a greater threat to drug-free flocks. However, field experience indicates that effective coccidiosis control coupled with good management can help prevent necrotic enteritis by maintaining a healthy gut, which is less vulnerable to bacterial attack, Broussard says.

Another indirect benefit has been improved control of gangrenous dermatitis. Both field experience and trials suggest that late coccidial cycling predisposes birds to the development of this costly disease, he says. Dermatitis tends to be seen in flocks on chemical-to-ionophore or straight ionophore programs, which allow late coccidial cycling. In contrast, dermatitis tends not to develop in flocks that are vaccinated against coccidiosis at 1 day of age, presumably because they develop immunity early instead of late.

"Coccidiosis vaccination itself is not effective against gangrenous dermatitis," Broussard emphasizes, "but by preventing late coccidial cycling, it reduces the severity of gut epithelial damage from coccidia or shifts the time at which it occurs. This could be an important means of preventing or at least reducing the prevalence of gangrenous dermatitis," the veterinarian says.

Focus on nutrition

Coccidiosis vaccination enables producers to focus on improved nutrition for broiler chicks.

At Fisher Feeds in Listowel, Ontario, which produces drug-free feed for Bert Fisher Farms and contract growers, CEO and veterinarian Dr. Rae Fischer says, "With antibiotics, you can have some insult to the livestock and still not have a visible disease problem. When you go drug-free, you have to remove all those stresses that antibiotics might protect you from."[1]

He recommends that producers vaccinating birds against coccidiosis focus on nutrition the first 7 days of life, which are critical to the development of immunity. This is extremely important in antibiotic-free production. "You carry that thought process out a little farther, extend it for the life of the birds and do absolutely everything you can to minimize any insult that might be thrown in their way," he says.

The importance of good nutrition and the development of early immunity has been confirmed by research. Teeter's metabolic studies show that when broilers develop immunity early in life, as occurs with coccidiosis vaccination, it costs producers less because coccidiosis has less overall impact on the bird's energy utilization. In contrast, when birds develop immunity against coccidiosis later in life, the impact on energy utilization is greater and so is the cost because it's the same time that birds eat and grow the most.

"Producers today have a choice of how and when to develop bird immunity against coccidiosis. This is critical since birds consume approximately 50% of their feed during the last couple weeks, and to utilize feed effectively, intestinal health must be achieved," he says.

HANDLE WITH CARE

Although coccidiosis vaccination has matured into an easy and reliable coccidiosis-control method, producers have learned from experience that good results require proper vaccine administration and attention to management.

"Properly administer these vaccines while they're still fresh, and to get optimal results, adjust management as necessary. For instance, we've found that keeping chicks warm after they're sprayed and exposing them to just 5 or 6 minutes of bright light promotes preening and uniform vaccine administration," Broussard says.

When moved to the farm, chicks should be on litter with a moisture level in a range of 15% to 30%. Stocking density should be reasonable; if it's too high, litter moisture problems and high litter-oocyst density may occur, Broussard cautions.

"By coupling coccidiosis vaccination with good early nutrition and some simple management changes, we can achieve excellent results in broiler flocks," he says.

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[1] Adding More Value. *Intestinal Health*, North America, Issue 1, page 12.

worth repeating

"'Magic bullets' do not exist. The diseases that we are faced with 'preventing' have multiple and convoluted causes and involve the understanding of all disciplines of broiler production.

DR. STEWART J. RITCHIE
ALBERTA AGRICULTURE
ALBERTA, CANADA

"When we talk about necrotic enteritis, we have to talk about coccidiosis control. It's much easier to induce necrotic enteritis if birds have coccidiosis...

DR. STEVE DAVIS
PRESIDENT, COLORADO QUALITY RESEARCH, INC.
WELLINGTON, COLORADO

"I'm posting birds every month, and every month they're telling me their gut is better when they're on the coccidiosis vaccine. The birds are telling me this program isn't going to fail.

DR. MUEEZ AHMAD
DRAPER VALLEY FARMS
MOUNT VERNON, WASHINGTON

INTESTINAL health
NORTH AMERICA

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