

Is No Antibiotics Ever (NAE) Poultry Production Sustainable?



For many years, commercial poultry feeds in the United States contained sub-therapeutic levels of antibiotics, commonly known as antibiotic growth promoters (AGPs), to maximize growth potential of commercial broiler chickens. Recently, however, increasing concerns over antibiotic resistance have resulted in significant reductions in antibiotic use in poultry feed and at commercial broiler hatcheries. In fact, the number of birds produced in “no antibiotics ever” (NAE) programs in the U.S. today is now at more than 50 percent (*Poultry Health Today*, 2019).

Unfortunately, growing NAE chickens is much more difficult than raising conventional broilers. NAE production is challenging and can be stressful to the chickens, poultry companies, and growers. Perhaps the most important thing to understand before considering an NAE program is that “clean” before the program and “clean” after it are two completely different things. NAE programs require better disease control; consistent, high-quality feed; cleaner hatching eggs; reduced stress on broilers; increased downtime between flocks; and reduced stocking densities.

Can it be done? Absolutely! Numerous poultry companies do it every day. At least one company has been doing it for almost 20 years now. Is it easy? Absolutely not! It requires learning to operate under a more intense, better-managed production program—from pullets to breeders and from hatchery to feed mill to broiler farm. And, in the beginning, the learning curve is steep.

Why NAE Production?

Consumer pressure has made NAE a major issue in U.S. poultry production today. To some extent, compared to the poultry industry, the U.S. beef and pork industries have flown under the radar regarding the antibiotic-free movement, but that may change in the near future. As the poultry industry continues to figure out how to successfully manage NAE production, it is likely consumers will soon make the same demands on the beef and pork industries.

Why? Because today’s consumers have a greater interest in animal-production practices, they want to know more about how their food is raised. Unfortunately, because most consumers are far removed from the farm, they have little or no understanding of what is best in terms of animal health and welfare, environmental impact, carbon footprint reduction, and overall long-term sustainability. Regardless, consumers today are devoting more attention to nutrition programs, where their food comes from, food safety, and livestock production systems. Therefore, poultry companies are listening to their demands.

Most poultry companies, at least to some degree, are moving away from antibiotic use at the hatchery and in the feed. Programs such as Tyson Foods’ “No Antibiotics Ever” and “No Antibiotics or Other” have been in place for several years and reflect the extent of this changing landscape. More recently, Sanderson Farms Inc., one of the last holdouts to the NAE movement and the third-largest poultry

producer in the U.S., removed gentamicin and virginiamycin (antibiotics considered medically important to humans) from its live poultry operations on March 1, 2019.

Removal of antibiotics from the poultry industry in the U.S. today includes medically important antibiotics given *in-ovo* at the hatchery (gentamicin) but also non-medically important ionophore anticoccidials given in the feed. The removal of medically important antibiotics from the feed (used for growth promotion) went into effect in the U.S. on January 1, 2017. However, there is concern that removal of antibiotics to prevent, control, and treat disease—without viable alternative replacements—may result in animal-welfare issues related to increased mortality and loss of production efficiency resulting from sickness and death loss. In addition, it is possible that removing antibiotics at the hatchery and in the feed will result in higher rates of intestinal disease and, therefore, more foodborne-illness-causing bacteria such as *Salmonella* and *Campylobacter* on carcasses.

Ionophores

The current antibiotic situation is somewhat puzzling. For example, ionophores are classified as not medically important because they have no applications in human medicine, but they are also classified as antibiotics in the United States. Ionophores are used to decrease chicken sickness and death from coccidiosis disease. Unfortunately, all currently available alternatives to ionophores for coccidiosis control are less effective and often result in increased flock sickness and death numbers.

Further complicating the antibiotic landscape is how ionophores are classified around the world. For example, in the U.S., ionophores are considered antibiotics because they meet the definition of an antibiotic in the U.S. That definition is “a substance

produced by one organism which impedes the growth of, or kills, another organism.” Because ionophores are classified as antibiotics in the U.S., poultry companies marketing NAE products cannot use them. This often leads to high rates of sickness and death in broiler flocks from coccidiosis and necrotic enteritis (NE) on NAE farms. Ionophores are classified as “anticoccidials” in Europe, allowing NAE programs in Europe to include the use of ionophores. This discrepancy puts U.S. poultry operations marketing NAE poultry products at a disadvantage relative to their European counterparts.

There are several ionophores still available for use in non-NAE poultry feeds in the U.S. today. In fact, rotating ionophores in an attempt to minimize selection for resistant coccidia strains is (and has been for years) a common practice across the poultry industry for birds raised in non-NAE programs to reduce sickness and death losses. Common ionophores in the U.S. include:

- Narasin (Monteban) — Beneficial because it has an effect on clostridial bacteria. It can be used in summer (a major advantage) because it has minimal impact on decreased feed intake during hot weather.
- Narasin (ionophore) + Nicarbazin (chemical anticoccidial) (Maxiban)
- Salinomycin
- Lasalocid (Avatec)
- Monensin (Coban)

In addition to the ionophores listed above, there are a number of synthetic, non-ionophore compounds available for use in either the feed or water. These are not produced through a fermentation process and are often referred to as “chemical” anticoccidials. By definition, these compounds are not classified as antibiotics and are often used in NAE programs to help manage the coccidiosis and NE threat. These include:

- Nicarbazin (Nicarb) — Works well (unfortunately, a major side effect is that flock heat tolerance is seriously affected, so it is generally not used during warm and hot weather).
- Narasin + Nicarbazin (Maxiban)
- Zoalene (Zoamix) — Develops flock immunity by allowing some coccidia to reproduce without causing disease. Was off the market for a while but is now back and showing good results in many locations.
- Decoquinate (Decox) — Resistance has been reported to be an issue.
- Diclazuril (Clinacox)
- Clopidol (Coyden 25%)
- Amprolium (Amprol) — Typically given in the water. Around for years; still effective.

Changing Landscape

Commercially raising broilers under a 100 percent NAE program is possible in the U.S. Multiple poultry companies now do it every day. Some have been doing it, at some level, since the late 1990s. Others are just getting into the game.

Regardless of whether companies have been doing it for years or are just getting started, restricting antibiotics reduces the overall efficiency of broiler production. This will result in additional costs and resources used because it will require that more eggs be laid, more chicks be hatched, more feed be manufactured, more acres be used to grow grain for the feed (and corn production requires substantial water usage), and more water be used to grow and cool the birds. In addition, more manure will be produced and will need to be disposed of in an environmentally friendly manner.

Unfortunately, consumers who demand NAE products also want better sustainability, along with a smaller carbon footprint, less environmental impact, and lower prices at the grocery store. Currently,

it is not possible to produce NAE birds in the U.S. more sustainably and at less cost than conventional birds, or with a smaller carbon footprint and less environmental impact.

Certainly, there is a niche market for a limited amount of NAE product, and some people are willing to pay a higher price for such products. It makes good business sense for poultry companies to supply this high-value, niche market. However, it is not practical to oversupply a product that most consumers will not buy.

NAE Management Practices

Growing NAE chickens requires a different approach to management practices. Greater emphasis must be placed on management details under NAE programs. Again, the most important thing to keep in mind before starting an NAE program is that “clean” before and “clean” after are two different things.

Growing NAE birds requires attention to these cleanliness issues:

- Better control of coccidiosis and necrotic enteritis.
- Consistent, high-quality feed that’s always available (don’t let broilers run out of feed).
- Cleaner hatching eggs (reduce floor eggs; maintain nest cleanliness at the breeder farm).
- Better management of broiler farms (reduce stress on broilers).
- Increased downtime between broiler flocks.
- Reduced stocking density on broiler farms.

Coccidiosis and NE are the two most serious issues facing any NAE program. NE is a disease caused by *Clostridium perfringens*, a bacterium that is found ubiquitously in litter and even in the gut in low numbers; when environmental (see below) or other pathogen (i.e., coccidia) challenges occur that upset the microbial balance in the gut, NE can result. It affects the small intestine, resulting in lesions and

a foul-smelling brown fluid; mortality ranges from 2 percent to 50 percent (Hargis, 2019). *Clostridium* is easily treated by penicillin, but, in an NAE program, treatment is not allowed.

Addressing these issues is often done, in part, by decreasing stocking density (placing fewer birds in the broiler house and allowing birds additional space) and increasing downtime between flocks. Compared to 14-day downtimes for conventional flocks, NAE flocks may need 18 days or longer to let bacteria and viruses in the litter die down to manageable levels and to dry the litter as much as possible. In general, litter is wetter on NAE programs, and wet litter is bad for a variety of reasons (increased bacterial load, more ammonia generation, poor paw quality, and decreased animal welfare).

Stocking Density and Downtime

While decreasing stocking density and increasing downtime between flocks does appear less stressful on chickens, these factors often result in lower income for growers. Growers are paid on pounds of meat sent to market. Decreasing stocking density means fewer birds in the house, resulting in fewer pounds of meat sent to market at harvest time, and, overall, less income at the end of the year.

In some cases, increased downtime could mean a grower sells one flock of birds fewer per year, again resulting in less income at year's end. Contract growers can't remain in business if can't make a profit, and poultry companies can't stay in business if their contract grower base can't survive.

Litter Conditions

Reducing stocking density and increasing downtime between flocks have been mentioned as ways to reduce stress on broilers. There are other steps to take, as well. Litter should be kept as dry as possible in the broiler house. This is more difficult

with NAE programs, particularly if an all-vegetable diet is used, but dry litter is critical to reducing stress.

Understanding litter conditions is critical to successful NAE production. Litter has a thriving microbial population living in it. Some are good bugs; some aren't so good. That population of bacteria, fungi, molds, coccidia, and others developed around antibiotics, ionophores, and feed additives that were common on the farm in the past. When switching to an NAE program, that microbial balance in the litter is upset. Some bugs that were held in check before may be more able to create problems (*Clostridium perfringens* that causes NE, for example).

This shift in the microbial population in the litter is stressful for broilers. Couple this microbial shift with removal of antibiotics at the hatchery and from the feed, along with the fact that chicks are often vaccinated for coccidiosis at the hatchery, and it makes coccidiosis control in the broiler house much more difficult. However, we must control coccidiosis to better control NE and successful NAE programs.

Bedding Material

Using new bedding material has serious disadvantages in NAE programs. New farms (when first coming on-line) or older farms that have been cleaned out and have had old litter replaced with new bedding material appear to have a higher risk of breaking with NE than farms with used litter. While it may sound contrary to good biosecurity principles, in some cases, used litter has been moved off carefully selected farms onto new farms (or old farms with new bedding) to help lessen the NE threat, with beneficial results. It does appear that, in the field, early exposure to *Clostridium perfringens* in used litter can help minimize effects of NE breaks on new farms or farms with new bedding later on in the flock. Used litter is a better option than new litter when trying to manage NE in NAE flocks, so, unless absolutely

necessary, do not clean out and start over with new bedding. Additionally, you can windrow used litter between flocks, and, when done correctly, heat (130–140°F) generated in the windrows will kill most bacteria and disease organisms and keep microbial populations at manageable levels.

Feeding

Feeding NAE birds is more difficult than standard feeding programs of the past, and timing feed changes is critical to success. Baby chicks need an easily digestible, high-protein diet early in life to ensure a good start. However, with NAE programs, a high-protein diet fed early in life can put birds at a greater risk of NE later on.

Additionally, pay increased attention to timing of feed changes. Feed changes are stressful to the intestinal tract even under ideal conditions. However, we often switch from a starter diet to a grower diet at about the same time we are also getting maximum challenge or damage from coccidiosis. Increased stress of the feed change, coupled with a cocci challenge, is often enough to send birds already struggling with a coccidiosis challenge into NE, as they are no longer able to withstand the additional challenge from the *Clostridium perfringens* organism that causes NE. If possible, avoid feed changes when cocci challenge is at its peak.

Broiler growers should constantly monitor their feed inventory and, if possible, never run out of feed. Even if the feed mill or the service technician orders the feed, the grower should monitor inventory independently and, if the feed appears to be about to run out, call the mill and let them know feed is needed. If birds run out of feed and get hungry, they will storm the feeders and overeat when feed does arrive. Being out of feed is stressful on the intestinal tract; overeating when the feed returns is even more stressful. Stress on the intestine, regardless of the

source, gives *Clostridium perfringens* a foothold and sets the flock up for an NE break.

Clean Hatching Eggs

A strong, healthy chick starts with a clean hatching egg. It is imperative to manage the breeder house environment to maintain dry litter in the scratch area. Floor and slat eggs should be kept to a minimum by maintaining uniform light levels throughout the house. If litter in the scratch area is wet, hens will track manure into nest boxes and soil nest pads and eggs. Floor eggs are also at greater risk of being soiled and contaminated when litter in the scratch area is wet. Cleanliness of the egg pack sent to the hatchery is critical for the hatchery to produce a quality broiler chick.

Water Quality

As long as it is available, water is otherwise often neglected in broiler, breeder, and pullet operations. However, water quality has a huge impact on the health and welfare of the flock, and the value of a clean, safe water supply cannot be overestimated in NAE programs. If there are doubts about a water supply, a sample should be collected and analyzed for minerals, pH, and maybe bacteria; Extension poultry specialists are equipped to assist with this. Too much iron, manganese, sodium, etc., in the water or a pH that is too high or too low can cause intestinal damage and affect performance. Drinker lines should be cleaned with a product approved by the integrator to remove biofilm buildup.

What Drives the U.S. Poultry Industry?

Again, customer demands and consumer preferences are driving the chicken business in the U.S. today, and the result is the NAE movement currently taking place. Walk into any fast-food franchise today and look at the menu board. Even

those operations that used to be considered strictly “hamburger places” now often have more chicken selections on the menu than they do hamburger choices. You can have grilled chicken, fried chicken, chicken tenders, chicken strips, chicken nuggets, popcorn chicken, and chicken salads in just about every shape and size. In addition, consider the number of high-end restaurants and fast-food outlets today that carry “chicken and waffles” on the menu. It is *the* thing to have these days.

And we have not even mentioned franchises that specialize in chicken such as KFC, Buffalo Wild Wings, Chick-fil-A, Church’s, Popeye’s, and Zaxby’s. Most of this chicken is sold as white meat in the U.S.; almost all of the dark meat is exported. The huge demand for white meat is a large part of why many chickens are grown to heavier market weights today (9.75 pounds or more). Heavier market weights mean more breast yield, and breast meat is what consumers are asking of poultry companies. However, heavier market weights mean birds must stay on the farm longer. This longer time on the farm means a greater risk for something to go wrong in an NAE program.

Best Management Practices

Making any NAE program successful means going back to basics. We have to re-establish and strictly follow a well-designed set of best management practices (BMPs). These practices include:

- Well-developed biosecurity program
- Well-managed vaccination program
- BMPs documented and in use
- Excellent nutrition program (clean and safe ingredients [corn, soybeans], probiotics, prebiotics, enzymes, organic acids, essential oils, etc.)
- Consistent, high-quality feed (don’t let broilers run out of feed)
- Finely tuned breeder health program

- CLEAN eggs, hatcheries, chick boxes, and chick delivery trucks
- On-farm management practices that address litter quality, NH₃ levels, temperature, ventilation, and humidity levels

In the past, a small amount of antibiotic at the hatchery and/or in the feed covered up a lot of “less than stellar” management practices. Today, without that little bit of help at the hatchery and/or in the feed, less than stellar management is extremely costly. There are multiple areas where we must redefine *clean*, including:

- Hatching egg cleanliness and quality
- Hatchery cleanliness
- Feed quality
- Farm management
- Litter quality
- Air quality
- Ventilation control
- Temperature control
- Ammonia control

Consumer Education

It’s important to keep in mind that consumers are, in most cases, multiple generations removed from the farm and have little understanding of what it takes to put food on the table today. A recent survey indicated that 55 percent of respondents were very or extremely concerned about antibiotic use in chickens (Boyer et al., 2017). However, this same survey demonstrated that respondents generally have misunderstandings about poultry production. For example, 60 percent of respondents considered themselves to be somewhat or very knowledgeable concerning care of chickens, but 75 percent believed that there are added hormones or steroids in chicken meat and 71 percent believed that chickens raised to be eaten are raised in cages—neither of which is true for U.S.-grown chickens.

As an industry, we must do a better job of educating consumers so that they better understand what they are asking for and the associated consequences. Animal welfare is a serious issue when growing NAE birds. A recent report by the Council for Agricultural Science and Technology (CAST, 2018) indicated that the negative impacts on animals' welfare resulting from disease that could be prevented and/or that cannot be controlled and treated are significant and unacceptable.

Summary

Antibiotic-free poultry production in the United States is still finding its way, and we do not yet know what the final version will be. We do know that NAE production is challenging and can be stressful for chickens, poultry companies, and growers. However, consumer pressure has the attention of all major broiler companies today. As a result, universities and poultry companies are researching a variety of antibiotic alternatives in order to provide consumers with what they want. Much of the current research on these alternatives is focused on natural agents with beneficial effects similar to those of AGPs.

The goal is to find alternatives that will help provide low mortality rates and maintain good flock performance while protecting consumer health and preserving the environment. Alternatives currently receiving consideration include probiotics, prebiotics, eubiotics, enzymes, organic acids, essential oils, and phytogetic feed additives that may substitute, in part, for removal of antibiotics from the hatchery and the feed. Some show greater promise than others, and researchers and the poultry industry are working to determine which path to follow to achieve more sustainable NAE production.

Regardless of which path is chosen in the end, we must first recognize that "clean" before NAE and "clean" after its initiation are two different things.

Management practices that focus greater attention on cleanliness, sanitation, and reducing stress levels on broiler chickens have to be in place before any NAE program can be successful and sustainable.

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Publication 3371 (POD-06-19)

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Produced by Agricultural Communications.

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Extension Service of Mississippi State University, cooperating with U.S. Department of Agriculture. Published in furtherance of Acts of Congress, May 8 and June 30, 1914. GARY B. JACKSON, Director