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PoultryPractices

Oklahoma Cooperative Extension Service

A newsletter for poultry producers and poultry litter applicators...

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Editor's Column

This issue highlights an emerging poultry disease often mistakenly referred to as kinky back. With cold weather approaching, we also discuss methods to determine poultry house tightness and identify any potential air leaks. Litter treatment use is evaluated for heating cost savings and we explore propane and natural gas market trends. For applicators, we examine the economics of poultry litter application and look at two new mobile tools.

For publications, regulatory information, and upcoming classes, visit your local county Extension office or poultrywaste.okstate.edu where you can also obtain an electronic version of this newsletter.

Josh Payne

Differentiating Lameness in Broilers: Is It Really Kinky Back?

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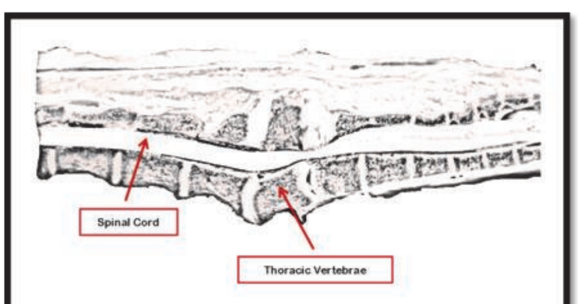
Spondylolisthesis, or kinky back, is a skeletal disorder resulting in lameness of broiler chickens. This deformity commonly causes ventral dislocation of the freely movable thoracic vertebrae in broilers, resulting in compression of the spinal cord, which leads to paralysis of the hind limbs. Clinical signs include birds sitting on hocks or tails with legs extended forward, and sometimes using their wings for support. This condition usually affects broilers between 3-6 weeks of age and is more common in females. In commercial flocks, the incidence can reach up to 2%.

Bird sitting on hocks with legs extended forward.



Dislocation of the thoracic vertebrae resulting in spinal cord compression caused by kinky back. Photo adapted from I. Dinev.

Factors such as age, rapid growth rate and genetics are thought to influence the occurrence of kinky back. Poor ligament strength or a weak ligament attachment, due to heavy breast weight, are likely causes. Management practices that delay the rapid early growth of broilers have been shown to decrease the incidence of kinky back.

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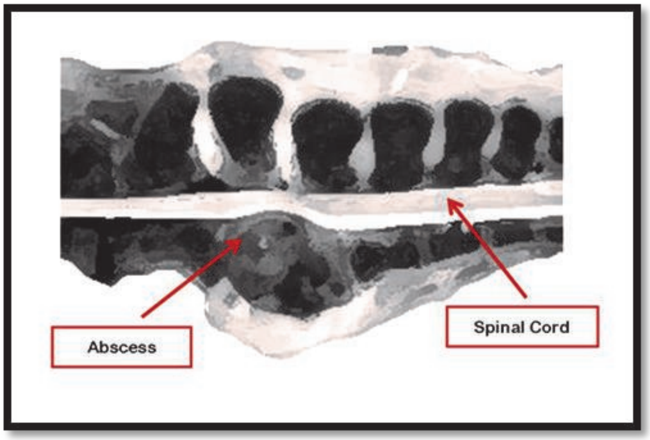
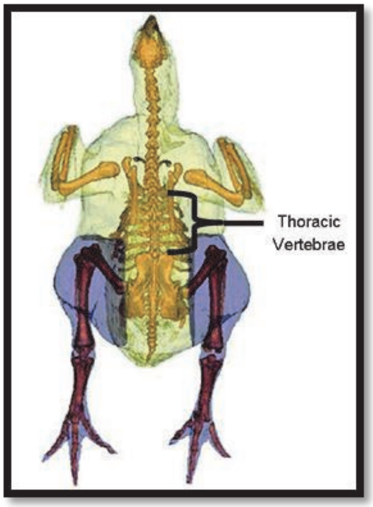
Spondylitis can be defined as inflammation of the vertebrae. Enterococcal spondylitis (ES) is a disease caused by the bacteria *Enterococcus cecorum*. This bacteria normally inhabits the gut of birds; however, it has more recently been associated with lameness outbreaks in broilers. This disease has been characterized by vertebral osteomyelitis (infection and inflammation of the bone) and spinal abscesses. Vertebral lesions have been reported in varying sections of the thoracic vertebrae, resulting in necrosis, swelling, spinal cord compression and, consequently, posterior paralysis. Clinical signs parallel those described for kinky back. The disease predominately affects males while the age of onset varies. Incidence within a diseased flock has been reported to range between 2-4%.



Spinal abscess resulting in spinal cord compression caused by enterococcal spondylitis.
Photo adapted from E. Gingerich.



Avian skeleton showing location of thoracic vertebrae.
Photo adapted from Royal Veterinary College.

Once established, the disease has been reported to persist in subsequent flocks. Management practices including full house clean-out and disinfection with a fumigant, bedding replacement, windrowing between flocks, and sanitizing and maintaining clean water lines have reportedly helped to reduce incidence.

Scoliosis, lateral curvature of the thoracic vertebrae, can also compress the spinal cord resulting in paralysis; however, occurrence is low in commercial poultry production.

It is important to differentiate kinky back, ES and scoliosis. All three diseases can result in spinal cord compression and produce similar clinical signs. A post-mortem examination of the split spinal column is required for proper diagnosis and for developing possible prevention and treatment strategies. These strategies will most likely differ based on the disease diagnosed.

References:

Armour, N.K., S.R. Collett, and S.M. Williams. 2011. *Enterococcus cecorum*-related arthritis and osteomyelitis in broilers and broiler breeders. The Poultry Informed Professional. University of Georgia College of Veterinary Medicine. 117:1-7.

Aziz, T. and H.J. Barnes. 2007. Is spondylitis an emerging disease in broiler breeders? World Poultry 23:44-45.

De Herdt, P., P. Defoort, J. Van Steelant, H. Swam, L. Tanghe, S. Van Goethem, M. Vanrobaeys. 2008. *Enterococcus cecorum* osteomyelitis and arthritis in broiler chickens. Vlaams Diergeneeskundig Tijdschrift. 78:44-48

Dinev, I. 2012. Pathomorphological investigations on the incidence of clinical spondylolisthesis (kinky back) in different commercial broiler strains. Revue Med. Vet. 163:511-515.

Pompeu, M. A., V.M. Barbosa, N.R.S. Martins, N.C. Baiao, L.J.C. Lara, J.S.R. Rocha and D.J.A. Miranda. 2012. Nutritional aspects related to non-infectious diseases in locomotor system of broilers. World's Poultry Science Journal. 68:669-678.

Robbins, K.M., M.M. Suyemoto, R.L. Lyman, M.P. Martin, H.J. Barnes, and L.B. Borst. 2012. An outbreak and source investigation of enterococcal spondylitis in broilers caused by *Enterococcus cecorum*. Avian Diseases. 56:768-773.

Economic Effects of Fertilizing Cropland with Poultry Litter

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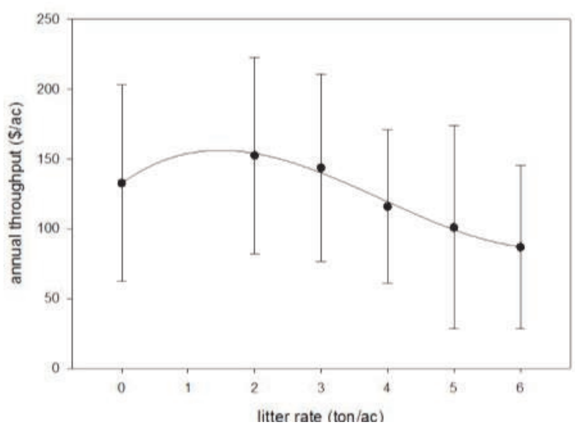
A study conducted by researchers in central Texas observed the profitability of using poultry litter as a fertilizer and soil amendment (Harmel et al., 2008). Traditional commercial fertilizer application was compared to poultry litter application supplemented with commercial N. Litter costs for transportation and application ranged from $16.50 - $23.25/ton (by 2013 the cost per ton has risen to $43). Annual litter application rates of 0, 2, 3, 4, 5 and 6 ton/ac were randomly assigned to 6 sites. The site receiving no litter application received only commercial N and P. Sites receiving between 2 and 6 ton/ac of litter were supplemented with commercial N to meet crop N requirements when necessary. Corn N requirements were set between 145 to 160 lb/acre, and wheat N requirements were set between 60-84 lb/acre based on historical guidance; however, actual requirements are considerably less based on realistic yield goals. Poultry litter applications met the wheat N requirement, thus only the site receiving no litter application received commercial N when growing wheat. Between 2002 and 2007, a 3 yr., cultivated crop rotation of corn-corn-wheat was established with each site receiving a different rate of fertilizer. Six years worth of land management, crop yield, crop price and fertilizer cost data were collected from the 6 field sites to determine economic throughput, which was defined as total revenue generated by crop sales minus fertilizer costs.

The greatest average annual throughput values ($153 - $154/ac) occurred for the 1 and 2 ton/ac litter rate range. The throughput maximum ($155/ac) occurred at 1.5 ton/ac. The commercial fertilizer-only treatment and the 3 ton/ac litter treatment produced relatively high throughput values ($133 - $144/ac) but profits were reduced 7-14% compared to the 1.5 ton/ac rate. At litter rates greater than 3 ton/ac, diminishing returns were observed due to increased fertilizer costs and a lack of increased yields to provide offsetting revenues. Unpublished data collected through 2013 show very similar economic results.

Total budget analysis, total revenue minus operating costs, showed the greatest annual profit occurred when applying litter at 2 ton/ac ($56/ac) and 3 ton/ac ($55/ac). Annual profit for the commercial fertilizer-only treatment averaged $41/ac and was less than $25/ac for the 4, 5, and 6 ton/ac treatments.

The researchers concluded that an annual fertilization strategy of 1 – 2 ton/ac of poultry litter along with supplemental N maximizes profitability for cultivated crop production. This economically optimal litter rate is also environmentally optimal in terms of minimizing nutrient runoff, preventing rapid buildup of soil test phosphorus and providing a sustainable fertilizer alternative (Harmel, 2009).



Annual throughput values presented as the treatment mean (±1 SD) for the 6 fertilizer treatments . Figure courtesy of D. Harmel.

References:

Harmel, D. 2009. Water quality effects of repeated annual poultry litter application. J. Soil Water Conserv. 64:180A.

Harmel, R.D., B. Harmel, and M.C. Patterson. 2008. On-farm agro-economic effects of fertilizing cropland with poultry litter. J. Appl. Poult. Res. 17:545-555.

What Is Ahead for Poultry House Heating Costs?

Changes in the Propane And Natural Gas Industries

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Winter and cooler temperatures will be arriving soon. Following quickly will be the dreaded propane or natural gas bill. This expense plays a pivotal role in determining how profitable the year will be for broiler producers. Knowing this, keeping a watchful eye on the US energy markets can help growers prepare for upcoming seasons. It is also important to look at any structural changes that may be forthcoming in these industries. Collectively, this information can help with short term farm financial planning, as well as, help us look at more long term issues like a possible change to an alternate fuel source.

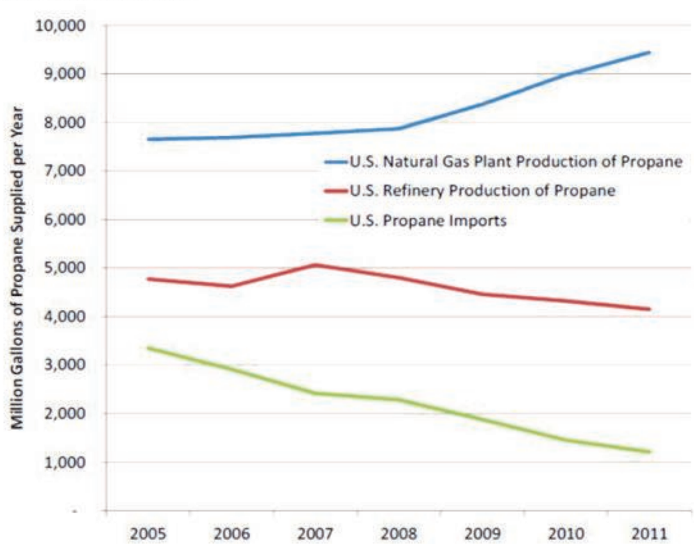
Propane has been the most common fuel source used to heat modern broiler facilities and for good reason. Many factors have been responsible for this dependency, such as the ability to utilize it in rural areas without a central pipeline, the consistency of the product delivered, and its convenience from a farm labor perspective. However, farms with a single fuel source are inherently exposed to price risk. Since there is not a readily accessible alternative, the grower is left at the mercy of the current market price. In an attempt to mitigate this, alternative fuel sources have been explored but adoption has been minimal. As access to rural natural gas has increased, some producers have been able to take advantage of the recent favorable price situation. In the past several years, there have been changes in the production of these two energy sources, propane and natural gas, which may have implications to the market that we have not encountered previously.

Supply and Trade

Propane is a byproduct of the natural gas and crude oil industries. Data prepared by ICP International shows a shift with the largest portion of our propane now coming from natural gas production. As shown in Figure 1, the gap between natural gas and oil refinery production appears to be widening. The projected growth of natural gas shale production (US EIA, 2013) has the potential to change the dynamics of the marketplace. This has resulted in an expectation for supply increases of both energy options.

Figure 1

Sources of Propane



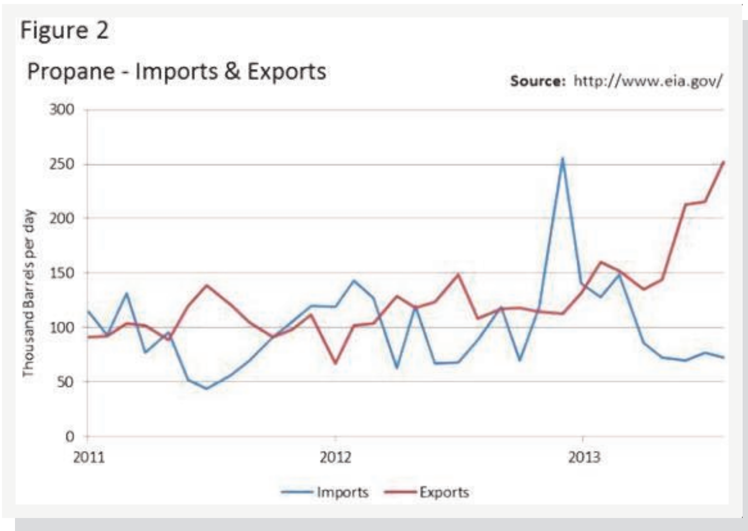
Source: http://www.npga.org/files/public/Propane_Supply_Sources_and_Trends_August_2012.pdf

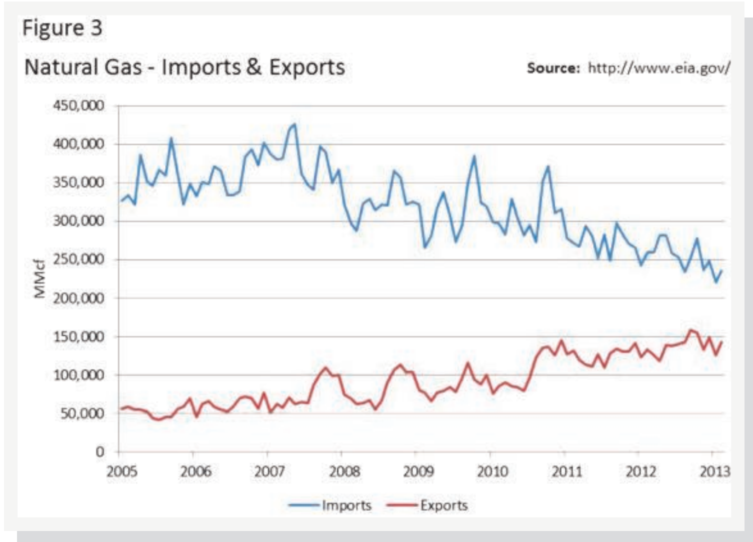
The supply increases have put pressure on companies to find outlets for the added supply, and both propane and natural gas have turned to export channels. The US now exports more propane than what it imports, which has historically not been the case (Figure 2). The natural gas market has not crossed the point where exports exceed imports, but if current trends continue, we should become a net exporter soon (Figure 3).

What Does This Mean to Broiler Growers?

A few thoughts to consider:

- *Natural gas is now the primary source for propane, not crude oil.*
- *Although shale gas production is expected to increase, that does not mean that domestic natural gas prices will fall automatically.*
- *The natural gas and propane markets will be encountering some uncharted territories with the development or expansion of export markets.*
- *Market outlooks have natural gas and propane prices trending upward.*





The Annual Energy Outlook from the US Energy Information Administration suggests that we should not see price increases to natural gas and propane until approximately 2015 and 2016 respectively. However, with so many variables influencing the market, we should still proceed with caution regarding our management decisions.

Pay attention to news regarding legislative changes, technological advances, or any other development in the natural gas field that may alter the market conditions. Based on the current market outlook, use these times of reduced energy costs to set aside a portion of each flock check into an account allocated specifically for winter heating expenses. Once this account is established, it could be used to supplement income in years that heating costs increase. Another option would be to use the funds for energy efficiency improvements such as tightening or upgrading your houses.

Winter heating costs are the most variable and significant annual operating expense in broiler production. Preparing now for increased operating costs can only have positive results for your farm.

References:

U. S. Energy Information Administration (US EIA). 2013. “Annual Energy Outlook 2013,” available at http://www.eia.gov/forecasts/aeo/. Accessed 13-September-2013.

ICP International. 2012. “Propane Supply Sources and Trends,” available at http://www.npga.org/files/public/Propane_Supply_Sources_and_Trends_August_2012.pdf. Accessed 13-September-2013.

Litter Treatment Use to Conserve Energy and Reduce Ammonia

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Litter treatments are commonly used in poultry houses to reduce harmful ammonia emissions offering a potentially better in-house environment to both birds and growers. Microbial degradation of nitrogenous compounds such as uric acid, which is excreted by the bird, leads to the release of ammonia, a colorless, highly irritating alkaline gas (Carlile, 1984). Litter pH, moisture content and temperature all play an important role in the rate of ammonia volatilization with an increase in volatilization observed by increasing in any of these variables. Depending on litter pH, ammonia is present as either the uncharged form (NH_3) or the ammonium ion (NH_4^+). As litter pH increases, ammonia concentration increases. Uric acid decomposition, by the enzyme uricase, is most favored under alkaline (high pH) conditions.

Ammonia concentrations can reach high levels when birds are reared in houses having artificial ventilation systems and heating. It is important to control ammonia levels in production facilities because high concentrations of atmospheric ammonia can be detrimental to the health of the bird and the grower (Carlile, 1984).

Proper house ventilation and litter management can be used to control high ammonia levels. However, during the winter months, ventilation rates are generally reduced in order to conserve heat, thus leading to increases in ammonia levels.

In-house application of litter treatment.

When coupled with the high costs of winter ventilation, litter amendments have been utilized to reduce ammonia levels by slowing uric acid degradation through the inhibition of microbial growth or by lowering litter pH, creating a neutralizing effect on the ammonia released (Carlile, 1984). Sodium bisulfate, sulfuric acid and aluminum sulfate products are all common treatments that accomplish this task by releasing hydrogen ions that will attach to the ammonia to form ammonium. Application of these treatments can allow for lower ventilation rates during the brooding phase, resulting in fuel cost savings.

References:

Blake, J. P. and J. B. Hess. 2007. Sodium bisulfate (PLT) as a litter treatment. http://www.aces.edu/pubs/docs/A/ANR-1208/. Accessed November, 2007.

Blake, J. P. and J. B. Hess. 2007. Litter treatments for poultry. http://www.aces.edu/pubs/docs/A/ANR-1199/. Accessed November, 2007.

Carlile, F. S. 1984. Ammonia in poultry houses: A literature review. World's Poult. Sci. J. 40:99-113.

Testing and Preparing Poultry Houses for Wintertime Ventilation

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With cold weather on the way, now is a good time to test poultry houses for tightness and remedy any air leaks to conserve energy and reduce wintertime heating costs. A well insulated house free of cracks, leaks and holes allows the grower to maintain a controlled minimum ventilation rate while limiting cold air infiltration. An effective wintertime minimum ventilation rate brings in fresh air while removing moisture, ammonia, and carbon dioxide. However, this colder, heavier outside air must enter the house through the sidewall inlets at a high velocity and mix with warmer, inside air near the ceiling before coming into contact with the birds. Cold air that enters through leaks in the house or through sidewall inlets at a low velocity will drop downward along the sidewalls resulting in cold drafts, chilled birds, wet litter, increased ammonia levels and increased fuel usage.

Thermal imagery of the inside of a broiler house. Colder areas are shown as purple and hotter areas are shown as orange.

House tightness describes the structure's ability to resist outside air infiltrating into the house due to leaks. A static pressure test can easily be performed to determine house tightness. Static pressure is the difference in pressure between the inside and outside of the poultry house, as measured by a manometer. To conduct this test, first close all vents, doors, windows, and fan shutters and turn on a 48", 20,000 CFM fan. The static pressure reading, obtained from the poultry house environmental controller, should typically be at least 0.13 inches of water column. Values less than this usually indicate that the house is leaky and needs to be tightened up. Note: These values may vary based on house design.

A smoke emitter used to conduct a smoke test.

If a house is considered leaky, then these air leaks should be identified and sealed. Common areas for leaks include side-walls, end-walls, seals around doors, vents and fan shutters, etc. To identify these leaks, a smoke test can be performed in conjunction with the static pressure test. Smoke emitters that provide a dense, white (or colored) smoke can be purchased from on-line retailers. These smoke emitters can be activated outside of the house, during a static pressure test, while someone inside the house watches for smoke to leak into the house from cracks or other openings. Any leaks should be marked with chalk or spray paint for later sealing. Caulk and foam applications can then be used to seal the identified structural leaks. After sealing any air leaks, house tightness can be retested by conducting an additional static pressure test.

Smoke entering through cracks indicating air leaks.
Photo courtesy of University of Delaware Extension.

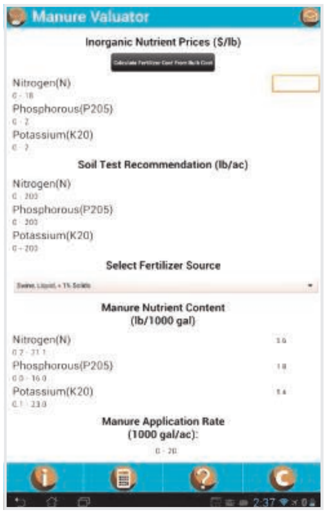
Mobile Tools Available for Manure Applicators

Since applicators are always on the go, it makes sense that they would need technology as mobile as they are. Recently mobile applications (apps) designed for agricultural use have expanded in the marketplace and include several geared to the business of valuing and spreading manure as fertilizer.

Manure Calculator by Move Creative: This app is designed to assist farmers in calibrating manure application equipment and calculating the total amount of manure applied to a field. It also includes a calculator to determine the amount of N, P and K applied, which can help prevent over- or under- application of nutrients to a field. Under-application reduces yields while over-application wastes money and represents a potential water quality concern if excess nutrients are transported from the field to water.

Other features include a manure value estimator and a function to save and email records of each calibration and nutrient calculation.

Available for Android 2.2 and up, iPhone, iPad, iPod Touch (iOS 5.0 or later). Download for free from Google Play.



Manure Valuator by University of Arkansas: The Manure Valuator automates calculation of dollar and nutritive value of manure, with quick access to:

- Bulk cost calculator to determine cost per pound of N, P and K from inorganic fertilizers
- Database consisting of nutritive value of 18 different sources of manure
- Customized values for dry and wet manures

Calculation results can then be shared via email.

Available for Android 2.1 and up. iOS (Apple) version is in development. Download for free from Google Play.

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