RESEARCH WATCH October 2011

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BEEF CATTLE

Effects of Castration Technique and Anesthesia on Behaviour and Weight Gain in the Feedlot

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Background:
In the production of our livestock and poultry species, a majority of the animals may experience some painful procedures within their lifetime. Such procedures may include

dehorning, castration, branding, tail docking, beak trimming, vaccination, etc. all of which may be necessary management procedures depending upon the species, gender, rearing conditions or ultimate use of the animal. For any one procedure there is often a multitude of tools, techniques, and various ages during which the procedures are performed. For example, the cattle industry currently performs castration on bulls anywhere from 1 day of age all the way up past sexual maturity. The techniques currently include elastrators, the burdizzo and knives, all of which are normally used without anesthetics. It seems logical to assume that at least one of these techniques is superior, inflicts the least amount of pain and causes the least set back. As an industry we ought to know (society will demand that we know) which procedure is the most humane and we should move in that direction.

Even though we have known for sometime that the younger the animal the more rapid is the healing process, the Canadian and American beef industry has continued to perform castration of bulls well past weaning age. This is in contrast to many of the European nations and in the U.K. for instance where the Protection of Animals (Anaesthetics) Acts and the Veterinary Surgeons Acts prohibit the castration of bull calves over 2 months of age by the producer and require a veterinarian and the use of anesthetics for animals over 2 months of age. Currently several equipment manufacturers in North America are marketing elastrator devices designed to fit mature bulls and are advocating delaying castration (see photo ad) because of the additional benefit in growth from endogenous testosterone produced by the testes. We believe, some of the preference by North American producers for a specific castration techniques is due to the fact we are either unaware or unconcerned about the amount of pain the animals may experience during the castration procedure. Furthermore there have been no comparative studies that have conclusively identified which procedure is the least painful.

Objectives:
1) Determine if the behavioural response during and immediately after castration of sexually mature bulls varies depending upon the castration technique and the use of anesthetics.
2) Determine if the weight gain of sexually mature bulls after castration varies depending upon the castration technique.

Experimental Procedures:
Objective :. A total of 150 bull calves were randomly allotted to 6 treatments. Fifty calves were randomly selected to serve as controls: 25 bulls were castrated and implanted 3 weeks after arrival and 25 kept intact for the duration of the study. The remaining 100 bull calves were randomly allotted in a 2 x 2 factorial design to investigate the impact of castration. Two castration procedures were compared, surgical castration (Newberry knife) vs. rubber rings (elastrator designed for mature bulls), with and without anesthetics. Prior to castration the headgate was equipped with strain gauges hooked up to record the amount of force exerted against the headgate by the cattle during castration. On the day of castration all bulls were run through a chute complex, individually weighed, caught in a headgate and given either saline or an epidural designed to block pain in the hind quarters and testicular region. In addition each animal

had two patches of hair clipped on opposite sides (5 x 5 cm) of the body. Within the two clipped areas a surgical staple was applied to serve as an attachment point for the electrodes from a heart rate telemetry transponder. Following injection, each animal was released and we waited a minimum of 5 min. to allow the anesthetic to take effect. After the 5 minutes had elapsed the bulls and steers were brought back into the facility, caught and restrained in the headgate and subjected to their respective treatments. A 10 second baseline recording of heart rate and exertion force was taken prior to the castration of each bull. Control bulls and steers, plus the bulls castrated with the elastrator were restrained in the headgate for a comparable amount of time as the knife castration treatment to equalize the restraint time across all treatments.The castrations were completed over a 4 day period. Each day an equal number of cattle from each treatment were castrated.

Objective 2: All bulls were weighed on a weekly basis for 28 days following castration and biweekly thereafter until slaughter. On each weigh day bulls on the castration treatment were inspected to determine if the incision site had heal or whether the testicles and scrotum had dropped off.

Results and Discussion

The maximum force exerted against the head gate during the castration treatments is shown in Figure 1. Not surprising, bulls and steers that received an epidural block exerted significantly less force against the headgate compared to their counterparts that were given a saline injection. The bull that were castrated with the Newberry knife without an epidural block exerted more than twice the force against the headgate compared to all other treatments. The Newberry knife caused by far a greater response in the bulls both in exertion force and heart rate. Animals on all treatments had a drop in heart rate as measured from the 10 sec. baseline collected immediately after restraint and again following the castration period. The knife caused a significant drop in heart rate which is likely a reflection of an acute painful response due to castration. Surprisingly the elastic bands did not cause a marked response in heart rate or exertion force immediately following application.

Both castration treatments caused a reduction in weight gain compared to control steers and control bulls. Within the first seven days after castration 23 out of 50 bulls castrated with the Newberry knife lost weight, while only 3 out of 50 on the elastic band treatment lost weight. However, throughout the duration of the trial both castration treatments performed at the same level and neither group was able to catch up to the control group prior to slaughter.

Surprisingly, the elastic bands did not cause an acute response at the time of application. However, the elastic bands did cause a delay in wound healing compared to the knife. None of the testicles or scrotums had fallen off by the 21 day weigh period. Only 6 had fallen off by 28 days post application of the elastic bands. Even though the scrotums appeared dead before they dropped off, as long as they were attached there was a weeping wound at the site where the live tissue met the band and necrotic tissue. Only 34 of the banded treatment group had dropped their testes and scrotums by the 42

day weigh period. The prolonged period that elasped before the groups were completely healed must have had some negative effect on performance. Neither castration treatment resulted in satisfactory gains or in the time required to heal.

Conclusion: Compared to control steers the data clearly indicates that castration should not be delayed until the animal reaches 350 kg. If one must castrate bulls at a larger weight, we recommend using an epidural block when castrating with the Newberry knife. Castrating with the Newberry knife to open the scrotum and using an emasculator to cut and crimp the chord caused a response indicative of acute pain. To surgically castrate mature bulls without mitigating pain would be deemed inhumane. Castrating mature bulls with elastic bands will result in a prolonged healing time and suboptimum gains.

Why is early castration of bull calves important?

By a Drovers CattleNetwork news source
Updated: July 13, 2011

In the United States, more than 17 million bulls are castrated yearly that range in age from 1 day to 1 year old. It is well known that this procedure is painful and causes a period of slowed growth rate and poorer feed efficiency, especially if the procedure is delayed until the calves get older and heavier. If castration is performed at the feedlot or backgrounding operation, these calves have a marked reduction in weight gain and are twice as likely to get sick as steers (one study found 28% sickness in steers vs 60% sickness in bulls castrated on arrival). The benefits of castration for feedlot owners and those who retain ownership through the feeding phase far outweigh the negative effects and include:

1. Reduced aggressiveness and sexual activity by lowering testosterone levels

2. Decreased number of "dark cutters" due to high muscle pH

3. Higher quality grade-more consistent, marbled, and tender beef

4. Steer carcasses command higher prices at market

Although these advantages are clearly proven, many cow-calf producers do not castrate because they are afraid steers will not wean off as heavy as bull calves despite the fact that research has proven this to be untrue. Even though steers command a higher price at the market, the difference in price has not been enough to overcome the reluctance of many to adopt this as a routine practice. However, the rapidly changing situation of the welfare implications of cattle castration may ultimately move the industry to demand early castration or adopt some method of pain control if castration is delayed.

Several methods of castration are commonly used. The three most common castration procedures for cow-calf producers are surgical removal of the testes, banding of the

scrotum with rubber bands, or crushing of the testicular chords with a burdizzo clamp. The method chosen often depends on multiple factors including the potential risk of injury to the operator, the size of the calf, the handling facilities, and experience with a certain technique. Possible health complications include hemorrhage (bleeding), excessive swelling, infection, and poor wound healing. Poor technique, especially common with the burdizzo clamp, may result in castration failure. Failure may also occur during banding if only one testicle is in the scrotal sac when a band is placed. The calf will become a "stag" with the characteristics and actions of a bull due to the retained testicle. There is virtually no difference in performance of the calf if knife cut, banded, or clamped at a young age. In a study at Oklahoma State reported in 2001, it was found there was absolutely NO advantage in the growth rate of bulls before weaning compared with bulls that were castrated (by any method) at 2-3 months of age and given an implant. In a similar study conducted in 1989, bulls castrated at birth performed similarly to those castrated at 4 months of age, indicating that leaving a bull intact for a "period of time" did not increase gains either. It is important to note that these studies did utilize an implant (such as Ralgro®) in the steers to replace the hormone influence lost by removing the testicles.

The animal welfare implications of late castration are beginning to be a force in the beef industry. As guidelines are being established for pain prevention and control, castration is recognized as one of the most stressful and painful experiences for livestock by measuring blood cortisol concentrations and the levels of specific brain neurotransmitters which are associated with pain in food-producing animals. Visible pain responses to castration include struggling, kicking, tail swishing, and restlessness during the procedure followed by swelling, stiffness, and increased recumbency (lying down) whether surgical or nonsurgical techniques are used. Blood cortisol levels, used as an indication of pain, spike almost immediately from surgical castration and clamping while banding causes a slower yet longer period of cortisol elevation. Banded calves have actually shown signs of pain in response to scrotal palpation a month or more longer than calves that were clamped. Perhaps the most important fact gleaned from the many studies conducted on castration is: the earlier the better. Calves castrated from 1-7 days old showed very few behaviors associated with pain and their plasma cortisol levels were essentially the same as the calves left intact. The risk of hemorrhage and infection is much lower, the risk of injury to the person performing the castration is lower, and the procedure is relatively quick and easy. The issue of pain control during and after castration is one of growing importance in the United States. Application of local anesthesia prior to castration is mandated in some countries because it significantly reduces the cortisol response to castration. This effect only lasts as long as the anesthetic but, when combined with a non-steroidal anti-inflammatory drug (NSAID) such as ketoprofen or flunixin meglumine (Banamine®), the cortisol response can be virtually eliminated in young calves, regardless of the castration method used. These calves also show increased feeding activity and fewer pain associated behaviors. The major obstacle in the US to pain relief for castration is no approved drug exists that is actually labeled for this use. Any NSAID used for pain would be considered extra-label use and must be administered only under the direction of a veterinarian with a valid veterinary/client/patient relationship. However, as research

continues to validate methods of measuring pain, then drugs will begin to be approved for pain relief because their effect will be measureable.

Castration is considered to be a necessary management practice for cattle. Work with your local veterinarian to establish the optimal herd health program for your farm and institute an early castration program to minimize the pain, stress and complications that go along with this procedure.

Protect cattle from winter weather

North Dakota State University Extension
October 4, 2011
For more information on helping cattle survive winter weather, visit two new NDSU publications: "Winter Management of Feedlot Cattle," at http://www.ag.ndsu.edu/pubs/ansci/beef/as1546.pdf, and "Winter Management of the Beef Cow Herd," at http://www.ag.ndsu.edu/pubs/ansci/beef/as1564.pdf.

During the winter, cattle increase their production of body heat in response to severe cold by increasing their heart rate, respiration and blood flow. This physiological response may result in lower gains and reduced feed efficiency, even with increased feed intake.

"That's why good winter cattle management practices are so important," says Vern Anderson, animal scientist at North Dakota State University's Carrington Research Extension Center. "These practices contribute to healthy, productive cattle and reasonable feed costs."

Here are ways to mitigate the effects of winter on beef cow and feedlot cattle:

* Cattle adapt to cold during a period of time. Provide adequate, good-quantity feed so animals can gain weight prior to severe weather if at all possible. Fat reserves are insulation and will provide extra energy during severe cold when feed may not meet the animals' energy requirements.

* Wean calves before severe cold to reduce the cows' nutritional requirements and allow cows to gain condition. Wean calves a few weeks before severe weather arrives if possible. This gives the calves time to adapt to new rations and gain weight and condition prior to winter weather.

* Protect cattle from the wind. A combination of constructed wind fences and shelterbelts with mature trees is ideal. Wind fences can be constructed of wood, metal, bales, tires or other materials. For more information on wind fence construction, see the "Beef Housing and Equipment Handbook" available from MidWest Plan Service at http://www.mwps.org.

* Provide feedlot cattle with bedding. Frequent bedding with modest amounts will keep feedlot cattle and replacement heifer dry and clean, which significantly improves gains and feed efficiency. Bed cows prior to and during calving. Cereal grain straw is preferable, but corn stover is acceptable.

* Keep feed bunks reasonably clear of snow, especially for feedlot cattle. If cows are fed on the ground, feed on a new or clean area every day to disperse manure and reduce potential health issues.

* Offer better-quality forage in cow rations during severe cold to help compensate for increased energy needs. Cold temperatures increase appetites, which increases the rate of passage through the digestive system, causing a decrease in feed's digestibility. Provide supplemental feed, such as coproduct feeds, for energy and/or protein if feeding low-quality forages.

* Avoid feeding very high-moisture rations because these feeds can freeze in the feed bunk, and intake may be reduced. Frozen feed takes more energy to thaw and digest.

* Sort cows by nutrient requirements and feed them according to need to optimize feed use. Sorting can reduce overfeeding of some animals and allow thin cows to gain weight.

* Feed cattle late in the day during severe cold. The activity involved in eating and ruminating will increase the animals' heat production during the night. Feeding late in the day during calving may increase the number of calves born during daylight hours.

* Make sure animals have adequate amounts of clean, fresh water at all times.

Water does not have to be warm.

* Be prepared for winter storms. Have snow removal equipment ready and in good repair. A backup generator may be advisable in case of power outages to maintain water pressure and heat sources, and run equipment to process feeds. Identify extra workers who can help during emergency situations. Remove snow from pens, especially in areas adjacent to feed bunks and water fountains, as time permits.

* Feeding animals inside a closed building isn't advisable unless ventilation is adequate and knowledgeable management, labor and bedding are provided. Ammonia concentrations from poorly ventilated structures can cause major air quality problems. High humidity and crowding can reduce the insulating ability of an animal's hair coat significantly. Diseases transmit more readily in humid, crowded buildings.

* Sort cows close to calving into more accessible pens so you can observe the animals and address any problems more easily.

* Enclose cattle trucks when shipping animals in severely cold weather.

* Make sure hospital pens and receiving pens for newly arrived calves are especially well-protected from the effects of winter weather.

Calmer cattle equal better performance

Drovers Cattlenetwork
Updated: September 19, 2011

During the recent Colorado Nutrition Roundtable at Colorado State University, several graduate students from CSU, University of Nebraska and University of Wyoming presented results of their research. Paul Repenning, a CSU student, outlined results of his study on the relationship between behavioral traits and performance in finishing steers.

The trial evaluated cattle behavior using both subjective and objective measurements, and examined the relationship between those behavioral traits and average daily gains and dry-matter intake.

The subjective measurement used chute scores in which workers rated cattle in the chute from zero to five, with zero indicating calm and five indicating aggressive behavior. Subjective gait scores used a four-point scale, with one equaling walk, two equaling trot, three equaling run and/or jump and four for cattle that fell as they exited the chute.

Objective measurements included the number of seconds in the chute and electronically measured exit velocity.

The researchers tested a group of 186 Bos taurus and Bos indicus crossbred steers, weighing them every 14 days for a 70-day trial period. They used a Grow Safe bunk system with radio-frequency identification to measure individual intake, and employed low-stress animal-handling methods throughout the trial.

The researchers found that exit velocity was negatively correlated with average daily gains and dry matter intake in the feedyard, meaning cattle that ran, jumped or fell out of the chute showed poorer performance than those that waked or trotted. In this trial, the objective, electronic measurement for exit velocity had the strongest correlation with average daily gain, but the subjective gait measure, with scores assigned by processing crews, also was negatively correlated with daily gains. The researchers conclude that subjective gait scores can serve as an adequate representation of objective exit-velocity measurements.

In future research, the team hopes to collect the same subjective and objective behavior measurements at weaning, and evaluate their correllations with lifetime average daily gains, feed intake, residual feed intake and carcass quality in beef steers. If measurements of behavioral traits early in a calf's life provide a reliable indicator of

lifetime performance, ranchers potentially could incorporate them into decisions regarding bull selection, heifer selection, cow culling, calf management and marketing.

Lameness in beef cattle

September 2011

Lameness in cattle is a serious economic problem. There are many causes for lameness. It is important that the problem be diagnosed correctly and treated quickly to minimise economic losses, said Dee Griffin, Beef Cattle Production Management Veterinarian.

A review of the records from five large western feedlots showed 13.1 per cent of 1,843,652 animals were treated for health problems. Lameness accounted for 16 per cent of these health problems and five per cent of deaths of feedlot cattle.

Lame cattle accounted for 70 per cent of all sales of non‑performing cattle. The price received for these salvaged lame animals was only 53 per cent of the original purchase price. While lame cattle in this set of records were sold, on average, 85 days after their arrival, they weighed, on average, only 10 pounds more than their in‑weight.

The NCBA National Quality Audits identify lameness in over 15 per cent of culled cows and over 30 per cent of culled bulls. Additionally, carcase bruising had a high incidence in all marketed lame culled cattle. A close look at NCBA Quality Audits in both finished fed and marketed cows and bulls, trim loss from carcases exceeds a million pounds a year.

Causes of Lameness

Diseases of the feet account for approximately 70 per cent of all cases of lameness.

Other causes include injuries to the upper skeleton or major muscles (15 per cent), septic joints (12 per cent) and injection site lesions (three per cent).

The incidence of each cause will vary by season, source of cattle, environmental management, and cattle handling. However, regardless of the circumstances, an accurate diagnosis is the key to successful treatment and prevention of future cases. Examination of the animal is the key to making an accurate diagnosis. Since most lameness involves the feet, you must pick up the foot to make a proper examination. Never medicate the animal before making a proper diagnosis. Your veterinarian should routinely review your cattle's health problems.

Most foot diseases in feedyards are caused by mechanical injuries from handling equipment, footrot or sole penetration from excessive wear (toe abscesses). In cows and bulls footrot is also common.

In these cattle hoof wall disease associated with genetics and/or nutrition is also a common finding. Hoof sole disease can be an important issue in bulls. This general is found in the medial claw of the front feet and is associated with laminitis.

Toe Abscesses

Young cattle coming from lush pastures are prone to toe abscesses. These abscesses are caused by a sole penetration that leads to an infection under the hoof wall. The hoof is soft and easily worn down into the sensitive tissues, especially in the toe area. The outside front toe is usually the most severely affected. The outside rear toe is the next most common location for this problem.

Fall weaned calves, cattle coming from parts of the country with high annual rain fall, and cattle coming from small grain pastures in the spring are most likely to have problems with toe abscesses. Wild cattle, abrasive surfaces, and rough handling of the cattle often combine to create this problem.

If toe abscesses are a problem in feedlots, the receiving areas may be too clean. Dirt and dried manure provide a cushion to the hoof. Some feedlots only have a problem with toe abscesses after rains have washed the cushion away.

The early symptoms of toe abscesses are very subtle. The cattle will appear sore and short-strided. The foot is not swollen in the early stages. Nearly all animals treated properly at this stage will recover.

If the disease is allowed to progress, the animal will become noticeably lame. The animal may hold the most severely affected foot up, and if the disease continues to progress, a slight swelling may be noticed at the top of the hoof.

When the animals are taken to the hospital area, the feet must be picked up and examined. When pressing your thumb on the side at the end of the toe, you should feel a soft area. You may also notice a crack between the hoof wall and the sole.

There should be no swelling between the toes. Swelling between the toes is a cardinal sign of footrot, and is totally unrelated to toe abscesses. Beef producers often make the mistake of treating all lame cattle for footrot or upper leg injuries when toe abscesses may be part of the problem. If toe abscesses are not treated in time the toe will have to be amputated or the animal sold for salvage.

Toe abscesses are treated by trimming the end of the hoof just enough to relieve the pressure inside the hoof caused by the infection. If the animal bleeds when you trim the end of the hoof, you have trimmed too much. In addition to trimming, animals should be treated with a long-acting tetracycline. Antibiotics alone will not benefit the animal - the hoof must be trimmed.

Mechanical Injury to the Hoof

Hoof injuries are another cause of lameness. They are most often caused by poorly designed facilities or poorly maintained facilities. An animal's toe can be caught in the space between the ground and the wall in crowding facilities. If the animal steps forward with a toe caught, the hoof can be injured.

You can minimise damage by using a pipe instead of square corner metal at the bottom of a side wall. This round finish will minimize damage to the hoof. The ideal condition would be to have no space between the side wall and the ground in the crowding facility. However, the minimum standard is no more than 1/4 inch per 100 pounds of the typical animal handled.

Equipment should be inspected every day before it is used. Loose metal can cause mechanical injuries to dozens of animals before it is detected. Mechanical injuries should not be left to heal on their own. A minor injury can become a severe local infection which can cause loss of animal performance. Mechanical injuries vary widely, as does appropriate management. Your veterinarian can recommend appropriate treatments.

Footrot

While footrot is the most commonly diagnosed cause of lameness in all cattle, it actually accounts for less than 10 per cent of the confirmed cases of lameness. The patterns of occurrence for footrot and toe abscesses are similar. Footrot is most often apparent one to two weeks after the soft tissue between the toes has sustained mechanical damage.

The mechanical damage may come from dried pasture stubble or frozen mud spikes. You should be especially careful during the first two weeks after fall weaning when calves are coming from dried pastures, and during the first two weeks after the temperature drops below freezing following a wet period.

Footrot can be easily and successfully treated. To properly diagnose footrot, pick up the foot and examine the soft tissue between the toes. In footrot cases, the soft tissue between the toes will be swollen and smell very bad.

Footrot is treated with long-acting antibiotics. Topical medications are of very little value. Footrot seldom affects only a few animals in a group. You must be on guard for other cases to develop from the same set of cattle.

It is difficult to prevent footrot. Many producers have used iodine in the feed with questionable results. The level of iodine that is approved for use in the feed (10 mg/head/day) is not considered therapeutic. Research suggests that high levels (50-250 mg/hd/day) of iodine fed for 15-17 weeks can interfere with some immune function tests. However, there is some evidence that zinc methionine in the ration may have some value in preventing footrot. Zinc methionine can be used with other feed additives including antibiotics and ionophores.

Swollen joints

Swollen joints are linked to about 10 to 15 per cent of all cases of lameness. These usually fall into three categories; an infection that settles in the joint after an animal has a generalised infection; an injury to a joint; or an infection that develops in the joint after an infection in the foot was improperly treated. The most common joints involved are the front fetlock, the hock and the elbow. Stifle, hip and shoulder lameness is very rare in cattle.

Regardless of the cause of the swollen joint, the three most common isolated bacteria are Hemophilus somnus, Pasteurella multocida, and E. coli. While the bacteria are often sensitive to common antibiotics, treatment is not very rewarding and should only be considered after visiting with your veterinarian.

Sale for salvage is often the best option for animals with swollen joints. If the swollen joint appears before the animal has cleared its drug withdrawal time from the medications and vaccines used at processing, treatment with antibiotics should be considered. An antibiotic with a short withdrawal time is recommended so that the animal can be marketed as soon as possible. Swollen joints are very painful to an animal, and the animal may not eat enough for minimum body maintenance. If the animal is under a long withdrawal time for a medication when the swollen joint is diagnosed, humane euthanasia should be considered.

Broken Bones

If the animal is not under medication withdrawal time restrictions, it is best to salvage the animal as soon as possible. If time restrictions exist, and the fracture does not break the skin, the animal may get along quite well if kept in a small pen. The fracture will not heal, but it will allow the animal to clear the medication before marketing.

Muscle Damage

Severe muscle damage is common in newly arrived cattle and feedlot bullers. Newly arrived cattle should be allowed to rest before processing to replenish the energy in their muscles. The animals should rest for as few as six hours but for no more than 72 hours.

Muscle damage can often be traced to handling techniques. It is very important to handle only small numbers of cattle at a time and handle them gently.

Muscle damage in feedlot bullers can be severe. It is important to be looking for bullers constantly and to remove them from riding cattle as soon as they are noticed. When bullers are removed from a pen it is common for the animals to be re-tagged, have their implants removed and placed in a "buller pen."

There is no information to support the removal of the implants, but the implants should be checked and replaced if the implant is crushed or abscessed.

Finishing bullers in a buller pen does seem to be an effective management tool. Antibiotic therapy is usually not required in the treatment of bullers. Your veterinarian can prescribe medications to minimise the effects from muscle damage and help you with effective buller management.

Non-ambulatory Animals

Many non-ambulatory animals have sustained an injury to the central nervous system. Response to treatment for this injury is generally poor. There are many causes for these injuries and a veterinarian should be consulted. USDA regulations prohibit slaughter of non-ambulatory cattle! Putting these animals to sleep is almost always the most humane and economical decision.

Injection Site Damage

Injections can cause severe muscle damage. The swelling that results can be painful and can decrease an animal's consumption and daily gains. Most injection site problems can be avoided if the manufacturer's recommendations for use are followed.

Subcutaneous administration of medications, if offered as an acceptable route of administration by the manufacturer, will minimise damage to muscle tissue. Never mix drugs in the same syringe before administration. Never mix medications or accept medications that have been mixed in the same bottle.

BRD "shipping fever" in cattle

Washington State University Extension
Source: Dr. Ram Kasimanickam, Washington State University Extension
Updated: September 7, 2011

Bovine respiratory disease (BRD) is the most common and costliest problem encountered in stocker or feedlot calves (Griffin, 1997). BRD, also called “shipping fever”, causes major economic losses to the producer, 7% of production costs, by reducing average daily gain, feed efficiency, and overall performance of beef calves. The economic loss associated with lower gains and treatment costs for BRD infection in a 1,000-cattle feedlot was estimated as $13.90 per animal (Snowder et al., 2006).

Shipping Fever is a respiratory disease complex that occurs most often within the first month after weaning. The weaning process is a stressful time for calves due to handling, commingling, and shipping to other locations (Blecha et al., 1984). During this period, calves may be exposed to many infectious agents that cause BRD. Stress predisposes calves by affecting their immune system (Galyean and Hubbert, 1995; Cole, 1996). In addition, poor body condition will increase the risk to BRD. As a result, it

is possible for calves to develop severe bronchopneumonia and even die from “shipping fever”.

Infectious Agents: There are many types of infectious agents involved in this disease complex. The most common viruses involved with BRD include Bovine Viral Diarrhea (BVD), Infectious Bovine Rhinotracheitis (IBR), Bovine Respiratory Synctial Virus (BRSV), and Parainfluenza Type-3 Virus (PI-3) (Plummer et al., 2004). Exposure to these viruses can cause severe damage to the respiratory tract of calves creating opportunities for bacteria to then settle in the lungs. Fortunately, disease caused many of these agents can be prevented through vaccination programs. The most common bacteria found in the lungs of calves with BRD include Mannheimia haemolytica and Pasteurella multocida. Haemophilus somnus may also be involved in cases of pneumonia and can cause severe damage to heart muscles (Pandher et al., 1998; Duff and Galyean, 2007; Griffin et al., 2010). Vaccines are also available for these bacteria. Another bacterial-type organism that is being found more often in the past few years is Mycoplasma bovis (Griffin et al., 2010). This organism not only causes severe pneumonia but also swollen, painful joints in calves. Unfortunately, there is not an effective vaccine or treatment available. It is also possible to find sick calves that have Mycoplasma bovis or are persistently infected (PI) with BVD.

Clinical Signs: Symptoms of BRD usually develop within a month after weaning/marketing (Buhman et al., 2000). Clinical signs can be variable since there may be multiple pathogens involved in this disease complex. Early clinical signs usually include: depression, loss of appetite, and dull eyes (Duff and Gaylean, 2007; Perino and Apley, 1998; Noffsinger and Locatelli, 2004). These calves should be pulled from their group and checked for fever. Temperatures over 104 degrees F indicate early signs of BRD. Clinical signs later in the course of the disease include: rapid/labored breathing, droopy ears, coughing, diarrhea, staggering, nasal discharge or sudden death (Duff and Gaylean, 2007; Bleul, 2009). Because the onset of BRD should be expected after weaning/marketing, producers should closely monitor every calf with quantitative measures such as respiratory rare twice daily for the first few weeks (Perino and Apley, 1998; Noffsinger and Locatelli, 2004). Left untreated, calves with severe BRD will die from their pneumonia and incur economic loss.

Treatment Options: Early recognition and treatment of calves with BRD usually improves their outcome and overall performance (http://extension.usu.edu/files/publications/factsheet/ah_beef_04.pdf). Treatment options can vary but most involve use of antibiotics specifically designed to treat calves with pneumonia. Many antibiotics are effective against bacteria most commonly found in the lung tissue. There are new generations of antibiotics which combine effectiveness with less frequent treatments and offer subcutaneous dosing. Some antibiotics have short or no slaughter withdrawal periods. In addition, administration of an anti-inflammatory drug may help reduce fever and damage to the lungs, and may help sick calves get back on feed sooner. Providing calves with 1 gallon of warm water and electrolytes per 100 lbs. of body weight can stimulate appetite and correct the dehydration suffered if the calf is sick for more than 24 hours. Vitamin B and probiotics

may also be used to help stimulate appetite (http://pubs.ext.vt.edu/400/400-008/400-008.html). Response to therapy is usually seen within 24 hours, particularly if treatment is initiated early in the course of the disease.

Diagnosis of BRD is usually made on the clinical signs, response to treatment and lung lesions in necropsy. Necropsy on all dead calves is recommended which will help to to confirm the diagnosis of BRD and to find out which pathogens are involved. Necropsy can also provide answers on the nutritional status of the calf and which antibiotics might be most appropriate for treatment (Galyean et al., 1999; Bryant et al. 1999).

Prevention Strategies: Prevention of BRD requires advanced planning and careful attention to herd health management (Duff and Gaylean, 2007). Risks can be reduced by the following steps: (http://pubs.ext.vt.edu/400/400-008/400-008.html; http://www.ag.ndsu.edu/pubs/ansci/beef/as1154w.htm)

• Good nutrition before weaning,
• Reducing stresses related to handling and shipping,
• Purchasing source-verified cattle from herds with a known health history,
• Vaccinating calves pre-weaning followed by booster vaccinations at weaning,
• Vaccinating calves at processing
• Castrating and weaning calves and allowing them time to acclimate to eating from a bunk prior to shipment is also a good idea
• Treating any calves that appear sick or have a fever as soon as possible

Mass medication (metaphylaxis) with long acting antibiotics given to all calves on arrival, is another common prevention strategy (Loffgreen, 1983; Nickel and White, 2010) to reduce the number of BRD cases in calves on arrival. Treated calves will have better average daily gain, feed efficiency, and overall performance. These factors support the use of metaphylaxis and have proven to be cost effective.
Some factors to consider when deciding to mass medicate are:

• Source of the calves as well as that of your own farm should be considered.
• Calves are more likely to get sick in the fall than any other time of the year.
• Inclement weather probably plays the single largest role in the likelihood of a large number of calves becoming sick.
• Calves that are not weaned when marketed are much more likely to get sick.
• Calves weighing < 450 lbs are more likely to get sick.
• Calves castrated after marketing are more likely to contract BRD.

Bovine Respiratory Disease is economically important disease. Consult your veterinarians for effective vaccination strategies and management and treatment options. Your veterinarians will consider age and source of the animal, the type of stress the animal will tolerate, laboratory antibiotic sensitivities for isolated bacterial pathogens, the withdrawal time so that no violative residues will be found and most importantly available for the follow-up. Cattlemen must understand it is a violation of federal law to use antibiotics other than as directed on the label unless prescribed by a veterinarian.

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When do we intervene and assist a cow or heifer in labor?

Glenn Selk, Oklahoma State University Emeritus Extension Animal Scientist
Updated: September 6, 2011
Drovers Cattle Network

Fall calving season is upon the Oklahoma ranches that have fall calving. An issue facing the rancher at calving time, is the amount of time heifers or cows are allowed to be in labor before assistance is given. Traditional text books, fact sheets and magazine articles stated that “Stage II” of labor lasted from 2 to 4 hours. “Stage II” is defined as that portion of the birthing process from the first appearance of the water bag until the baby calf is delivered. Newer data from Oklahoma State University and the USDA experiment station at Miles City, Montana clearly show that Stage II is much shorter, lasting approximately 60 minutes in first calf heifers, and 30 minutes in mature cows.

In these studies, heifers that were in stage II of labor much more than one hour or cows that were in stage II much more than 30 minutes definitely needed assistance. Research information also shows that calves from prolonged deliveries are weaker and more disease prone, even if born alive. In addition, cows or heifers with prolonged deliveries return to heat later and are less likely to be bred for the next calf crop. Consequently a good rule of thumb: If the heifer is not making significant progress 1 hour after the water bag or feet appear, examine the heifer to see if you can provide assistance. Mature cows should be watched for only 30 minutes before a rectal examine is conducted. If you cannot safely deliver the calf yourself at this time, call your local veterinarian immediately.

Most ranches develop heifers fully, and use calving ease bulls to prevent calving difficulties. However, a few difficult births are going to occur each calving season. Using the concept of evening feeding to get more heifers calving in daylight, and giving assistance early will save a few more calves, and result in healthier more productive two-year cows to rebreed next year.

DAIRY AND VEAL

Grazing cows live longer

TheCattleSite News Desk
Monday, July 18, 2011

DENMARK - The more time cows spend grazing, the lower their mortality rate, according to new figures from a study carried out by scientists at Aarhus University.

Fresh air and exercise are good for your health and well-being. That goes not only for humans but also for cows. Recent results from Aarhus University show that cow herds have a lower mortality rate when the cows are allowed to graze on pastures compared to herds that must suffice with staying indoors all summer.

The results are based on figures from 391 farms collected via a database and questionnaires.

"The differences were greatest in herds with automatic milking systems (AMS). When cows on farms with AMS had the opportunity to graze, mortality was 54 per cent lower than on farms where the cows could not graze," says PhD student Elke Burow from the Department of Animal Science.

"In herds with traditional milking systems grazing reduced the mortality rate by 25 per cent."

Mr Burow also found that the reduction in mortality was influenced by how much time the cows spent in the pasture. When cows have access to pasture for a long time, the mortality was 42 per cent lower that on farms where the cows had only limited or no access to pasture.

The data do not indicate what the causes of death were, so it is not yet possible to point at specific reasons for the differences in mortality rates.

At the present, scientists at Aarhus University are investigating if grazing affects cow health and welfare and are looking into the possibilities for using various means to control grazing in the project ”Grazing – also a part of future dairy production”.

Study finds major flaws in colostrum management

Dairy Calf and Heifer Association
Updated: September 19, 2011

California State University research suggests there are major variations in colostrum antibody concentrations and bacteria levels on farm.

Researchers collected colostrum samples from seven central California dairies. Herd size ranged from 800 to 4,000 cows. The researchers collected the samples prior to first feeding. Three of the seven dairies added a colostrum supplement to the maternal colostrum. On those dairies, researchers collected one sample before adding the supplement and one sample after supplementation.

Here are some key findings from the study:

Average IgG concentration of colostrum fed was 35.96 mg/ml, with a range of 0.45 to 114.94 mg/ml.

Individual farm average IgG concentrations varied from 21.2 to 47.21 mg/ml.

On the three dairies that supplemented colostrum, average IgG concentrations before and after supplementation was: 45.39 and 47.21 mg/ml, 32.13 and 35.39 mg/ml, and 27.2 and 37.07 mg/ml, respectively.

Bacterial levels in the colostrum samples ranged from 13,420 to about 2.2 million colony forming units per milliliter (cfu/ml.)

A total of 41 out of 234 (~18 percent) samples of the non-supplemented colostrum were considered contaminated with bacteria (levels exceeded 100,000 cfu/ml.)

A total of 179 out of 312 (~57 percent) samples of the supplemented colostrum were contaminated with bacteria (levels exceeded 100,000 cfu/ml.)

About 220 (~40 percent) of the 546 calves in the study were fed contaminated colostrum.

The research suggests there is certainly room for improvement in the management of colostrum fed on-farm.

The research was presented at the 2011 Joint Annual Meeting of the American Dairy Science Association and the American Society of Animal Science.

Learn more about good colostrum management and goals for bacterial contamination of colostrum in the Gold Standards I.

How weaning management can get calves off to the right start for stockering

Mississippi State University Extension
Updated: August 8, 2011
Source: Holly T. Boland – Assistant Research/Extension Professor, MAFES Prairie Research Unit

Weaning can be a very stressful event in the life of a calf. It is not uncommon for calves to be weaned abruptly, separating the calf from the cow and immediately moving the calf to some new environment away from its dam. There are many potential sources of stress during the time surrounding weaning that may include any of the following: loading and unloading from trailers, transport, crowding, restraint, commingling with unfamiliar animals, withholding of feed and water. Stress during weaning makes calves more susceptible to respiratory infections such as bovine respiratory disease, causing a high level of mortality and morbidity in feeder calves. It has been estimated that the beef industry may lose over one billion dollars every year from this disease.

There are more gradual ways of weaning that can potentially reduce the stress experienced by the calf. Less stress should help keep the calf healthier prior to entering a backgrounding program. The attachment between a cow and its calf is strong, as it is with most mothers and their babies. So breaking that attachment suddenly can be quite unsettling for the calf. “Low-stress” weaning methods work by breaking down the weaning process into two steps. The first step is preventing the calf from suckling while still allowing it some contact with the cow and then after a period of time (usually anywhere from 4 to 10 days) the calf and cow are separately completely. Two such methods are fence-line weaning and nose-clip weaning. In fence-line weaning, calves are physically separated from their dams and placed in an adjacent paddock so that they can still be comforted by seeing and hearing the cow but they cannot suckle. With nose-clip weaning an antisuckling nose-clip is placed on the calf. This clip has small points that irritate the cow when the calf attempts to suckle, causing the cow to walk away and refusing to nurse. Because the nose-clip hangs in front of the calves nose it also acts to some extent as a physical barrier to prevent suckling, but does not interfere with the calf being able to graze. Nose-clip weaning allows the calf to maintain physical contact with its mother while getting accustomed to not being nursed.

Implementation of these low-stress weaning methods depends on what resources are available. Fence-line weaned calves will spend a lot of time in the first few days pacing along the fence looking for a way back to their dam. Because of this, fences need to be in good shape to prevent calves from crossing back through. In order to nose-clip wean, the nose-clips must be purchased (around $3 each) and the calves need to be brought to a working facility twice for nose-clips to be put in and later to be removed (although this may be combined with other management activities and not be extra work). There are a few circumstances to note on the use of nose-clips. Because most of the nose-clips out on the market are made of a molded plastic there will often be a coarse ridge

along the portion that will be on the inside of the calf's nose. Smoothing down this ridge should help reduce the degree of nasal irritation. Also, consider what type of waterer and mineral feeders will be used by the calf. If the calf has to push down a ball in the waterer or lift up a lid on a mineral feeder the calf might stop drinking or eating mineral because its nose has become irritated or sore from the nose-clip. Also, it is possible for the nose-clip to be pulled off altogether by getting hung up on something in the pasture and the weaning process will no longer be "low-stress" when the calf is separated from the cow.

Besides the most immediate concern of a newly weaned calf becoming sick, the question of how does weaning method impact animal performance during the backgrounding period is currently being evaluated in a series of studies at Mississippi State University. Past research has tended to favor fence-line weaning over nose-clip weaning or showed no differences at all in backgrounding performance. However, there are several different types of nose-clips available for purchase. Therefore in addition to comparing fence-line weaning to nose-clip weaning, the Mississippi State study will compare different types of nose-clips including a "one-size fits all" variety along with nose-clips that are adjustable enabling them to fit both larger and smaller noses. For more information on stocker cattle management, contact an office of the Mississippi State University Extension Service.

Improving Dairy Calf and Heifer Welfare: Development of an Advisory Tool

By Kimberly Sheppard
Article originally published in CCSAW News, the newsletter for the Campbell Centre for the Study of
Animal Welfare at the University of Guelph.
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.
A million dairy calves are born in Canada every year. Of these calves, around 10% die, which is a far cry from the 3% mortality seen in beef calves.
But it is not always easy to pinpoint the exact contributing factors to calf mortality, especially on individual farms or by the farmers themselves – even if the cause of death is known.
Clearly, there is a need for assessment and advice on the farm, so that dairy producers know exactly how to optimize management and improve not only the welfare of their calves, but also the bottom line.
In her keynote talk at the CCSAW Animal Welfare Research Symposium, Dr. Elsa Vasseur, Agriculture and Agri-Food Canada, gave us an overview of an Advisory Tool that does just this. Welfare assessment schemes have been available for adult dairy cows for some time, but no such tool has ever been developed for calves and heifers. Toward developing one, Vasseur and her research team surveyed 115 Quebec dairies to gain a sound understanding of typical calf management and risk factors for calf welfare in producer's attitudes. Although many good practices were identified, there

was room for improvement in several key areas. Calf mortality was underestimated by producers by about 40% - and even when mortality was estimated to be in the 10-20% range, producers felt that it was not a problem on their farms. Related to this, very few producers kept health records, likely because they perceive calf health as quite good in general. Cost of raising a calf was also underestimated, meaning that producers do not perceive that losing a calf costs a lot of money, which it does. It was also found that calving checks were not done frequently enough to consistently supply calves with early colostrum. Early feeding of good-quality colostrum is one of the most critical elements for good calf health, as it contains the antibodies the calf needs to fight off any infections that could ultimately contribute to the calf's death – and optimum absorption of antibodies occurs within the first four hours of birth. Colostrum quality was not reported to be checked at all on the farm either – a practice that is easily implemented. Simply helping producers understand the importance of early colostrum has the potential to dramatically improve calf livability.

Dehorning is routinely performed on calves and has been shown to be painful, both during and after the procedure. Analgesics are readily available and extremely effective in mitigating dehorning pain. However, less than 50% of producers reported using analgesics during dehorning, although this number is higher than ever before. Further improvements in this area could be made with producer education. The challenge, said Vasseur, is in finding tools to ensure better knowledge transfer to producers. Enter the Advisory Tool. Backed with information gained from their survey, Vasseur and her team focussed their Advisory Tool on assessing and improving key practices identified as having the greatest impact on calf welfare. They developed targets (such as timing of first colostrum feeding, calving pen cleanliness, weaning procedures etc.), a scoring system for the targets, and recommended practices. The team then solicited participation of producers, who took an active part in the on-farm intervention. In all, the tool stayed on target with a 3-hour visit, covering data collection on management and environment, scoring, practical demonstration, and debriefing. As the researchers hoped, the tool helped to detect and discuss problems with producers, some of which scored below 50% for some targets. But the real test of the Advisory Tool's effectiveness came six months after the initial farm visit, when the researchers were pleased to see recommended practices being implemented in many critical areas they had identified and discussed.

Overall, the development of this tool has shown that voluntary improvements in animal welfare can be facilitated by using appropriate tools to educate producers and help them change their attitudes towards calf management and welfare. Such tools are invaluable, as they ultimately empower producers to positively and measurably impact the welfare of their animals. To see the online tool yourself, please visit: www.agrireseau.qc.ca/bovinslaitiers/documents/E valuate your Rearing Strategies.pdf

New insights on rumen development

Land O'Lakes Purina Feed
Updated: September 29, 2011

A well-developed, fully functional rumen enables cattle to utilize forage for advanced growth, maintain adequate health, efficiently reproduce and produce optimal volumes of milk. However, a dairy calf is not born with a functioning rumen. Calf rumen development studies at Land O'Lakes Purina Feed's LongView Research Farm have provided growing insights on dairy calf nutrition which suggest that the development of a rumen with optimal efficiency and function can be – and is – influenced by early life feeding.

The substrate, or diet provided to the young calf directly impacts the progress of rumen development. Therefore, the calf feeding program is a critical aspect in the transition of the calf from a pre-ruminant to a ruminant animal. Calves fed a milk-only diet, which is primarily transferred directly to the abomasum by the reflexive closure of the reticular groove, have shown to have a more limited rumen development since nutrients bypass the rumen. Therefore, the abomasum increases in size and the rumen remains small with restricted development of the rumen wall and papillae.

Studies have shown that by infusing milk directly into the rumen, growth of the rumen papillae could be stimulated due to the production of volatile fatty acids (VFA) by rumen fermentation. It is known that the production of VFA is essential to the development of the rumen papillae.

Calves fed forages early in life, prior to weaning, will begin to ruminate and have greater flow of saliva into the rumen along with greater muscle development of the rumen wall. However, this dietary program does not provide sufficient concentrations of VFA – especially butyrate – to promote rumen papillae development. This development is a key component to a functioning rumen.

A study by Heinrichs and Lesmeister demonstrated that calves fed milk and high-quality alfalfa hay diets over a 12-week period had high growth rates, but minimal papillae development compared to calves fed milk only. The forage-based diets resulted in the primary production of acetic acid rather than butyric acid. (Butyrate, or butyric acid, is believed to stimulate papillae growth in the rumen as the primary substrate for energy to the rumen wall.) As such, a key element to a calf's rumen development is the ingestion of grain. The grain is necessary for sufficient VFA production, which results from microbial digestion and therefore supports papillae growth. When calves were fed milk and free-choice grain over a 12-week period, the papillae were larger and the rumen wall was thicker and more developed. Additionally, the rumens of grain-fed calves were darker in color due to greater vascularization or blood capillary growth, which allows for more absorption of VFA into the blood stream.

"During this period of time, it also is critical that adequate water be fed, along with the grain, to create the correct rumen environment that will support fermentation and production of VFA, which will in turn stimulate rumen development," says Dr. Dari Brown, young animal marketing leader with Land O'Lakes Purina Feed.

“Research has helped make progress on understanding the role of the calf’s diet through the first 12 weeks of life, to support growth and rumen development,” adds Brown. And yet, the optimal nutritional program during the phase of 12 to 24 weeks of age is not as well defined. “At this time the calf is still undergoing significant growth in structure (frame) and body weight, along with additional, important rumen development. Traditionally, calves have been feed high amounts of hay or forage with limited grain during this period,” Brown says. At this critical growth stage, the heifer still needs adequate nutrient supply to meet these demands. Identifying the proper grain and hay balance of a nutritional program should help her continue to develop structurally and potentially improve her production and longevity in the herd.

“The studies we have been conducting are helping us understand the important role feed plays in the rumen development of a dairy calf,” concludes Brown. “These findings could have a significant influence on how calves are fed pre and post-weaning in the future.”

Heat lamps help grow bacteria

Dairy Calf and Heifer Association
Updated: October 10, 2011

Chilly fall temperatures signal the start of calf-warming season, and with it comes some precautions for heat lamp users.

Heat lamps can be helpful, but they also can create the ideal breeding ground for bacteria such as salmonella, says Sheila McGuirk, veterinarian and professor at the University of Wisconsin School of Veterinary Medicine.

Calves pick up organic matter in the maternity pen and carry it with them to the warming area. A maternity-pen stay of just 10 minutes is long enough for a calf to pick up “flora” from the environment, McGuirk says. Under the warm glow of a heat lamp, this flora, along with moisture from the calf’s wet hair coat, encourages the growth of bacteria and other disease-causing organisms in the bedding.

“We can grow salmonella out of that bedding repeatedly,” McGuirk said at the 2011 Dairy Calf & Heifer Conference.

On one farm visited by McGuirk, the temperature inside the warming pen was 90 degrees F. Newborn calves stayed in the pen for several days. A closer look at the calves’ manure showed that two out of three were shedding cryptosporidium oocytes.

A calf can get off to a good start without a heat lamp – even on those zero-degree days, contends McGuirk. She recommends that you remove the calf from the maternity pen promptly, dry her off and give her a warm, 4-quart helping of colostrum. Promptly move her to cold housing while the colostrum still has a warming effect.

According to the newly released Gold Standards III, good colostrum management is essential to maintain calf health, well-being and productivity. Learn more about the Gold Standards III at the Dairy Calf & Heifer Association website.

Innovative calf warming boxes reduce disease transmission

Dan Grooms, Bob Kreft, Rob West, Adam Blumerich and Phil Durst
Dairy Herd Network
Updated: August 22, 2011

Introduction
For the last 6 years, the Michigan State University Dairy Cattle Teaching and Research Center (MSU Dairy Herd) has actively engaged in a Johne's disease (JD) control program. The ultimate goal is to eliminate the disease from the herd. Johne's disease is a chronic disease caused by the bacteria *Mycobacterium avium* subspecies *paratuberculosis* (MAP). The disease is transmitted from adult to young animals primarily through feces, colostrum and milk. Control of the disease requires long-term diligence in maintaining management changes designed to slow down the risk of disease transmission.

Recently, a team from Michigan State University completed a multi-year research study looking at control and prevention of JD in cattle herds. One of the key findings from this study was the need to stop the transmission of the disease in the maternity pen. Anything that can be done to reduce calf exposure to MAP in the maternity pen is highly beneficial to preventing the spread of the disease.

Key to Controlling MAP
An environmental study of farms enrolled in the Michigan Johne's Disease Control Project showed that 17 percent of cultures taken from maternity floors were positive for MAP. In addition, another study in which swab cultures from the skin of cows in maternity or close-up dry cow pens showed that MAP could be cultured from 6 of the 7 animals tested, even though only one of those cows was test-positive (fecal and blood) for MAP. Therefore, the risk of exposure in the maternity pen is high; the longer time spent by the newborn calf in that pen increases the risk of JD infection. A key management strategy for controlling MAP transmission in dairy operations is to remove the calf from its dam as soon as possible after birth.

To facilitate rapid removal of calves from their dam at birth, the Dairy Cattle Teaching and Research Center staff designed and built neonatal calf warming boxes to provide a means to care for newborns and reduce the opportunity for pathogen exposure. Essentially, these "calf incubators" allow for rapid removal of calves from their dams immediately after birth, even when they are still wet. This protected environment allows for the calf to dry rapidly while protecting it from pathogens that often are transmitted in the maternity pen. The boxes are located immediately next to the maternity pens to facilitate the rapid movement of calves into them.

Each box is built to hold one calf. Dimensionally, they are 2 ft W x 4 ft H x 4 ft D (see Figures below). They are completely made of plastic material to allow for easy cleaning and disinfecting between calves. The floor is made of rubber coated expanded metal grating to facilitate drainage of urine and feces. The front panel is clear Plexiglas which allows for easy observation. Each box has its own thermostatically controlled heater to maintain an air temperature of 72 degrees F. The list of construction materials is in Table 1.

At birth, calves are towel-dried and moved to the warming boxes using a calf sled (available from www.foxworthysupply.com). While in the boxes, calves receive 1 gal of high quality colostrum and other neonatal health procedures. Calves remain in the boxes for approximately 24 hr at which point they are moved to outside calf hutches. The number of boxes needed may vary depending on breeding programs, but roughly, 1 box/ 25 cows is a starting place.

While it may not be practical, to remove every calf this soon, consider times and situations where the importance of this option is increased; such as the case when calving into a pen with more than one cow or when JD test-positive dams calve. In these instances, the risks are higher and the need to protect the calf is greater.

Table 1: Construction materials, sources, and costs for one calf box.

Material	Source	Cost Estimate (January 2011)
2 - 4 ft x 8 ft x ½ inch plastic wood	Plastic Lumber Yard www.plasticlumbaryard.com	$318.00
1 - 2 ft x 4 ft x ½ inch clear acrylic sheets - Item # 44386	US Plastics http://www.usplastic.com/	$124.63
4 - 2 inch x 4 inch x 8 inch plastic dimensional wood	Plastic Lumber Yard www.plasticlumbaryard.com	$70.40
1 - 2 inch x 6 inch x 10 inch plastic dimensional wood	Plastic Lumber Yard www.plasticlumbaryard.com	$35.20
Rubber coated expanded metal grating	Foxworthy Supply www.foxworthysupply.com/	$105.70
1500 Watt Heater - Item # PD 95-92	Foxworthy Supply www.foxworthysupply.com/	$105.70
Thermostatically controlled extension cord - Item # 2E535	Grainger Supply www.grainger.com	$91.50
Galvanized pan head bolts	Local hardware	--
Door handle - Item # 1WAE9	Local hardware	--
2- Safety hasp - Item # 1RBP7	Local hardware	--

Advantages of Warming Boxes

Farm personnel and veterinarians have identified several advantages with the warming boxes. First, a significant drop in the incidence of calf scours has occurred. This is likely a result of the rapid removal of the calf from an environment where it could become exposed to a multitude of pathogens (E. coli, *cryptosporidium*, salmonella, etc.) that cause calf diarrhea.

Personnel also have noticed that calves from dystocia occurences seem to respond better when put into the boxes, presumably because of the added warmth provided. Although it is too early to tell if the calf boxes are advantageous in the JD control program, our understanding of the biology of the disease has convinced us that early removal of calves from adult cow environments, including the maternity pen, will reduce the risk of MAP transmission. The major disadvantage of the boxes is that they need to be cleaned and disinfected which obviously requires added labor. The staff estimates that 30 to 60 minutes is needed to clean all four boxes.

Protecting the health of the next generation of replacement animal is critical. The use of calf warming boxes is another tool in what should be a comprehensive control program on farms. No one practice can substitute for improperly maintained maternity pens or failure to implement other key strategies such as not feeding the colostrum of test positive dams. However, innovative solutions such as the one described here helps to ensure early calf health which can translate into superior health and performance as adults.

Figure 1: Drawing of calf warming boxes constructed at Michigan State University Dairy Cattle Teaching and Research Center.

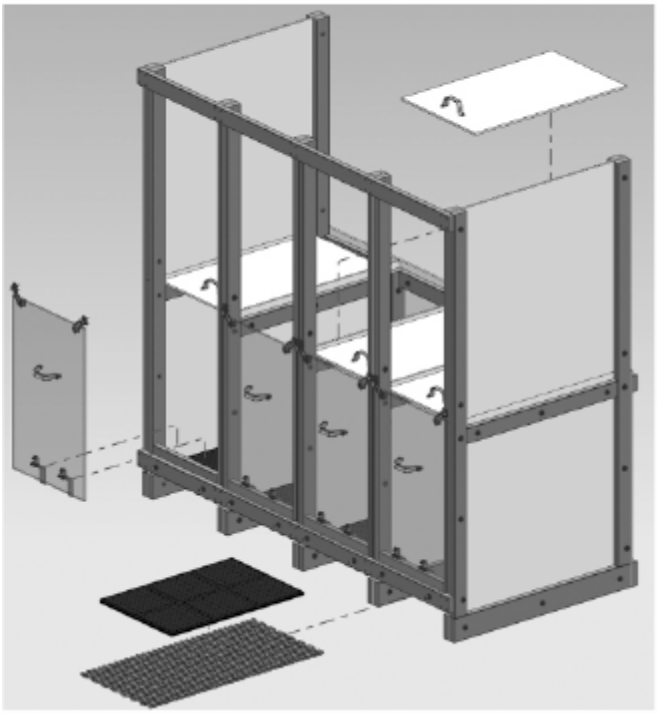
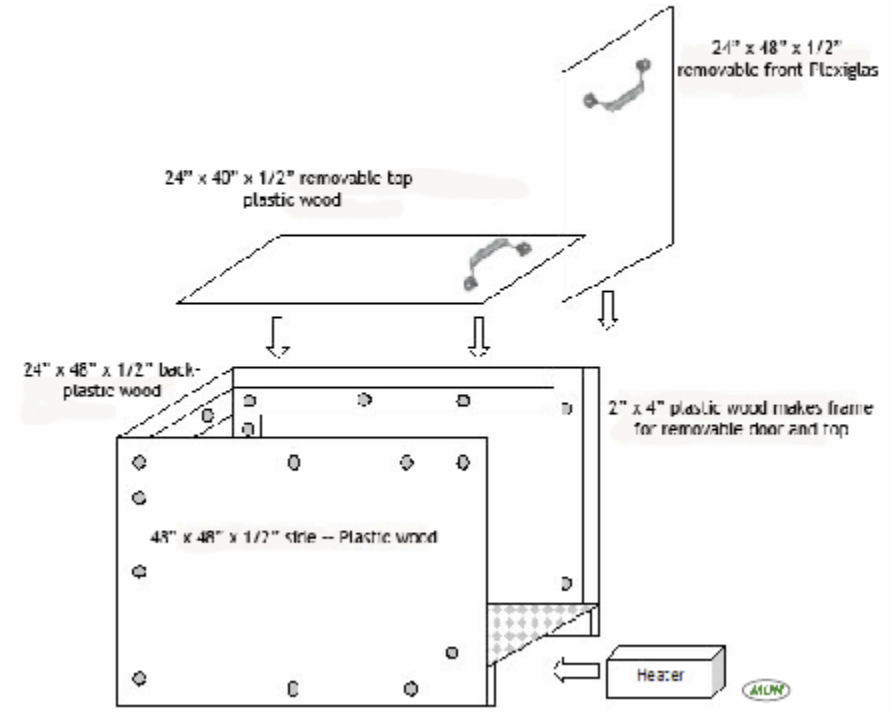


Figure 2: Calf warming box in action at Michigan State University Dairy Cattle Teaching and Research Center.

Figure 3: Dimensions of an individual calf warming box as built at Michigan State University Dairy Cattle Teaching and Research Center. (Note: Top panel is slightly shorter than sides and bottom to allow for top ventilation).



HOGS

Effect of Source & Quantity of Dietary Vitamin D in Maternal & Creep Diets on Bone Metabolism & Growth in Piglets

The Pigsite
July 18, 2011

Supplementation of the sow diet during pregnancy with 50µg/kg of either of the two vitamin D sources tested was adequate to meet the needs of the sow herself, the developing foetuses and for normal skeletal mineralisation and growth in her offspring, according to researchers based in Zurich, Switzerland.

The effect of the source and level of dietary vitamin D in the sow's gestation diet and the creep on growth and bone metabolism of the offspring were studied by A-K. M. Witschi of the ETH in Zurish and co-authors there and in Aarau and Basel. Their paper is published in a recent issue of the Journal of Animal Science.

Piglets are born with reduced plasma concentrations of 25-hydroxycholecalciferol (25-OH-D3) and are thus highly predisposed to vitamin D deficiency, explain the paper's authors. Furthermore, sow milk contains little vitamin D and the slow intestinal vitamin D absorption of sows limits the efficacy of dietary vitamin D supplementation. Hence, the neonatal piglet depends, to a large extent, on the vitamin D stores built up in foetal tissues from maternal sources.

The study was undertaken to evaluate whether the source and quantity of dietary vitamin D provided to the gestating and lactating sow, and also directly in the form of creep feed to the piglet, would influence the vitamin D status, growth performance and skeletal development of piglets.

A total of 39 primiparous and multiparous sows were randomly assigned to one of three dietary treatments (13 in each treatment), supplemented with either 5 or 50µg of the commonly used cholecalciferol (vitamin D3) or 50µg of 25-OH-D3 per kilogram of feed. By week 3 of lactation, piglets were offered a creep diet with vitamin D supplementation according to the treatment of the dam, and they were offered the same creep diets after weaning at day 35 of age until they reached a bodyweight of approximately 20kg.

When dietary 25-OH-D3 was provided, circulating concentrations of 25-OH-D3 in piglet serum increased ($P<0.05$) as early as day 21 and later at day 33 and 77, indicating greater body stores in those animals. Bone-breaking strength and cortical bone mineral content and density at the tibial mid-shaft of piglets were reduced ($P<0.05$) when vitamin D3 was supplemented at 5µg/kg compared with the bone traits of other groups but no differences ($P>0.05$) were observed between the two other groups.

After weaning, average daily feed intake (ADFI) was greater ($P<0.05$) and growth performance tended ($P=0.08$) to improve when doses of 50µg/kg were administered, regardless of the vitamin D source.

Witschi and co-authors concluded that supplementation of the diet with 50µg/kg of either source of vitamin D was adequate to meet the needs of gestating sows and in permitting the accumulation of vitamin D in foetal tissues, as well as for normal skeletal mineralisation and growth in the offspring.

Furthermore, they said, the markedly improved vitamin D status of piglets whose mothers received 25-OH-D3 possibly resulted from greater tissue reserves present at birth and a greater availability of vitamin D when released from those stores.
Reference

Witschi, A-K. M., A. Liesegang, S. Gebert, G. M. Weber and C. Wenk. 2011. Effect of source and quantity of dietary vitamin D in maternal and creep diets on bone metabolism and growth in piglets. J. Anim. Sci., 89 (6): 1844-1852.

Controlling boar taint in pork

ThePigSite News Desk
Friday, July 15, 2011

UK - Advice on controlling boar taint in pork has just been published as part of BPEX's Target Pork Quality factsheet series.
British Pig Executive

Boar taint is an odour or flavour which is offensive to some people if they detect it when cooking or eating pork or pork products. It is important that producers minimise the risk of boar taint to ensure they produce consistent, high quality pork and pigmeat products for consumers.

The odour or flavour is a result of high concentrations of androstenone and/or skatole in the meat. Androsterone is a natural sex pheromone found in boars and skatole is a by-product of digestion in the pig.

The BPEX factsheet highlights a number of areas that pig producers can manage to minimise the risk of boar taint, including:

- pig pen hygiene
- ventilation
- dietary fibre – increasing fibre content can help
- dietary protein – avoid feeding excessive protein
- age for weight – achieve target pig weight at a younger age

Plus there is information on technologies in the pipeline that may help control boar taint in future.

Interestingly, consumers often react differently to boar taint depending on which part of the world they are from and whether they are male or female. For example, the British are generally less critical of pork with boar taint than other consumers across Europe. Females are more likely to be sensitive to boar taint than men, at least when it relates to androstenone.

For a copy of Target Pork Quality No.6: Boar taint and its control, please click here or call 02476 478 792.

Chicory may be the answer to prevent boar taint in pork

(By Janne Hansen)
Source: Aarhus University
Pig Progress
07 Oct 2011
The discovery of how chicory affects boar taint can, in the long run, open the door to a more targeted and efficient way of preventing boar taint via the feed. If you have ever experienced the malodour of cooked, boar-tainted pork, then you will know that it is not very appetising. In order to avoid giving consumers this unpleasant experience, most male pigs in Denmark are castrated.
Castration is uncomfortable for the pig and extra work for the farmer, but has until recently been the only viable solution to the problem.

Earlier studies at Aarhus University have shown that feeding pigs chicory can replace castration. Scientists have now taken a step closer to understanding how chicory affects boar taint. Their discovery can put the scientists on the track to finding a cheaper and more efficient way of using chicory as a replacement for castration. This would benefit the pig, the farmer and the consumer.
If the farmer feeds his pigs chicory for 14 days prior to slaughter he can avoid unpleasant boar taint in the pork. Feeding chicory is, however, not very widespread on Danish farms. One of the reasons is that chicory is too expensive.

Exploring the liver
If the scientists can home in on how the beneficial effect of chicory originates then that knowledge could pave the way for new possibilities of feeding chicory or bioactive compounds from chicory or other plants containing the bioactive compounds. To begin with, though, the scientists must find out how feeding pigs chicory is related to reduced boar taint. This is what they have recently come a step closer to understanding.

“We can see that there is a reduced skatole content in pig’s fat and blood when the pig has been fed chicory for 14 days prior to slaughter. We investigated if this is because metabolism of the compound in the liver is improved for some reason. We conducted analyses to find the liver enzymes that metabolise skatole and androstenone and found

that the enzyme content was higher and that enzyme activity was greater after feeding chicory," says PhD student Martin Krøyer Rasmussen from Aarhus University.

Skatole is produced by bacteria in the pig gut from which it is absorbed into the blood. Via the blood the compound finds its way to the liver where it is broken down by enzymes.

Pheromones also smell
Androstenone is also a problem. It is a pheromone produced in the pig's testicles. It is also metabolized in the liver. Androstenene inhibits skatole metabolism. If skatole and androstenone are not metabolised in time with their production, they accumulate in the fat and give rise to boar taint in pork.

"In our studies we also found a clear effect of chicory on androstenone. We measured less androstenone in the fat, a higher level of the enzyme that metabolizes androstenone in the liver, and higher levels of the particular mRNA and protein that need to be present to build the enzyme," explains Martin Krøyer Rasmussen.

The next step for the scientists will be to find out if there is something bioactive in chicory that stimulates the liver directly or if the body is affected in some other way so that the liver reacts indirectly. The scientists will investigate this by subjecting liver cells grown in the laboratory to chicory directly and thereafter measuring if there is a higher enzyme level.

"If there is no effect on the enzyme level in the cultivated liver cells, then it is because the chicory has an effect somewhere else in the body," says Martin Krøyer Rasmussen, who, at the end of the day, hopes to find the bioactive substance in chicory.

"Chicory is used to produce inulin. If the bioactive substance we are seeking can be produced as a by-product of inulin production, then it might be a cheaper way to give it to pigs. Another possibility is that, when we find the bioactive compound, we look for the compound in other plants or produce it artificially," he explains and adds that are indications that chicory can put a damper on aggression in male pigs.

The project is supported by the Ministry of Food, Agriculture and Fisheries and the agricultural company DLG and is being carried out in collaboration with the Swedish University of Agricultural Sciences.

Effect of local anaesthesia and/or analgesia on pain responses induced by piglet castration

Reference
Hansson M., N. Lundeheim, G. Nyman and G. Johansson. 2011. Effect of local anaesthesia and/or analgesia on pain responses induced by piglet castration. Acta Veterinaria Scandinavica, 53:34. doi:10.1186/1751-0147-53-34

Researchers in Sweden found that lidocaine reduced pain in male piglets during castration and that meloxicam reduced pain after castration.

Surgical castration in male piglets is painful and methods that reduce this pain are requested, according to Monica Hansson of the Swedish University of Agricultural Sciences in Uppsala and co-authors there and the Swedish Animal Health Service in Linköping. This study, published in Acta Veterinaria Scandinavica, evaluated the effect of local anaesthesia and analgesia on vocal, physiological and behavioural responses during and after castration. A second purpose was to evaluate if stockmen can effectively administer anaesthesia.

For the experiment, four male piglets in each of 141 litters in five herds were randomly assigned to one of four treatments: castration without local anaesthesia or analgesia (C, controls), analgesia (M, meloxicam), local anaesthesia (L, lidocaine), or both local anaesthesia and analgesia (LM). Lidocaine (L, LM) was injected at least three minutes before castration and meloxicam (M, LM) was injected after castration.

During castration, vocalisation was measured and resistance movements judged. Behaviour observations were carried out on the castration day and the following day. The day after castration, castration wounds were ranked, ear and skin temperature was measured, and blood samples were collected for analysis of acute phase protein serum amyloid A concentration (SAA). Piglets were weighed on the castration day and at three weeks of age. Sickness treatments and mortality were recorded until three weeks of age.

Piglets castrated with lidocaine produced calls with lower intensity ($p<0.001$) and less resistance movements ($p<0.001$) during castration. Piglets that were given meloxicam displayed less pain-related behaviour (huddled up, spasms, rump-scratching, stiffness and prostrated) on both the castration day ($p=0.06$; not significant) and the following day ($p=0.02$).

Controls had less swollen wounds than piglets assigned to treatments M, L and LM ($p<0.001$).

The proportion of piglets with high SAA concentration (over threshold values 200, 400 mg/l) was higher ($p=0.005$; $p=0.05$) for C + L compared to M + LM.

Ear temperature was higher ($p<0.01$) for controls than for L and LM. There were no significant treatment effects for skin temperature, weight gain, sickness treatments or mortality.

The Swedish researchers concluded that lidocaine reduced pain during castration and that meloxicam reduced pain after castration. Furthermore, Hansson and co-authors noted that the stockmen were able to administer local anaesthesia effectively.

Improve piglet survival

Source: Sept. 19, 2011
www.porknetwork.com

Improving piglet pre-weaning survival can critically impact profitability in pork production. Keeping pre-weaning mortality low can optimize the number of market pigs sold per sow per year. This can ultimately keep overhead costs low per pig sold. However, improving piglet survival from birth to weaning can be difficult. Newborn piglets need a warm environment, 90-95o F, while sows like the ambient temperature to be near 70o F. In addition, piglets are often born with low energy stores and little immunity to combat environmental pathogens. For piglets to thrive, they must consume ample amounts of colostrums, which is high in energy and immunoglobulins, specifically immunoglobulins G (IgG), which improves passive immunity and help prevents occurrence of disease. Colostrum production in the sow occurs during the first 24 hours after farrowing begins and curtails quickly after 24 hours in most sows. There appears to be quite a bit of variability in colostrum production and IgG concentration in colostrum from sow to sow. Recently a study was reported that evaluated different factors and their effect on colostrum production and yield (Quesnel, 2011). Characteristics evaluated were those experienced by the sow that may have a roll in colostrum production and IgG concentration. Few factors evaluated in the study significantly influenced colostrum yield. Sows with differences in litter size at birth, litter birth weight or variation in litter birth weight has similar colostrum yield. However, it was reported that sows that took longer to farrow their third through fifth pigs had lower colostrum yield than sows who took less time. Furthermore sows that had more stillborns also had less colostrum yield than sows that had fewer stillborn pigs. This suggests that sows that might have been in distress during farrowing, may produce less colostrum and subsequently their pigs may also consume less colostrum as well. IgG concentrations were found to be higher in older parity sows than in first parity sows and that the decline of IgG concentrations during the first 24 hours after farrowing was extremely variable, with 15% of the sows maintaining 50% or more of their IgG concentration at 24 hours after farrowing. This study also reported that colostrum intake by piglets was highly variable as well. Light birth weight piglets had less colostrum intake than heavier birth weight pigs and also colostrum intake was lower within litters with high variability in birth weight. This suggests that piglet viability and competition for colostrum within the first 24 hours after birth can have a large impact on viability to weaning. This study confirms the need to provide low birth weight piglets ample opportunity to consume colostrum within the first 24 hours after birth. This can be accomplished by split sucking. Larger pigs within the litter can be placed in a warm area away from the sow to allow low birth weight piglets ample opportunity to consume colostrum. The same oversight should be given to smaller piglets that greatly differ in birth weight from their larger litter mates. In addition this study suggests that sows which have a higher incidence of stillborn pigs as well as those that take longer to farrow the first half of their litter may produce less colostrum. Pigs born to these sows may need additional attention during the first hours after birth and along with supplemental energy.

Hypothermia in Neonatal Piglets: Interactions and Causes of Individual Differences

Source: Aug. 2, 2011
www.aasv.org

Hypothermia is a major cause of mortality in neonatal piglets. However, there are considerable individual differences in the successful recovery from postnatal hypothermia in the common farrowing environment, and so far the causes and interactions of causes have not been studied in detail. Using 635 crossbred neonatal piglets, the aim of this study was to identify the links among different physiological and behavioral measures and their connections to the ability of piglets to overcome initial postnatal hypothermia, with rectal temperature at 2 h as the response variable. The data included birth weight, hypoxia at birth (viability score and lactate in umbilical cord blood), latency to first udder contact and first suckle, scans of individual piglet position during the first 2 h after birth, and rectal temperature at birth and 2 h postpartum. A graphical chain model was used to analyze data. The statistical variables were divided into blocks according to level (design and litter) and chronological order (prenatal, birth, perinatal, and thermoregulatory success at 2 h) before applying the graphical model to the data. Bayesian information criteria (BIC) was used for model selection. The BIC relates to maximum likelihood, but introduces an additional penalty term for the number of variables. The strength of an association between 2 variables is reported as the increase in BIC (BICinc) due to removing the link. Results indicate that at 2 h, 22.1% of the piglets had a rectal temperature below 37°C. Out of the 16 variables included in the model, only 3 had direct links to the response variable of rectal temperature at 2 h. There was a positive relationship between rectal temperature at 2 h and birth weight (BICinc = 26), and between being observed more often by the udder as opposed to alone during both the first (BICinc = 8) and second hours (BICinc = 19) after birth. Lighter piglets and piglets that had experienced hypoxia took longer to achieve first suckle, which in turn affected where the piglet positioned itself during the first and second hours after birth. Variables related to the birth process had no direct connection to thermoregulatory success, but were additive in the explanation of piglet behavior. The rectal temperature of individual piglets at 2 h depends largely on piglet birth weight and on piglet position in relation to sow and littermates. Birth weight is the most important single factor in successful recovery from postnatal hypothermia.

Comparing feed efficiency, backfat and reproductive performance between group-housed and conventionally stalled gestating sows

Ontario Pork Daily News Brief
September 13, 2011
Case Study: Farm Innovation Program Project -

This project will evaluate the effects of housing on feed efficiency, backfat and reproductive performance by comparing two group housing systems to conventional

stalled housing on one farm. Ultrasound technology will be a key tool in this research project.

The Wilson Livestock Company in Perth County currently houses its sows in three housing systems – two types of group housing as well as stalled gestation. The unique set-up of this farm makes it ideal to test the hypothesis that group housing systems can deliver equal or better feed efficiency than standard, stalled gestation housing.

This project was funded in part through Growing Forward, a federal-provincial-territorial initiative. The Agricultural Adaptation Council assists in the delivery of several Growing Forward programs in Ontario.

Shoulder sores

The causes, treatment and prevention of shoulder sores in sows are set out in Knowledge Transfer Bulletin No. 17 from BPEX.
Pig Site, August 22, 2011
Source: Danish Pig Production

It is of interest to all parties to reduce the number of sows with shoulder sores, as sores not only affect performance but are also a major welfare concern. Reducing shoulder sores may have a greater impact on productivity than initially thought, as many factors that cause shoulder sores can be linked with other areas of production, and a chain reaction of improved production efficiency will occur once the action plan is implemented.
What are Shoulder Sores?

Shoulder sores on sows are not common on pig units in England but they can occur from time to time, the most likely stage for them to develop is during the first two weeks in the farrowing house. The sores can vary from small red patches on the skin, to wounds of up to 10cm in diameter. Various factors can lead to the development of shoulder sores, with poor sow condition and prolonged lying periods on hard floors during lactation being the main contributors.

Sores are caused by pressure compressing the blood vessels supplying the skin and tissues covering the shoulder blade, this interrupts the blood flow causing tissue damage and the formation of lesions. These are different from other skin wounds resulting from causes such as fighting, and need different treatment.

The best method of prevention is good management but if sores do develop, interventions must be put in place immediately; these include fitting a mat in the crate or moving the sow to a more spacious pen with soft bedding.

Categorisation

0	No sores or sores caused by other factors such as fighting and physical injury
1	Sores in the top layer of the skin
2	Sores in the top layer of the skin, with crust formation and scar tissues
3	Sores in the deeper layer of the skin and with crust formation and severe scar tissue
4*	Deep sores into the muscles, sometimes with visible shoulder bone

* Sores in this category are considered totally unacceptable and something which should not, but could, occur

Causes of Shoulder Sores

Degree 1 - Lesion in the dead part of the top layer of the skin

Degree 2 - Deeper lesion with crust formation and scar tissue

Degree 3 - Deep lesion with scar tissue

Degree 4* - Lesion with visible bone

- **Lying down:** During lactation, considerable pressure is placed on the shoulders as sows are lying down for long periods; this reduces blood circulation to the side on which the sow is lying
- **Skinny sows** (condition score below 3) are more prone to shoulder pressure when lying down
- **Overfat sows** (condition score above 3.5) will lie down for longer periods and may struggle to get up; this can increase pressure on the shoulders
- **Illness:** Any illness, including lameness, during the farrowing and lactation period can increase the time a sow spends lying down and the chances of developing sores
- **Age:** Older sows are at higher risk of developing shoulder sores; this may be related to the increased weight of the animal or loss of body condition over consecutive lactations
- **History of sores:** Sows that have previously had shoulder sores are prone to getting them again. Generally, sows with healed shoulder sores should be culled. Sows with mild sores, scoring less than 2, could be retained, provided that the sore is healing and the sow is otherwise in good health and physical condition

- **Genetics:** In a Danish trial in the Danbred herds, a record of shoulder sores was collected for sows during their time in the farrowing crate. It was found that twice as many Landrace sows had shoulder sores compared to the Yorkshire sows.

Treatment of Shoulder Sores

- Interventions must be put in place if a sow has a sore between degree 1 and 2. If a sow has a shoulder sore of degree 3 or 4, euthanasia should be the only solution to prevent unnecessary pain and suffering
- Any shoulder sores that do develop should be kept clean and treated according to veterinary advice or farm health protocols, developed in conjunction with your vet
- Lame sows and sows with a shoulder sore of degree 1-2 should be moved to recovery pens (See *Action for Productivity 15: Hospital and recovery pen management*)
- It is critical to seek immediate veterinary advice when sows are detected with severe scores of degree 3 or 4.

Preventing Shoulder Sores

Accommodation

- The farrowing crate should allow the sow to easily get up and lie down
- The recommended length of the farrowing crate is 210cm, measured from the front of the trough to the back of the crate. The crate itself should measure 65cm wide at the trough and should be adjustable in width, to a maximum of 90cm, at the back end of the crate
- Breeding has increased the size of sows over the years and adjustable crates may be needed to give more length and accommodate the natural standing and lying actions of longer breed types
- Where adjustable farrowing crates are used, open to the widest position when sows enter the farrowing house, reduce at farrowing to minimise crushing and then open up again one to two days later
- Bedding can help to reduce shoulder sores but can be difficult to manage in crates with perforated floors
- Creep floor heating is good for piglets but should not be laid under the crates as this will be too warm and uncomfortable for the sow
- A dry and non-slippery concrete floor where the sow is lying may reduce shoulder sores
- Ensure that the floor surface under the sow is not abrasive; worn and rough concrete surfaces should be repaired/resurfaced
- Slippery floors, such as some fully slatted plastic floors, deter sows from trying to stand and can increase shoulder sores
- Fully slatted floors, which apply uneven pressure on the shoulder of the sows, should be avoided

- Mats can help reduce the pressure on the shoulders, particularly if they are made of softer material
- Mats should be used as a temporary solution and only for high-risk sows, as they can reduce a sow's ability to keep cool and increase heat stress. Mats can also lead to poorer hygiene around feed troughs
- Loose housing with deep bedding for dry sows can improve the physical condition of the sow on entry to the farrowing house
- If reddening is seen on the skin in the shoulder area, interventions must be put in place to reduce the development of shoulder sores; sows should be moved to recovery pens or mats should be fitted in the crates.

Body condition

- Sows should stay in similar body condition score throughout their cycle; aim for sows to maintain a condition score of 3 (on a scale of 1-5)
- If the hipbone can be felt easily when laying the palm of the hand on the hip of the sow, the sow is too skinny and her body condition must be increased
- If the hipbone cannot be felt, the sow is probably too fat
- Body condition scoring (BCS) should be carried out regularly. If condition deviates from the target of 3 or slightly higher (3.5), the risk of developing shoulder sores increases; if this happens discuss diet specification with your nutritional adviser
- In modern lean genotypes BCS is an indicator of the animal's overall muscularity but a poor indicator of fat cover or fatness. Diets should be formulated to meet sow protein and energy requirements, taking into account requirements to support body lean gain in gilts and young sows to maintain them in good body condition at all times
- Sows that have lost body condition during lactation should not be placed on low protein diets to increase fatness, as this is counter productive to improving their BCS. The diet must be balanced for energy AND protein to support the re-gain of muscle mass and associated fat cover to reduce their risk of developing shoulder sores.

Food and water

- To achieve optimal body condition (score 3) at farrowing, sows should ideally be individually fed during gestation so that their daily feed allowance can be adjusted for weight gain management. If this is not possible, ensure that sows are grouped according to size and condition and that extra attention is paid to the smaller/weaker sows
- When floor feeding, it is important to distribute feed evenly and to provide sufficient space per sow eg 2.7 m^2/sow
- Aim to maximise feed intake during lactation to avoid loss of body weight and condition. This can be achieved by using an appropriate feeding scale geared for day of lactation, parity and litter size. Feed management is especially critical in

the first few days after farrowing when appetite is low and the risk of feed rejection is high.
- Ensure that sows have access to a free supply of fresh drinking water at all times (see *Action for Productivity 16*). Water management is particularly important during lactation as the intake of fresh drinking water enhances feed intake, reducing the loss of body condition.

Sow management

- Sows with a history of shoulder sores should be given extra care and attention
- It is important that sows have good legs and sound feet so that they can move freely and without discomfort enabling them to alter their lying positions, reducing the risk of developing sores
- Feet should be trimmed to avoid soreness when standing up
- During the first two to three weeks in the farrowing house, sows should be inspected daily on both sides
- Specific shoulder vests can be fitted on sows that are at risk of developing shoulder sores; they should not be used if there is already a visible shoulder sore. If shoulder vests are used, the sow and the vest should be checked daily
- When choosing foster sows, ensure that they are healthy and in good body condition (score 3-3.5), and that no sow has a history of shoulder sores
- Foster sows should not lose more condition than other sows if sufficient feed intake is maintained.

It is important to establish why shoulder sores are occurring on sows in herds that are experiencing this problem. Working with your vet, draw up an action plan with unit managers and staff for the control and future prevention of shoulder sores. All staff should be involved with the process, with each individual taking responsibility for an area. The action plan should set targets and be regularly evaluated to assess its effectiveness.

10 top tips to prevent shoulder sores

1. The target is for sows to stay in similar body condition score (BCS) throughout their lives; aim for sows to maintain a condition score of 3 (on a scale of 1-5). Sows that have lost body condition during lactation should not be placed on low protein diets to increase fatness, as this is counter productive to improving their BCS. Sows weaned with BCS under 3 should be fed diets that are adequate in protein content with daily feed allowances to support body lean mass plus fat cover for the recovery of body condition.
2. Body condition scoring should be carried out regularly. If condition deviates from the target of 3 or slightly higher (3.5), the risk of developing shoulder sores increases; if this happens discuss diet specification with your nutritional adviser.
3. To achieve optimal body condition (score 3) at farrowing, sows should ideally be individually fed during gestation so that their daily feed allowance can be adjusted for weight gain management. If this is not possible, ensure that sows

are grouped according to size and condition and that extra attention is paid to the smaller/weaker sows.

4. Aim to maximise feed intake during lactation to avoid loss of body weight and condition. This can be achieved using an appropriate feeding scale geared for day of lactation, parity and litter size. Feed management is especially critical in the first few days after farrowing when appetite is low and the risk of feed rejection is high.
5. Identify high-risk sows and pay extra attention to them
    a. Skinny sows
    b. Sows which have previously had shoulder sores
    c. Lame sows or sows with other leg and claw problems
    d. Ill sows
    e. Old sows

    Provide high-risk sows with mats in the farrowing crate and make appropriate notes on the sow card, eg on which side she is prone to getting a sore.

6. Loose housing with deep bedding for dry sows can improve the physical condition of the sow on entry to the farrowing house
7. If reddening is seen on the skin in the shoulder area, interventions must be put in place to reduce the development of shoulder sores; sows should be moved to recovery pens or mats should be fitted in the crates.
8. A dry and non-slippery concrete floor where the sow is lying may reduce shoulder sores; slippery floors, such as some fully slatted plastic floors, deter sows from trying to stand and can increase shoulder sores.
9. Ensure that the floor surface under the sow is not abrasive; worn and rough concrete surfaces should be repaired/resurfaced.
10. Where adjustable farrowing crates are used, open to the widest position when sows enter the farrowing house, reduce at farrowing to minimise crushing and then open up again 1-2 days later.

Economic and welfare impact of lameness in sows in England

In a survey of UK farms in 2007/2008, four per cent of sows were found to show signs of lameness, with half of farms having at least one lame animal. The cost per lame sow was estimated to range from £19 to £266.
British Pig Executive

Lameness in pigs is a major welfare concern and one of the most commonly reported reasons to premature culling of breeding sows, according to Katriina Willgert of the UK's Royal Veterinary College in a report made available by BPEX.

The prevalence of lameness in sows was estimated from 113 English pig breeding units in 2007 and 2008, and different risk factors associated with the occurrence of lameness were examined, followed by an assessment of the economic costs of lameness in sows.

The prevalence of lameness in sows was 4.3 per cent and at least one lame sow was observed at 50.4 per cent of the 113 farms. The culling rate of sows due to lameness (3.9 per cent) was slightly lower than the prevalence of lameness in sows.

In both indoor and outdoor sows, the presence of a prevention plan for lameness at the farm significantly affected the occurrence of lameness. Farms with higher producing sows were more likely to have a prevalence of lameness of five per cent or higher.

When only indoor sows were considered, the odds of lameness occurring at the farm increased with the number of sows in the pen.

Lameness was also more likely to occur at farms where sows were housed on solid flooring than when they were kept on slatted or partly slatted flooring.

Depending on the severity of the case, the estimated cost of an initial case of lameness could range from £19 if only treatment is required to more than £266 in more severe cases where the production level is affected and euthanasia is necessary, concluded Ms Willgert.

The author added that increased awareness of the risk factors behind lameness is essential in farm management and can be useful when designing housing areas as well as developing future prevention plans for lameness.

Hypothermia in Neonatal Piglets

Reference

Kammersgaard, T.S., L.J. Pedersen and E. Jørgensen. 2011. Hypothermia in neonatal piglets: interactions and causes of individual differences. Journal of Animal Science, 89 (7): 2073-2085 doi: 10.2527/jas.2010-3022

Birth weight is the most important single factor in successful recovery from postnatal hypothermia, according to research from Aarhus University in which the interactions and causes of individual differences were investigated.

Hypothermia is a major cause of mortality in neonatal piglets. However, there are considerable individual differences in the successful recovery from postnatal hypothermia in the common farrowing environment and so far, the causes and interactions of causes have not been studied in detail.

In their paper published in the Journal of Animal Science, T.S. Kammersgaard and colleagues at Aarhus University in Denmark explain that they used 635 crossbred neonatal piglets in their study to identify the links among different physiological and behavioural measures and their connections to the ability of piglets to overcome initial postnatal hypothermia, with rectal temperature at two hours old as the response variable.

The data included birth weight, hypoxia at birth (viability score and lactate in umbilical cord blood), latency to first udder contact and first suckle, scans of individual piglet position during the first two hours after birth, and rectal temperature at birth and two hours post-partum. A graphical chain model was used to analyse data.

The statistical variables were divided into blocks according to level (design and litter) and chronological order (prenatal, birth, perinatal, and thermoregulatory success at two hours) before applying the graphical model to the data.

Bayesian information criteria (BIC) were used for model selection. The BIC relates to maximum likelihood but introduces an additional penalty term for the number of variables. The strength of an association between two variables is reported as the increase in BIC (BICinc) due to removing the link.

Results indicate that at two hours, 22.1 per cent of the piglets had a rectal temperature below 37°C.

Of the 16 variables included in the model, only three had direct links to the response variable of rectal temperature at two hours. There was a positive relationship between rectal temperature at two hours and birth weight (BICinc = 26), and between being observed more often by the udder as opposed to alone during both the first (BICinc = 8) and second hours (BICinc = 19) after birth.

Lighter piglets and piglets that had experienced hypoxia took longer to achieve first suckle, which in turn affected where the piglet positioned itself during the first and second hours after birth.

Variables related to the birth process had no direct connection to thermoregulatory success, but were additive in the explanation of piglet behaviour.

The rectal temperature of individual piglets two hours after birth depends largely on piglet birth weight and on piglet position in relation to sow and littermates, concluded Kammersgaard and co-authors. They added that birth weight is the most important single factor in successful recovery from postnatal hypothermia.

Dutch research: Learning how to eat like a pig

28 Sep 2011
Pig Progress
Related website:
• Wageningen University and Research Centre (WUR)

Recent research at Wageningen University and Research Centre, the Netherlands, indicates that training and learning can help piglets overcome the difficult timeframe around weaning.

Dr Marije Oostindjer, 26, received her PhD last week with a thesis called Learning How to Eat Like a Pig. Key to her research was to find out how piglets learn and how this knowledge can be used to facilitate the weaning process.

She discussed three different aspects:
• Direct learning from the sow through cues derived from observation and eating together

• Learning in an enriched environment

• Learning from flavour cues in the maternal diet

Learning from the sow
Oostindjer noted that the presence of the sow can influence piglet behaviour in various ways. She stated: "Piglets that were allowed to explore novel food items before weaning in the presence of the sow were less reluctant to explore an dingest these novel food items than in her absence."

"Being able to interact more and eat together with the sow also had positive effects on food intake before weaning an dresulted in less damaging behaviour and more play behaviour after weaning."

"Piglets learn effectively through both observation of the sow and participation with the sow while she eats, and they use information form both the location and the type of food eaten."

Enriched environment
In various tests, Oostindjer tested the behaviour of piglets in barren and enriched post-weaning housing conditions, e.g. more space allowance, straw, wood shavings, peat and branches.

She concluded, "Enrichment of the environment before weaning positively affected growth and food intake afer weaning. Providing enrichment after weaning increased growth and feed efficiency and decreased diarrhoea and stress-related behaviours."

Flavour exposure
The role of flavours also play a role as weaned piglets ‘recognise’ strong smells or flavours like e.g. carrot or anise, when this had been consumed prenatally or perinatally by their mothers. The resulting post-weaning effect is not so much related to piglets liking the acutal feed better – more it is related to a reduction of weaning stress levels.

The result, Oostindjer noted, is less stress-related behaviour, reduction of diarrhoea, and an increase of growth and feed intake.

Symposium

The PhD thesis was presented late last week with an international symposium around the theme. Presentations made e.g. parallels with similar developments in human behaviour and flavour preference.

New Knowledge about Sow Milk Production

Source: Jul. 25, 2011 www.thepigsite.com

DENMARK - Scientists from Aarhus University's Research Centre Foulum have developed a pig model that can provide answers to how pregnant and lactating sows should be fed to improve their milk production. The model, which is the first of its kind in the world, is expected to provide knowledge that makes it possible to reduce piglet mortality. Pig breeding in recent years has resulted in increasing litter sizes. However, large litters have also given rise to problems with high piglet mortality. One of the reasons is that the sow does not produce enough colostrum. Therefore, many neonatal piglets die of hunger hours after birth. If it were possible to get the sow to produce more colostrum, then more piglets would survive. The physiological factors that affect milk production are very complex. More needs to be learned about how to feed sows optimally in relation to promoting production of the colostrum which is so important for piglet survival.
Scientists at Aarhus University have developed a pig model that permits them to investigate the factors influencing milk yield more accurately. The way the model works is that catheters are operated into selected sows. This permits the scientists to extract samples from several different locations in the sow's body. The catheters are operated into the sows approximately one and a half months before expected farrowing thus permitting the scientists to investigate sow metabolism during pregnancy and lactation. With the aid of the model the scientists can study how nutrients are metabolised in the various organs and how the individual nutrients are metabolised to milk production. In other words, they can measure what happens to each nutrient inside the sow. The model will provide new insight into the mechanisms that control the distribution and application of the nutrients in the sow. This is the first time ever that this kind of investigation is being carried out. "To begin with we will study nutrient metabolism in the liver," said the leader of the project, senior scientist Peter Theil from the Department of Animal Science at Aarhus University. "The liver is particularly interesting because it metabolises many nutrients and to a great degree coordinates nutrient use in the rest of the animal. The liver makes nutrients from the intestine available to the udder and is thus one of the regulators of milk production," he explained. The model permits scientist to observe how different feeding strategies affect the production of colostrum and milk. There are several indications that present feeding strategies do not consider colostrum production well enough. The scientists expect that the pig model will provide knowledge to enable improvement of feeding during lactation. When all is said and done, Dr Theil expects the new model to provide knowledge that can improve pig production in general by, among others things, reducing piglet mortality. Since pigs are similar to humans physiologically speaking, he also expects that the model can provide knowledge that can be used in connection with birth and breast-feeding.

Study finds group size, diet affect sow behavior

Feedstuffs
(7/23/2011)
By Krissa Welshans

Animal rights groups have been targeting sow gestation stalls for years, saying sows should be able to move around freely to exhibit natural behaviors, while the hog industry has argued that gestation stalls actually protect the sows as they carry their piglets and that as long as they are fed and watered, sows are content.

Group housing is also not acceptable in the minds of animal rights groups, but it is currently the only solution that allows the pork industry to continue adequately feeding a growing population when forced to stop using gestation stalls.

Dr. Janeen Salak-Johnson from the University of Illinois at Urbana-Champaign conducted a research project that found positive differences when sows are housed in group pens versus gestations stalls. However, she also found that in some instances, group housing is not necessarily a better environment.

The objectives of the Illinois study were to evaluate feeding dietary fiber to gestating sows kept in group pens (10 sows per pen) at different floor space allowances to see how that affected sow performance, productivity, immune and endocrine status and behavior.

In this study, 240 sows were allotted to a dietary treatment of either a standard diet (control) or a standard diet supplemented with high fiber (treatment) and a floor space allowance treatment of either 1.7 sq. m or 2.3 sq. m per sow.

The high-fiber diet used in this study consisted of 15% wheat middlings and 30% soy hulls.

Performance measures included sow bodyweight, back fat (10th rib) and body condition, and lesion severity scores were assessed throughout gestation. Sow productivity was assessed using "standard" farrowing measures.

Sow well-being was further assessed using various welfare measures that encompassed immune, endocrine and behavior traits; these measures were taken throughout gestation.

Sow behavior was recorded using a video capture combo card and was viewed in real time. Behavior was observed and registered for 10 hours on days 44, 76 and 104 of gestation during block 2 and for 10 hours during late gestation, totaling 40 hours of continuous observation.

The behaviors registered and analyzed using continuous sampling included: drinking, eating, lying (next to a wall, next to a gate or next to a non-specific), standing, sitting,

oral-nasal-facial, sham-chewing and agonistic encounters. Both duration and frequency were assessed for each behavior.

The research revealed that diet and floor space allowance both had an impact on sow well-being, and there were diet-by-floor space interactions for some of these measures.

Sows fed the high-fiber diet performed better than sows fed the control diet; sows fed the high-fiber diet gained more bodyweight, were heavier overall and had greater body condition scores throughout gestation than sows fed the control diet. However, sows fed the control diet tended to retain more piglets than sows fed a high-fiber diet.

In some cases, the immune status of sows fed the high-fiber diet was enhanced compared with sows fed the control diet, with one exception: neutrophil phagocytosis. Neutrophil phagocytosis and plasma cortisol were greater for sows fed the control diet.

Diet also had an impact on sow behavior. Sows fed a control diet had longer and more standing bouts and more oral-nasal-facial bouts compared with sows fed the high-fiber diet. In general, sows fed the control diet were more active. The frequency of eating and drinking bouts was greater for sows fed the high-fiber diet.

According to the study, floor space allowance affected sow lesion scores and other behaviors but had a minimal impact on sow physiology.

Sows kept in 1.7 sq. m pens had greater lesion severity scores than sows kept in 2.3 sq. m pens, while aggression, sham-chewing and drinking behaviors were all greater for sows kept in 2.3 sq. m pens versus 1.7 sq. m pens.

However, the research found that standing behavior and overall activity were greater among sows kept in 1.7 sq. m pens than for sows kept at 2.3 sq. m.

Sows fed the high-fiber diet and kept in 2.3 sq. m pens performed fewer oral-nasal-facial behaviors compared with all other treatment groups. Sows fed the control diet and kept at 2.3 sq. m floor space had heavier litters than sows from other treatment groups.

Salak-Johnson reported that the findings imply that both diet type and floor space allowance can positively affect sow performance, behavior and immune status during gestation. However, she said this group pen system and management scheme are not optimized due to some apparent "negative" effects on sow welfare that still are apparent within this system, so others factors still need to be assessed and optimized.

For example, Salak-Johnson found that aggressive encounters were common within this system, especially around feeding time, and therefore, this may have diluted the "positive" effects and/or contributed to the "negative" animal welfare effects found within this housing environment.

The research found that because of this, it is speculated that reducing aggressive encounters by providing protection during feeding (e.g., feeding stalls) may further improve sow well-being, especially by reducing lesion severity scores within this system.

The study revealed that when implementing a group pen system and using floor feeding, feeding sows a high-fiber diet can improve sow performance (bodyweight, weight gain and body condition scores) and motivate sows to utilize their natural sequence of important maintenance behaviors such as the eating-drinking-eating sequence.

It also suggested that diet and floor space allowance are not the only components of a group housing system that must be considered; group size can also affect the well-being of the gestating sow.

For example, the study found that floor space allowance can affect lesion severity and maintenance behaviors, but the floor spaces used in this study did not necessarily improve or negatively affect sow well-being. However, it was shown that 1.7 sq. m of floor space is not detrimental to sow well-being, and in fact, if other components are considered, this may be more ideal than 2.3 sq. m of floor space.

According to the report, results indicated that individual components of a sow housing system (such as diet) can affect sow well-being and that these factors and others should be assessed further in order to determine an optimized system that truly improves sow well-being.

Measuring piglet vitality

22 Jun 2011
Source: Pig Progress magazine Volume 27. No. 5 (2011)

Vitality in piglets is a little-known notion because it is not very easy to observe and therefore not easy to describe with objectivity. The study of this parameter brings to light two phenomena: Vitality directly affects litter performances and mortality rate. In addition, vitality depends on the progression of the farrowing process (conditions, duration, etc.). These elements highlight the importance of good management of this crucial phase.
In 1997, French pig scientist Patrick Herpin and others suggested calculating a viability score at birth, and not a vitality score, in four classes. Nevertheless, the notion of vitality is addressed in their work and evaluation of vitality takes account of several criteria:

1. Interval between birth and first contact with the teat;

2. Interval between birth and first suckling;
3. Rectal temperature at 24 hours of life;

4. Weight gain and survival during the first ten days of life.This method constitutes a first approach to the notion of ‘piglet vitality’ at birth, but its use can sometimes prove difficult or confusing. Lack of precision and difficulty in evaluating certain criteria (e.g. first suckling: Effectively taking the teat in the mouth or suckling?) or material and human constraints make the method too complicated to use routinely.

Moreover, it requires a comparison of several data types, which are not always strictly correlated. The most recent publication published on the subject offers a simple scale focused on the first 15 seconds of life of the piglet, enabling the piglets to be classified according to four levels of vitality, devised by English scientist Emma Baxter and others in 2008. The scale is very similar to the viability score evaluation of Herpin. This scoring system was used in the study discussed in this article, performed by a team of scientists from Lallemand on a commercial 400 sow farm in France in 2008.

Before presenting results, it is essential to bear in mind that early postnatal vitality is directly linked to hypoxia during parturition. The weakest piglets at birth are generally those which have been exposed to anoxia during farrowing.

Piglet weight
The results confirm the correlation between piglet weight at birth and vitality. Vitality scores of the different weight classes are all significantly different, except for classes 2 and 3 which indicate a clear trend. These results don’t appear illogical considering the conclusions of Herpin, which specify that small piglets, because of their lower capacity to restore their homeostasis when faced with prolonged stress, and their tendency to come late in the farrowing process, would be more prone and sensitive to intrauterine hypoxias, which are synonymous with loss of vitality.

Birth rank and farrowing duration
Piglets delivered first in their litter have greater vitality than piglets delivered last in the litter. Mean birth ranks of different vitality classes are all significantly different. This data confirms the idea that an increase in the time spent in the vaginal tract raises the risks of hypoxia and affects piglet vitality. Piglets born last therefore tend to be the limpest, a phenomenon which will become more marked with the lower quality of the colostrum intake (for an equal quantity), etc. All these parameters inevitably damage the piglet’s subsequent chances of survival.

Unsurprisingly, in these trials, the same tendency was found if mean vitality is correlated with the progression of the farrowing process: piglets delivered at the beginning of parturition are more vigorous than those who come later. A large drop in vitality was noted for the piglets born after the third hour, which in practice are often distinctly less robust than their predecessors and sometimes require resuscitation. Finally, analysis of the data shows a parity effect: the piglets with 0 vitality have a greater tendency to come from old sows, whereas the highest vitality scores are from young multiparous sows. The data seems consistent, considering the conclusions that we have been able to draw in the earlier chapters: old multiparous sows are more prone to farrowing difficulties,

non-optimum conditions, and human interventions, and we have also established that they generate higher mortality rates at birth.

Performances
The performances of the high-vitality piglets after three days are clearly better than those of the weakest piglets; they are less active at feeding, and the quality of the colostrum has already deteriorated (immunoglobulin level, etc.). Furthermore, we know that these piglets are largely disadvantaged when competing with the rest of the litter. Nevertheless, we note that performance imbalance is compensated for at weaning, and this kind of result cannot be generalised because it appears to derive from a particularity of the farm being studied: a fostering policy would tend to reduce inequalities and mortality rates in lactation period.

Mortality
Mortality rates on day three rise for low vitality scores: piglets' lack of sturdiness may lead to reduced diet and performances, but it also sometimes generates major deficiencies, leading to the death of the piglet. This trend continues during the maternity process (compare this to mortality on day 21). The notion of vitality is therefore linked to that of mortality.

Focus on monitoring, control of pig aggression

Pig Progress Magazine
07 Sep 2011

Monitoring and controlling aggressive behaviour in pigs - that was the ambitious goal of new initial research, presented yesterday at the second BioBusiness workshop in Brussels, Belgium.

Although natural behaviour, aggression in finisher pig farms may lead to both physiological stress and physical injuries – and in extreme cases to death. Aim of the project is to develop a useful intervention strategy.

Researcher Maciej Oczak, on behalf of the Dutch company Fancom, explained the initiative at the workshop, which was attended by about 50 delegates from all over the world.

Monitoring
For the project, an experimental monitoring system has been constructed in which a pen with on average 23 kg pigs (entire males) were observed, both by on-farm presence and by using a camera for three full days.

Afterwards, behaviours that started aggression have been analysed and labelled, e.g. nose-to-nose, head-to-head knocking, mounting. The rest of the fights were also monitored.

This knowledge has made it possible to identify sequences in pigs aggressive behaviour and also patterns in pigs body positions during aggression.

Eventual goal of the project is to develop a concept approach in which mechanisms can be used that would automatically identify a potential fight – and to design intervention strategies that can act as a result.

Precision Livestock Farming
The project uses a Precision Livestock Farming (PLF) approach, which aims to combine the use of advanced monitoring technology with labelling methods, in order to be able to better take care of farm animals.

Apart from Fancom, the pig project is supported by the University of Veterinary Medicine in Hanover, Germany, the University of Milan, Italy and the Catholic University of Leuven, Belgium.

Similar progress was also reported in PLF projects in poultry (reducing the hatching window, Petersime) as well as dairy cows (detecting lameness problems, DeLaval).

BioBusiness
The BioBusiness project zooms in on PLF development, will run over a total period of 48 months and is interconnected to the European funded Marie Curie research project.

This week's event highlighted the progress of in total 11 fellows, attached to several universities and companies throughout Europe, and initiated discussion on PLF. On behalf of Pig Progress, editor Vincent ter Beek addressed the audience with a presentation about PLF and the media.

Fancom has also been working on a different PLF project, revolving around cough detection for identification of respiratory disease - and this research is in the stages of near completion. The company will be running prototype trials and hopes to launch it to the market late 2012.

Iowa leads project to reduce pig lameness

Source: Aug. 12, 2011 www.thepigsite.com

US - Understanding and solving lameness in pigs, especially in sows, could save producers $23 million a year. Anna Johnson, an Iowa State University animal scientist, will be leading a research project to understand lameness in pigs and provide solutions to producers. The four-year project is being funded with a $700,000 grant from US Department of Agriculture-Agriculture Food Research Initiative (USDA-AFRI). Currently, there are no science-based solutions to help producers solve lameness problems in pigs. Dr Johnson said the goal of the project is to find tools to measure pain mitigation, lameness and make recommendations to manage the problem. She explained:

"Lameness is the second highest reason that sows leave the breeding herd early. Problems during reproduction are rated as the number one problem, but we think that lameness may be contributing to the reproduction problems." Currently, there are no approved drug treatments for pigs with lameness pain. Producing science-based answers will help managers with housing, management and treatment lameness pain in breeding herds. Dr Johnson continued: "We want to be proactive. As a research group, we see this as an upcoming issue and we want to provide science that can be used to address lameness pain." The project collaborators include Ken Stalder, Iowa State animal science professor, Suzanne Millman and Locke Karriker, who are both associate professors of veterinary diagnostic and production animal medicine at Iowa State; and Hans Coetzee, an associate professor of clinical pharmacology at Kansas State University. Researchers will use technically advanced tools within the Swine Intensive Studies Laboratory. The tools measure the pressure and weight animals place on each hoof and how the animal's gait affects weight distribution. The state-of-the-art research facility is a joint collaboration between the College of Veterinary Medicine and the animal science department in the College of Agriculture and Life Sciences at Iowa State University.

Comparing sow comfort and productivity in farrowing pens to sows in conventional farrowing crates

Ontario Pork
September 2011

Case Study: Farm Innovation Program Project - Comparing sow comfort and productivity in farrowing pens to sows in conventional farrowing crates
Ontario pork producers typically house lactating sows in farrowing crates. The crates, which restrict sow movement, have proven to be beneficial as they protect newborn piglets from being crushed by their mothers. There are also animal health benefits to the crates as they allow for good hygiene in the crate, which reduces the risk of disease for the suckling pigs. Unfortunately, there are disadvantages related to sow comfort. For this reason, the crates are criticized by animal welfare groups as well as consumer groups worldwide. While farrowing crates are still permitted in Canada, many niche marketing systems (such as organic certification requirements) restrict their use.

The Lintons are interested in experimenting with alternatives to conventional farrowing crates. Their goal is to design a farrowing pen that enables the sow to move freely during farrowing and lactation while keeping crushing deaths to a minimum. The Lintons have previously eliminated gestation crates from their farm by designing a group housing system for gestating sows, which has been featured in a number of industry publications as well as two radio interviews. Jeff and his parents have designed two prototype farrowing pens and plan to build three of each prototype. They will compare pre-weaning mortality and pen hygiene between the two prototypes and compare these results to the conventional farrowing crates that are currently used on the farm. The three different housing systems will be compared in terms of piglet mortality, pen hygiene and sow freedom of movement.

Both pens are four-foot slats and four-foot solid. The producers decided on these dimensions as they plan to use bedding on the solid portion. They selected a steel (schonlou brand type) slat. The main reason would be that fastening any barriers to the floor would be easier with this type of flooring. Our experience shows these types of slats can be kept cleaner especially when the piglets are a little older.

Pen #1 will be a conventional style crate (maybe a little shorter), hinged at the front to swing around (like a gate) to the creep area. It will be moved back from the front partition to discourage the sow from dunging in the feeder. The pen area, where the sow is expected to lay for suckling etc. will have one or several moveable barriers to discourage the sow from flopping down, guide her where to lay and prevent her from crushing piglets. Currently they are looking at lagging a fabricated steel bar to the floor, that can be moved to what the sow shows us, is the best location. We are still researching the best design for this barrier but the preliminary design would resemble a large “drawer pull/handle” that is approximately 12 inches high and 12 inches long. The sow would be able to easy step over this barrier when walking around the pen. Anti-crush devices will be placed around the perimeter of the pen.

Pen #2 will have a gate to the left of the sow feeder but shorter than in pen 1, and it will be permanent as opposed to swinging. We presume this will solve the feeder dunging problem, as the sow will not want to back up around this gate to dung in the feeder. This pen does not allow for "locking" the sow in. It can be changed if it doesn't work out, but they believe that from their
experience, with their sows, this isn't necessary. As with pen #1, they will be using the same type of barrier (in the laying area) in this pen to help the sow lay in a safe manner.

\We will be using some (limited) bedding/litter in the creep and/or at farrowing time to help settle the sow. Anti-crush devices will be placed all around the perimeter of the pen. This project was funded in part through Growing Forward, a federal-provincial-territorial initiative. The Agricultural Adaptation Council assists in the delivery of several Growing Forward programs in Ontario.

Farrowing crates – freedom farrowing – are we getting there?

21 Sep 2011
Author: David Burch

I have personally been sceptical about the banning of farrowing crates to allow the sow her natural nesting behaviour – but progress is being made.
Following the ban of sow stalls in the UK, the compulsory ban on anything without scientific assessments and the proven development of suitable alternatives has always made me concerned. In the UK, outdoor sows kept in arcs produce 0.88 pigs reared/litter less than indoor reared litters (BPEX, 2011) which are mainly reared in farrowing crates.

I have always thought farrowing crates offer the piglets better care and they can be more carefully monitored and piglet crushing reduced. The farrowing crate also offers protection to workers and visiting vets from potentially disturbed sows and their litters, also not an inconsiderable health and safety issue.

In a recent talk by Sandra Edwards of Newcastle University (2011), she demonstrated that their new 'Pig Safe System' was able to achieve similar production results, regarding numbers weaned/litter, which were comparable with BPEX's top third herds of about 10.5 pigs reared/ litter. On a visit to the unit, we were able to see for ourselves what had permitted the breakthrough.

In the main pen, there was a safe, well-lit and heated creep area for the piglets to go into (see top picture). To stop crushing they had introduced a solid panel on the opposite wall that jutted out about 15 cm so that the sow could slide down the panel when she lay down and the piglets could escape under and behind it without being laid on.

Chopped straw was introduced for the first week or so to provide bedding and nesting material with a retainer board to stop it going into the slatted dunging channel. There was a crate for the sow to go into also for feeding and if she needed attention (see bottom picture).

From a stockman's point of view, he felt he had to build up a relationship and trust with the sow, especially with a litter but generally that was relatively straightforward and they settled in well and quickly.

The system was quite labour-intensive. The pens were in a converted barn, which had previously had farrowing crates, so was quite compact but the litters did look very well.

Provide sufficient water to piglets around weaning

Around weaning both suckling and weaned piglets have a high need for fresh and clean water. Its availability is appreciated by showing a better daily gain and feed intake.

By L.C.M. van Enckevort, Denkavit, the Netherlands

Besides feed, water is one of the most important nutrients for animals. Piglets should almost always have access to water, during lactation as well as after weaning. In the Netherlands for example, it is obligatory for pigs older than two weeks to have access to sufficient and fresh drinking water 24 hours per day. Different experiments have shown that piglets will eat more when they have access to drinking water. How much piglets actually drink depends on different factors, like temperature in the barn, type of feed, accessibility of the drinking nipple / trough, water quality and water yield of the drinking

nipple. Denkavit performed several trials to get an indication of the water intake of piglets and the subsequent effect on dry feed intake. This was done both during lactation and the first week after weaning. In the farrowing pen, water was supplied via a drinking nipple or via a drinking cup. After weaning water was supplied via a drinking nipple with drip cup.

Suckling piglets

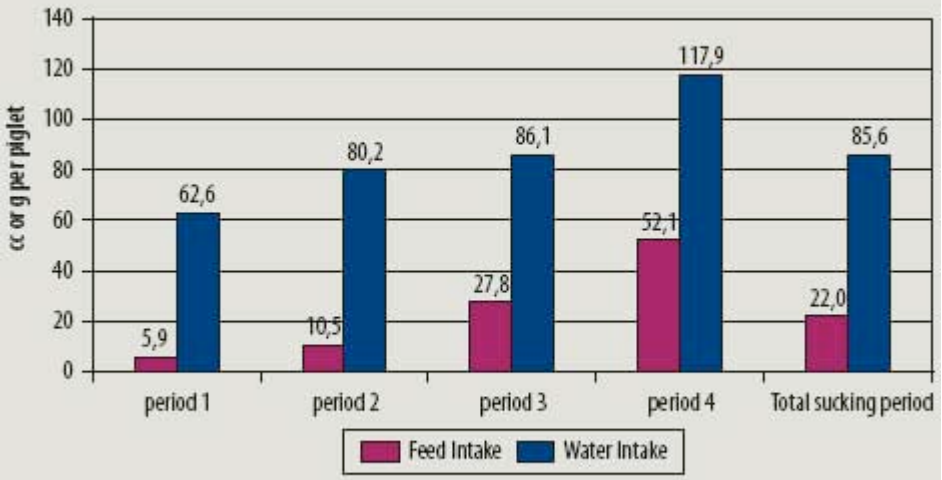
The effect of extra water supply on creep feed intake - The first trial was to determine the effect of extra water supply on feed intake of piglets during the suckling period. All litters had a drinking nipple in the farrowing pen. Half of the litters were supplied with extra water via piglet milk-drinking troughs from ca. day six until weaning. In the same period a prestarter (Denkapig Mini Start) was fed. The results show that although the piglets in the group with extra water supply had on average a lower birth weight, the creep feed intake was higher than in the group with only the drinking nipple. Growth of the piglets in the extra water group was also slightly higher, resulting in a 0.4 kg higher weaning weight. It should be noted that these piglets were on average slightly older at weaning. Their water intake via the drinking nipple was not recorded, but the intake through the drinking troughs was on average 1.02 litres water/piglet.

Based on these results, it can be concluded that supplying extra water to suckling piglets results in a higher creep feed intake. This difference can be caused by the easier or better accessibility of water from drinking troughs compared to water from drinking nipples.

Water intake of suckling piglets - The water intake from the drinking could not be determined in this trial, because the nipples were open in both groups. Therefore, a second trial was set up to find out if there is an effect of drinking nipples on water intake via piglet milk-drinking troughs. One group had access to drink water through a trough only, while the other group had both a drinking trough and a drinking nipple in the farrowing pen. With this setup it was possible to get an indication of the total water intake of suckling piglets. This trial clearly shows the importance of water intake for suckling piglets. The water intake was on average 1.7 litres per suckling piglet (weaned at 26 days of age). The difference between drinking via a drinking trough only or having a drinking nipple available as well, was very small (1.7 litres vs. 1.5 litres). This indicates that suckling piglets probably drink water easier via a trough than a nipple. In this trial there was no effect on feed intake, which was not expected anyway since both groups had the possibility to drink water from the trough.

The results of both trials show that suckling piglets with access to a nipple and trough had drunk 1 litre/piglet in the first and 1.5 litres/piglet in the second trial. In the second trial the feed intake was also higher (350 vs. 480 g/piglet).

Figure 1. Water and feed intake/ piglet/ day (excl. sow milk) in different periods and over the total suckling period.



Note: Period 1 = day 6 - 9; Period 2 = day 9 - 16; Period 3 = day 16 - 23; Period 4 = day 23 – 26.

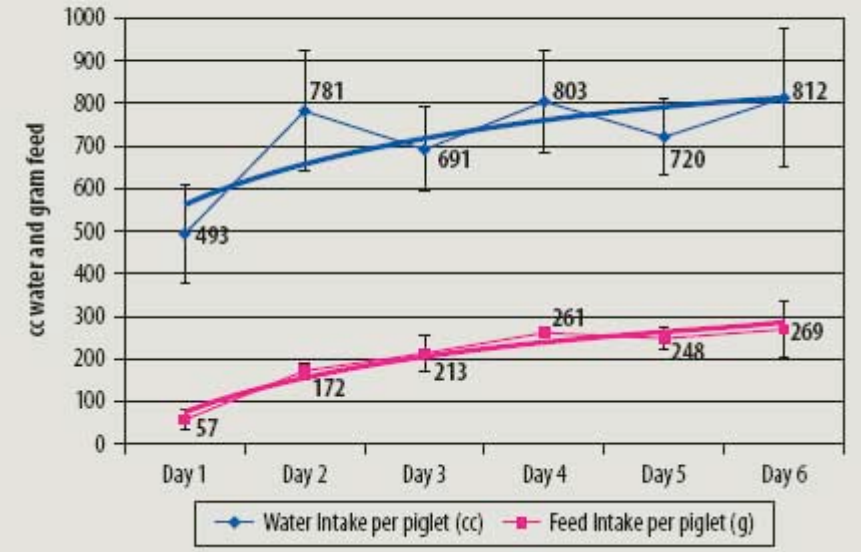
Figure 1 shows the progression of water and feed intake (excluding sow milk) of suckling piglets, in different periods during the suckling period. Both water and feed intake clearly increased during the suckling period. But feed intake increased relatively more than water intake. During a suckling period of 26 days, piglets drink about 85 cc water/day and eat on average 22 grammes feed/day. Feed : water ratio is on average 1:4, which is comparable with the amount of dry matter in sow milk. However, this ratio is higher (1:10) in the beginning of the suckling period, than in the end (ca. 1:2.5).

Weaned piglets

In a follow-up trial, daily water and feed intake of piglets was determined over the first six days after weaning. At weaning the piglets were on average age 25.2 days old and their average weight was 8.1 kg. Their weight four days after weaning was 8.6 kg and at six days 9.0 kg. Interestingly their daily water intake was much higher than their feed intake while both increased in time.

During the first day after weaning both water and feed intake were low, especially when taking into account that before weaning the intake of sow milk was on average 1 litre/ piglet/ day. When taking into account that sow milk contains about 20% dry matter the intake of fluids just before weaning was ca. 0.8 litre/piglet/day, while the intake of dry matter/piglet/day from the sow milk was 200 g only. The trial showed that it takes three days after weaning to recover feed intake to >200 g/piglet again. On day six after weaning however, feed intake was already more or less five times higher than on the first day after weaning. The first day after weaning piglets preferred to drink (*Figure 2*). Within four days, the water : feed ratio decreased gradually from 10 to about 3 and stayed at that level.

Figure 2. Average water and feed intake per piglet per day in the first 6 days after weaning. (four departments, 331 piglets in total).



Conclusion

The trials discussed clearly indicate that both suckling and weaned piglets have a high need for water. The easy availability of fresh water in farrowing pens has a positive effect on the creep feed intake. The first three days after weaning the water intake is preferred (more) than dry feed intake.Approximately at day 3-4 after weaning the daily water (800 ml) and dry matter intake (200 g) of before weaning is reached again.

Avoid Mixing Pigs for Industry and Consumer Gains

Source: Oct. 5, 2011 www.thepigsite.net

SCOTLAND, UK - Producers, hauliers and abattoirs could achieve welfare and financial gains and improve consumer satisfaction by working together to avoid mixing groups of pigs before slaughter. This is the message from SAC (Scottish Agricultural College) researchers whose latest study found pig aggression is a genetic trait that can impact on welfare, carcass value and meat quality. The findings also open the way for reducing pig aggression through genetic selection. The SAC-led study was part of the major pan-European SABRE project, published this week. Researchers from SAC's Animal and Veterinary Sciences Research Group found that pigs with aggressive 'personalities' cause more fighting and experience more stress when mixed in unfamiliar groups. Co-operation with international pig breeding company PIC gave access to a commercial farm. Project partners INRA in France and FBN Dummerstorf in Germany, went on to analyse pig tissue to identify genes linked with aggression, stress and meat quality and how they interact. Explaining the significance of the findings for the pig industry, SAC Behavioural Scientist Dr Rick D'Eath said: "The mixing of pigs into new groups

commonly occurs pre-slaughter. Increased fighting presents an obvious welfare concern and can also reduce carcass value when scratched or damaged areas have to be discarded. In addition, the pigs we studied which experienced stress prior to slaughter had less acidic meat post-slaughter, which can reduce its eating quality.

"Therefore, reducing pig aggression, particularly pre-slaughter, could bring welfare and financial benefits while reducing waste and improving meat quality. Producers, hauliers and slaughterhouses could work together to avoid the mixing of pigs in unfamiliar groups before slaughter, such as by ensuring that farm groups of pigs are penned separately on the truck and at lairage. In the longer term, the study also opens the way for tackling the issue of pig aggression using genetic selection."

POULTRY

Free range behaving birds produce less eggs

Source: World Poultry, Vol. 27, No. 4, 2011
By Wiebke Icken , and Dr. Rudolf Preisinger, Lohmann Tierzucht, Cuxhaven, Germany
27 May 2011

Hens that are kept under free range conditions automatically have more freedom of movement. Those birds that use their freedom abundantly tend to lay less eggs however. Breeding therefore should focus on responding to this behaviour.

With the aid of a new transponder technology, the free-range behaviour and laying performance of layers can be tested simultaneously. Lohmann Tierzucht, together with the Bavarian State Research Centre in Germany, investigated the laying behaviour of 272 Lohmann Silver hens in Electronic Pop Holes (EPH) and Funnel Nest Boxes (FNB). These systems made it possible to record automatically each separate visit to the free-range area as well as the egg number by every single hen in the flock. The hens were housed in an aviary with an adjoining winter garden at the Thalhausen experimental station of the Technical University of Munich. To identify each single hen in the EPH and FNB, every hen was tagged with a transponder on one leg. During the whole investigation period of one year, the winter garden was continuously accessible for the hens.

The frequency of passages (number of passages between the in- and the outside area) and the duration of stay in the free-range area of each hen was recorded daily. A large fraction of the hens (35%), did not use the winter garden at all. They were not even once registered at one of the four EPH throughout the whole year. The percentage of hens that used the winter garden (at least once in a 28 day period), increased during the observation period. As soon as a hen was familiar with the winter garden, she visited the free-range area nearly every day. Expected effects, like a reduction of the share during autumn and winter, were not found.

Antagonistic trend

The highest number of passages through the EPH was registered in the second laying period (15 passages per hen per day). Thereafter, the frequency decreased from a level of 13 passages in the fifth laying period to eight passages in the 12th laying period. The average length of stay in the winter garden showed an antagonistic trend to the frequency of passages. At the beginning of the observation period, the average visit to the winter garden had a duration of 14 minutes, whereas from laying period seven to the end of the observation, a single stay took an average of more than 30 minutes.

The number of passages and the duration of stay in the winter garden showed a big variation from hen to hen. There were some hens which returned to the barn after a short glance into the winter garden, whereas others stayed nearly day and night outside. Most of the passages through the EPH were registered in the morning between 6 am and 8 am as well as in the afternoon between 4 pm and 5 pm. The average stay in the winter garden per hen per day was about 2.5 to 4 hours. At four o'clock in the morning, the artificial light in the barn was switched on and at 8 pm, it was switched off. From 8 am onwards, the hens were looking intensively for the FNB to lay their eggs. The laying performance of the hens were calculated for each 28-day laying period, beginning with the first correct registered egg in the FNB. ens that are kept under free range conditions automatically have more freedom of movement. Those birds that use their freedom abundantly tend to lay less eggs however. Breeding therefore should focus on responding to this behaviour.

A bacteria infection in the third laying period caused the very late peak of the laying performance (94,2%) in the sixth laying period. The laying performance stayed on a slightly lower level thereafter, with a drop to 86% during the 12th laying period. The estimated heritabilities for the egg number were generally at a low level, varying from one laying period to the next.

Positive and negative correlation

Genetic and phenotypic correlations were estimated for the traits: frequency of passages, length of stay in the winter garden and laying performance. A highly positive correlation between the frequency of passages and the length of stay were expected and validated by the close relationship between both traits. Negative genetic correlations were estimated between both parameters for the ranging behaviour and the laying performance. Only a slightly negative trend could be found in the correlation between the traits: frequency of passages and laying performance, whereas a moderate negative correlation was detected between the traits: length of stay in the winter garden and laying performance.

Until now, no literature could be found which describe the correlations between the two free range parameters (frequency of passages and length of stay) and the laying performance, like in this investigation. Therefore, the EPH and FNB first showed the possibility to simultaneously record the free-range behaviour and egg number for each hen in a group housing system, with a justifiable effort under field conditions. It is being reviewed, how the recorded data can be integrated into the current breeding programme to improve and sustain the nest and free-range acceptance.

Constant pattern
To conclude, it can be said that layers do have a constant free-range behaviour pattern throughout the day. After getting familiar with the new production environment, many hens pay their first visit to the outside area nearly two hours after the lights were turned on. About half an hour later, they went back to the barn to lay their eggs and meet other needs such as feed and water consumption.

During the whole day, layers switch between in-and outdoors several times. Variation in free-range activity from hen to hen showed that hens with a high passage frequency tend to lay less eggs than hens with only two to three passages per day. However, about 35% of the hens do not go out. This is probably due to their fear of exploring a new environment and not due to laziness. It is not important for them to have a high free-range activity, but rather in the production system visiting nest boxes for laying purposes.

Canadian study highlights welfare benefits of beak trimming

Farming UK
29/07/2011

A study by researchers at a Canadian university has concluded that beak trimming is beneficial to the long-term wellbeing of hens.

The findings will be controversial amongst campaigners who have been pressing for the practice to be outlawed, but will lend support to those who believe it is necessary to prevent cannibalism amongst layer flocks. The study carried out at the University of Saskatchewan concluded that beak trimming was beneficial both to flock performance and to bird welfare.

A ban on the use of bird trimming was originally due to come into force in the United Kingdom this year but was delayed following lobbying by industry organisations like the British Free Range Egg Producers' Association (BFREPA) and on advice from the Farm Animal Welfare Council (FAWC). Agriculture Minister Jim Paice announced at the Egg and Poultry Industry Conference (EPIC) in November that the ban would not go ahead as planned, although he warned that the Government did still intend to move towards a ban on beak trimming and that it was looking towards implementation in 2016.

FAWC's recommendation that the ban should not go ahead at the moment was made after the organisation studied research carried out at Glasgow University, which was partially funded by BFREPA. The Glasgow research concluded that infrared beak trimming did not cause long term suffering to the birds.

Now researchers led by Dr Henry Classen at the University of Saskatchewan have concluded that beak trimming is beneficial in terms of performance and that there are no

significant welfare implications for the birds when it is carried out correctly. Dr Classen says, ’Our results suggest that moderate beak trimming continues to be the most important management technique for control of cannibalism in laying hens and that modern treatment systems enhance long-term hen well-being.’

Dr Classen’s report was released at the London Poultry Show in Ontario ’ one of the leading events of the Canadian poultry industry. The research looked into both hot-blade and infra-red beak trimming. Data was collected on bird productivity and behaviour, beak re-growth and a histological examination of the healing process. The findings were reported in the Canadian journal. Today’s Farmer.

Dr Classen found that hot-blade beak trimming administered at 0, 10, and 35 days of age resulted in improved feed efficiency and hen feathering during the production period for all three trimming ages.

He found that hot blade trimming at 0 days of age resulted in more rapid healing, had less impact on behaviour and had no impact on growth rate compared to trimming at 10 and 35 days of age. ’For the 10 and 35 day treatments, altered behaviour and reduced growth rates were noted after the trimming process,’ said Dr Classen in his report. He said that by sexual maturity these effects had disappeared.

He said that more beak re-growth was noted for birds trimmed at 35 days of age but results of the research indicated that hatch was the preferred age for beak trimming.

Classen said the pain associated with hot-blade trimming could be divided into a painless phase immediately after trimming (up to 24 hours), an acute pain phase associated with the healing process, and long-term chronic pain associated with phantom pain and the formation of beak neuromas (the swelling of the nerve).

’Our research used analgesics to confirm that day old chicks do not alter behaviour after trimming, thereby supporting the concept of a painless phase,’ said Dr Classen. He said that the effect of trimming on bird welfare was dependent on the age of trimming and was hardly noticeable by sexual maturity and not at all during the laying period.

He said that histological examination of beaks failed to demonstrate neuroma formation when beak trimming was moderate and completed at a young age.

Dr Classen said that an experiment was designed to determine the impact of 20 per cent, 40 per cent, and 60 per cent beak trimming at zero days of age. Both infra-red and hot-blade trimming methods were used.

He said the hot-blade trimming produced the desired range of trimming and at all levels reduced cannibalism and aggressive behaviour and significantly increased egg production, feed efficiency and feathering.

’However, the 40 per cent to 60 per cent trimming gave the best control of both cannibalism and aggressive behaviour,’ he said, adding that the infra-red trimming caused effects that were similar to moderate hot-blade trimming.

’Comparisons of zero day hot-blade and infra-red treatments demonstrated that both techniques successfully controlled cannibalism, reduced aggressive behaviour and improved feather condition.’

However, Dr Classen said that the infra-red treatment offered the advantage of a more precise trim with no open wounds that would permit infection, little or no pain post-treatment and an easier ability to eat before the beak is lost.

He said that four commercial flocks, two using the infra-red technique and two using the hot-blade method, were assessed for beak trimming quality at both 21 and 57 weeks of age. On each visit 300 birds were assessed and there were no beaks found with major defects using either method.

However, it was found that infra-red trimming resulted in more symmetrical beaks with fewer abnormalities.

’Our results suggest that moderate beak trimming continues to be the most important management technique for control of cannibalism in laying hens and that modern treatment systems enhance long-term hen well-being,’ he said in his report.

He said that infra-red trimming appeared to have advantages that resulted in superior beak length control.

The UK Government has specified the use of infra-red in lifting the ban on the use of beak trimming ’ once again on the advice of FAWC. FAWC made its recommendation because of its concerns about feather pecking and cannibalism. It told the Government that the ban should be deferred until it could be demonstrated reliably under commercial conditions that non beak trimmed laying hens could be managed without a greater risk to their welfare than that caused by beak trimming itself.

Incubation distress easily leads to splayed legs

By Edgar O. Oviedo-Rondón and Michael J. Wineland , North Carolina State University, Raleigh, NC, USA
Source: World Poultry, Vol. 27, No. 5

On some occasions the incidence of splayed or twisted legs in chicken and turkey flocks increases. These issues can be linked to incubator and especially hatcher temperature and ventilation conditions. Management in the hatchery or during transportation to the farm, may also play a role.
The incidence of splayed legs in chicks and poults at hatch is very low, normally no more than 0.35 to 0.50%, but it can increase on some occasions. Birds with this

condition have one or both legs splayed laterally from the coxofemoral joint and are unable to stand. Sometimes, the problem is only observed on the farms and constitutes another cause of culling during the first three weeks of age.

This condition has been associated with high humidity during incubation, but the results of our research indicate that higher temperature conditions during the last phase of embryo development may have a bigger impact. Splayed legs are also observed when newly hatched chicks are placed on slippery floors. Higher temperatures during incubation may have the bigger impact on splayed leg incidence because they affect bone, tendon and muscle development, and thyroid metabolism. Embryos can be heat stressed in commercial hatcheries due to incubator and hatcher design that prevents adequate air flow around the eggs in some locations. Occasionally reduced ventilation during incubation and extended length of hatching time (12 to 24 hours) may cause the heat stress that triggers higher incidence of splayed legs.

Muscle development

Poults and chickens exposed to elevated incubation temperatures may have lower muscular strength to stand up at hatch because they have lower glycogen reserves in the muscles and their myofibers are also thinner. Elevated incubation temperatures accelerate embryo growth to rates that demand higher oxygen consumption than can passively diffuse through the pores of the eggshell. Consequently, the embryo shifts energy metabolism from utilising lipids of the yolk, which requires oxygen, to using limited amounts of glycogen the embryo stored in muscles. Glycogen catabolism does not require oxygen, but produces lactic acid. When acidity increases important contractile and metabolic functions of muscles are hindered. In the case that acidity is not regulated, the accumulation of lactic acid may be a factor in muscular fatigue. Sometimes, this effect can be severe and cause late embryo mortality, but frequently the overheated poults or chickens that hatch will be lethargic, may appear exhausted, slow to search for feed and water, and potentially become the starve outs at the farm increasing the first week mortality. On some occasions the incidence of splayed or twisted legs in chicken and turkey flocks increases. These issues can be linked to incubator and especially hatcher temperature and ventilation conditions. Management in the hatchery or during transportation to the farm, may also play a role.

Tendon development

In multistage incubator machines the eggs in the last phase of incubation can reach eggshell temperatures of 106-108ºF, while younger embryos may be at the desired 101-102ºF.

We have also observed that incubation conditions have a major impact on tendon development. The strength of tendons is crucial for adequate locomotion in all avian species, but especially in turkeys. The structural integrity and mechanical function of tendons depend on precise alignment of Type I collagen fibres during embryonic growth. Typically collagen fibres become thicker with age and exercise. Tendons also contain several proteoglycans and among them, decorin which is an important regulator of matrix assembly, by limiting collagen fibril formation and directing tendon remodeling

due to tensile forces. Our research group evaluated the Type I procollagen and decorin with immunohistochemistry in the gastrocnemius tendons of chickens that were incubated either under standard eggshell temperature (37.6ºC) conditions or with an abnormal temperature profile with low eggshell temperature (36ºC) during the first seven days and high eggshell temperatures (39ºC) during the last seven days. The collagen fibres were thinner in the chickens from the abnormal profile during incubation, at hatching, 4, 14 and 21 days of age.

Bone development

Bone development in poultry species can be affected by incubation conditions. The formation of bone collagen matrix starts during the first days of incubation. Researchers have shown that poultry bones initiate ossification processes such as collagen Type X expression, alkaline phosphatase presence, and expression of metalloproteinases at 18 days of incubation in turkey embryos and at 16 days in broilers. In another report, ossification of long bones in turkeys starts at 12 days of embryonic development and increases the rate after 20 days of incubation one week prior to hatch. Several factors that control endochondral ossification of long bones can be affected by incubation conditions, primarily during the plateau stage of oxygen consumption, 3 to 4 days prior to hatching, when bones have their fastest elongation rate. However, bone developmental problems can be caused by suboptimal incubation conditions at any stage of embryo growth.

Modeling and remodelling

Chondrocyte proliferation and differentiation are affected by temperature stress during incubation. Suboptimal conditions in the incubator can influence incidence of tibial dyschondroplasia or change dimensions of long bones post-hatch. Many times there have been observed changes in the alignment of the distal tibial and deformation of condiles that cause twisted legs, but which early in life appear very similar to the splayed leg condition. Incubation temperature also has significant impact on the thyroid-IGF1-GH hormonal axis that controls growth plate chondrocyte differentiation, and in general bone development. Additionally, the lipids, trace minerals and vitamins in the yolk are involved in bone modeling and remodeling. If the yolk is not absorbed during this period, bones will not receive nutrients critical for their early development. On some occasions the incidence of splayed or twisted legs in chicken and turkey flocks increases. These issues can be linked to incubator and especially hatcher temperature and ventilation conditions. Management in the hatchery or during transportation to the farm, may also play a role.

Incubational stress

A small proportion of chicks may show splayed legs at hatching or days after on the farm.

Another factor that can cause the splayed legs is the asymmetry between the left and right limbs due to incubational stress. In all our experiments, we have observed that pre-hatch incubational stress increases relative asymmetry of certain bone parameters in turkeys and chickens. Relative asymmetry between limbs and other bilateral phenotypic

traits reflect the ability of hatchlings to cope with stressful conditions during ontogeny. Higher asymmetry of bone traits has also been linked to locomotion problems and worsening of gait scores. Relative asymmetry has been considered a possible parameter to evaluate animal welfare although there has been some controversy about the adequacy of this parameter for welfare in adult poultry. Many other factors can affect relative asymmetry post hatch, but it seems to be an accurate measurement of poultry welfare for embryo development.

Differences among genetic lines?
Frequently it is mentioned that there are differences among genetic lines on the prevalence of leg problems or incidence of splayed legs. We evaluated three temperature incubation profiles on three genetic parent female lines of turkeys where a female grandparent line was crossed with three different grandparent male lines. In this way, egg traits were similar, but embryo genetics were different. The three temperature profiles included elevated, normal, and reduced temperature profiles. Our results indicated no significant effects of incubation by strain interaction on bone development, gait scores or valgus/varus angular deformities; however, incubation profiles affected all these bone and leg health parameters, indicating that independently of strain, incubation may have a stronger effect on leg health. The elevated incubation profile caused a high incidence of splayed legs at hatching independently of the strain. Almost 20% of the hatchlings in the elevated incubation profile were affected. Some of the effects of overheating embryos can be observed at hatching as splayed legs. But overheating may also affect endocrine systems, nutrient utilisation, body formation and the overall health of chicken and turkey flocks. Then, splayed legs can be an indicator that overheating is occurring and corrections need to be made in the machines or in the hatchery management.
* References are available upon request from the authors

Role of nutrition in litter condition in turkeys

The PoultrySite
August 3, 2011

Dietary nutrient density impacted litter condition and the incidence of hock burns but not foot pad dermatitis in turkeys in a trial at Scottish Agricultural College (SAC). For ThePoultrySite, senior editor, Jackie Linden, summarises the results.

Litter quality is an important component of many production systems, especially in turkeys because they remain in contact with the litter throughout the growing period, according to Dr Muhammad Waseem Mirza of SAC. He was speaking at this year's Turkey Science and Production Conference in Macclesfield, UK.

A previous study by the same group showed that the concentration of dietary protein can influence the quality of the litter and the leg health of turkeys but it was unclear whether the effect was from the absolute protein level or the ratio between dietary protein and energy. So the SAC researchers conducted another trial using different

nutrient densities but holding the protein:energy ratio constant. They looked at the performance of growing male turkeys to 20 weeks of age, as well as nutrient digestibility, water intake, litter condition and the incidence of hock burns and foot pad dermatitis.

The diets were based on wheat and soybean meal and formulated to contain 77, 85, 100, 110 or 120 per cent of the crude protein and metabolisble energy content recommended for the breed standard, BUT 8.

Overall bodyweight was higher than the breed standard at the end of the trial at 20 weeks of age, said Dr Mirza. Nutrient density had positive and linear effects on weight gain, feed efficiency and dry matter digestibility. The effect on nutrient density on nitrogen digestibility, however, were not statistically significant. As expected, increasing dietary nutrient density had a negative and linear effects on feed and water intake.

Increasing nutrient density had positive effects on litter quality, with both litter moisture and litter score decreasing linearly. However, litter ammonia increased as nutrient density increased, as did the prevalence of hock burns. There was no effect of treatment on foot pad dermatitis in this trial.

Hock burn was related to water to feed ratio, feed efficiency, water intake and ammonia in the litter, said Dr Mirza. Foot pad dermatitis was associated only with the water-to-feed ratio.

Also interesting was that hock burn score was not linked to wet litter but rather to litter ammonia, said Dr Mirza.

He suggested another possible link between nutrient density and hock burn score: birds fed the more nutrient-dense diets spent less time eating and more time resting on the litter.

Other researchers have reported that foot pad dermatatis is associated with wet litter but the latest SAC research suggests that the combination of high litter moisture and ammonia concentration may be needed to predispose turkeys to foot pad dermatitis.

Dr Mirza concluded: "The results suggest that an increase in nutrient concentration can reduce the moisture content of the litter and so improve overall litter quality.

"However, the incidence of hock burn increased with the most nutrient-dense diets, suggesting that factors other than litter moisture may contribute to the occurrence of leg problems in turkey production." Reference

Mirza, M.W., V. Pirgozliev and N. Sparks. 2011. Diets based on different energy and protein concentration: effect on nutrient digestibility, growth performance, litter quality and leg health in turkey production. Proceedings of Turkey Science and Production Conference, Macclesfield, UK. 30 March to 1 April 2011. 63-65.

Healthy flocks from therapeutic nutrition

Source: World Poultry, Vol. 27, No. 6//30 Aug 2011

Adequate nutrition is a major tool in achieving maximum flock health. To a large extent this is related to protein, fat, fibre, vitamins and minerals in diets. The use of some natural herbs also increases the health status of a flock.

By Dr. Salah H. Esmail, Cairo, Egypt

In the poultry industry, there is a tremendous amount of money spent each year for buying medicines and other synthetic preparations to control diseases. It is estimated that about 800 million dollars is spent each year world-wide to only control coccidiosis. This amount should inevitably increase to several billions of dollars, considering the multiplicity of diseases which affect birds at different stages of growth and production.

Despite this, it was found that the use of medicines alone is not an effective means of duly controlling the diseases. Mortality may in many cases exceed 10%, which adds to the losses arising from the cost of medicines, and hence affects the economic returns from the production process.

Recent research studies have, therefore given a prime consideration to the therapeutic nutrition programmes as an alternative or additional means of disease control. They all emphasised the need for utilising the available feed nutrients, and for manipulating them qualitatively and quantitatively to better suit the control of a prevailing disease in a given area of the world, thereby minimising the use of medicines down to the desired economic level.

Protein nutrition

With most disease outbreaks it may be necessary to increase the level of dietary protein, or at least maintain it within the recommended ranges. Protein is a potent regulator of circulation of hormones such as insulin, glucagon, thyroxine, and growth hormones, all of which affect the immune system and hence improve its disease fighting capability. In other cases, however, the supply of protein should be decreased. This is particularly useful under some disease conditions such as coccidiosis.

If in this case the level of the dietary protein is maintained high, there will be an increased activity of the enzyme trypsin in the small intestine of the bird. This will, in turn, lead to faster release of coccidia from their oocytes, which eventually become so active as to be less responsive to vaccination. The feeding regimen can also affect the severity of coccidiosis. Workers have observed that starving chickens prior to oral vaccination will reduce infection, probably due to lower excystation resulting from the lowered trypsin level induced by starvation.

Adjustment of the protein level up or down, or selection of the protein-feeding regimen at times of vaccination may not always be an adequate means of disease prevention. In

fact, some protein sources such as raw soybean, cottonseed meal, and flax cake contain varying amounts of anti-nutritional factors such as trypsin inhibitors, gossypol, and glucosides, respectively. When ingested by the bird, these factors would then exert some damaging effects on the small intestine, thereby impairing the immune apparatus at this particular site which exert not only local but also systemic protective functions. Excessive use of such protein sources in the ration should, therefore, be avoided.

Fat nutrition
Including fat in diets of heat-stressed broilers improves feed intake and performance.

Dietary fat affects immune-competence either by altering the cell membrane structure or by modulating the synthesis of prostaglandins, which play an important regulatory part in many biological processes including the immune response. In one study, the resistance of chickens to disease agents such as E. coli and Mycobacterium tuberculosis were linearly enhanced as the level of lard or safflower oil was increased from 3% to 9%. Mortality associated with such diseases was also reduced with elevated levels of fat in the ration.

Under certain disease conditions, such as coccidiosis, it will be necessary to consider the type of fatty acids to be incorporated into the diet. Coccidiosis most likely impairs micelle formation. Fat with a high content of short- and medium- chain triglycerides may not be taken up into the micelles. The digestion of this fat will be less impaired by the infection than fat with a high content of unsaturated fatty acids, since they are easier incorporated into micelles. Such changes in the manner of fat digestion will, in turn, determine the extent to which weight gain and other fat-related production parameters will be affected by the disease. Adequate nutrition is a major tool in achieving maximum flock health. To a large extent this is related to protein, fat, fibre, vitamins and minerals in diets. The use of some natural herbs also increases the health status of a flock.

Matching requirements
The addition of more dietary fats should be considered during hot periods, particularly for broiler chickens, so that the daily energy intake can match the requirements for growth. It is a common practice on tropical farms to exclude fat from the diet during summer and include it during winter, because it is thought that the energy requirement of broilers is less in summer than in winter.
Recent studies, however, have shown that including fat in diets of heat-stressed broilers actually improves feed intake and performance. The heat increment of fat is lower than that of the other energy sources such as carbohydrates and proteins and, therefore, the heat load on the bird during summer will be less with high-fat diets. Also, there will be in this case larger amounts of fat-soluble vitamins ingested by the bird, which help improve resistance to common diseases prevailing in summer.

Fibre beneficial
Experiments have shown that dietary fibre reduces the number of goblet cells present on the villous epithelia. This is a beneficial aspect because the reduced goblet cell number should entail reduction in the amount of goblet mucin. If produced in large

amounts, mucin will then act as a luminal barrier preventing some feed nutrients from passing through the intestinal wall. Dilution of diet with fibres was also found to influence micro-organisms in the caeca of the bird. This should provide additional carbohydrate and protein metabolism, and also overcome fermentation problems associated with the small size of the caecum.

In long-term feeding of rations having moderate levels of fibre, there might be an improved utilisation of minerals. This effect, however, might vary with the source of fibre used. For example, it was found that retention of sodium and potassium was increased by oats hulls, but not affected by fibre sources such as alfalfa meal or soybean hulls. On the other hand, retention of copper was found to increase with soybean hulls but not with the other two sources of fibre. The three fibre sources equally increased retention of iron, suggesting that the iron contained in either source has a high relative bioavailability. Selection of the fibre source to be incorporated in the ration could, therefore, be an effective means of satisfying requirements for a specific mineral and correcting deficiency.

Cannibalism and nutrition

It was also found that cannibalism is more troublesome than usual during years when high-fibre feeds such as oats are eliminated from the ration because of scarcity of supplies. Insufficient fibre in the ration appears to be one of a number of causes of cannibalism. Oats are, therefore, so important in poultry rations that it would usually pay producers to buy oats even at what appear to be high prices.

A study was conducted to compare incidence of cannibalism with rations containing 80% yellow corn, and with 8%, 13%, and 18% fibre rations produced by substituting oat mill feed for corn in the aforementioned ration. The percent body parts pecked, the severity of pecking as determined by the scoring system, and the cannibalism mortality are given in Table 1. The relationship of fibre content of the ration and the prevention of cannibalism is not fully understood. Conceivably, it may be related to the increased consumption of feed and the time occupied in eating, or to the increased utilisation of sodium and potassium with high-fibre diets, as indicated earlier.

Minerals and vitamins

Birds should receive more vitamin E if infected with E. coli. In a study with day-old broiler chickens, there was a linear increase in the production of the antibodies specific to the E. coli infection at 2 weeks of age when the level of vitamin E in the diet was increased from 150 IU/kg to 300 IU/kg (IU = International Units). Similar responses were noted with parent stocks fed either 300 IU or 450 IU vitamin E in the diet. At the higher level of the vitamin, there was an increased level of immunity against bacterial infection such as B. abortus in the offspring at 7 days of age.

Also, there is a linear relationship between dietary vitamin A and diseases associated with M. tuberculosis bacteria. Increasing the level of this vitamin from 2200 to 4400 IU/kg resulted in increased serum immunoglobulin specific to this infection and reduced mortality. In a study with vitamin C, it was found that the vitamin has a strong action against S. gallinarum when fed at a high level (1000 ppm) daily for 3 weeks. Similar

responses were noted with iron when increased in the diet from 250 to 450 ppm, and mortality was reduced here by 9%.

Uses of herbs
The incorporation of 2% black cumin into laying diets seems to result in improved egg production.

A number of medical herbs and their extracts have been used in the poultry industry in place of chemical medicines which often accumulate in the bird's tissues and adversely affect the quality of the resulting meat and eggs. Among these is the black cumin (Nigella sativa), which contains 18-24% thymoquinone, based on the total amount of the volatile fraction thereof. The thymoquinone compounds have anti-bacterial, anti-fungal, and anti-parasitic effects, in addition to their effects as anti-cancer agents. It was also found that the black cumin contains about 30% protein with a digestibility value of about 75%. This protein contains most of the essential amino acids, and has a biological value of 1.6 compared to a value of 1.2 for most grains commonly used in poultry feeding.
In one feeding experiment, the incorporation of 2% black cumin into laying diets resulted in improved egg production, high fertility of males, and greater hatchability values. This was attributed to the stimulatory effect of the black cumin on the thyroid gland, and to its inhibitory effect on the bacterial infection which, in turn, improves the general health and production of the bird.

Less bacterial agents
When incorporated into diets of broiler chickens at 2%, the black cumin had inhibitory effects against Newcastle and IBD diseases. It has also promoted growth of the chickens due to its effects on secretion of the bile juices and hence on fat digestion and utilisation. Upon the post-mortem examination of carcasses of birds fed diets with black cumin, fewer bacterial agents such as E. coli, Salmonella, Streptococcus, and Staphylococcushave been detected, suggesting the role of black cumin on production of clean and edible carcasses.
Garlic powder (Allium sativum) is also a natural product that has successfully been used in feeding poultry. It helps overcome the problems of the formation of varying amounts of undesirable cholesterol resulting from the greater amount of saturated fatty acids relative to the unsaturated ones in each molecule of fat formed in the chick's body. It was found that the incorporation of 3-5% garlic powder into the diet resulted in increased activity of the enzymes that convert cholesterol into bile acids, eventually being catabolised in the body, so a negligible amount is disposed in the carcass.

Alternative sources
Other herbal plants that might be used in poultry feeding include the spiny acanthus (Acanthus spinosus), ginger (Zingiber officinale), and the Indian curcuma (Curcuma longa). Studies have shown that such species of plants act as natural antibiotics against coccidiosis and other microbial diseases. They could, therefore, be used in place of the synthetic antibiotics which in many cases reduce body vitamin B and vitamin K due to their effect on the gut micro-flora synthesizing the vitamins, in addition to their high costs relative to the natural plants, as indicated earlier.

Green tea leaves (Camellia sinensis) has also been used in the field of therapeutic nutrition, mainly because of the presence poly-phenol derivatives such as carnitine and catechin, which play an important role in fatty acid oxidation and in the production of ATP. The said derivatives also play an important role in the prophylaxis and/or treatment of neuropathic diseases, striate opacity, pancreatitis, fibroid tumors, etc. These effects, however, have so far been observed with laboratory animals only, and further work is needed to ascertain the potential role of the tea leaves in the therapeutic nutrition of poultry.

Changes in selected biochemical indices resulting from various pre-sampling handling techniques in broilers

Reference

Chloupek P., I. Bedanova, J. Chloupek and V. Vecerek. 2011. Changes in selected biochemical indices resulting from various pre-sampling handling techniques in broilers. Acta Veterinaria Scandinavica, 53:31 doi:10.1186/1751-0147-53-31

Researchers in the Czech Republic found that broilers showed signs of stress – in terms of elevated plasma corticosterone and lactate concentrations – during handling, especially when this was done with a lack of care or for longer than two minutes.

It is not yet clear whether it is possible to avoid satisfactorily sampling-induced stress interference in poultry, according to Petr Chloupek and colleagues at the University of Veterinary and Pharmaceutical Science in Brno in the Czech Republic in a paper published recently in Acta Veterinaria Scandinavica. They explain that more studies on the pattern of physiological response and detailed quantification of stress connected with the first few minutes of capture and pre-sampling handling in poultry are required.

Their study focused on detection of changes in the corticosterone level and concentrations of other selected biochemical parameters in broilers handled in two different manners during blood sampling (involving catching, carrying, restraint, and blood collection itself) that lasted for various time periods of between 30 and 180 seconds.

Stress effects of pre-sampling handling were studied in a group (n=144) of unsexed Ross 308 broiler chickens aged 42 days. Handling (catching, carrying, restraint, and blood sampling itself) was carried out in a gentle (i.e. caught, held and carried carefully in an upright position) or rough (i.e. caught by the leg, held and carried with lack of care in inverted position) manner and lasted for 30, 60, 90, 120, 150 and 180 seconds. Plasma corticosterone, albumin, glucose, cholesterol, lactate, triglycerides and total protein were measured in order to assess the stress-induced changes to these biochemical indices following handling in the first few minutes of capture.

The Brno researchers found that pre-sampling handling in a rough manner resulted in considerably higher plasma concentrations of all biochemical indices monitored when compared with gentle handling.

The concentrations of plasma corticosterone after 150 and 180 seconds of handling were considerably higher ($P<0.01$) than concentrations after 30 to 120 seconds of handling, regardless of handling technique.

Concentrations of plasma lactate were also increased by prolonged handling duration. Handling for 90 to 180 seconds resulted in a highly significant elevation of lactate concentration in comparison with 30 seconds handling, regardless of handling technique. As with corticosterone, a strong positive correlation was found between plasma lactate concentration and the duration of pre-sampling handling.

No other biochemical indices monitored showed any correlation pattern in connection with duration of pre-sampling handling.

Chloupek and co-authors concluded that their results indicate the pre-sampling procedure may be a considerably stressful procedure for broilers, particularly when carried out with lack of care and exceeding 120 seconds.

Culling more effective than vaccinating

The Poultry Site
5 Aug 2011
Unit: LEI

In economic and epidemiological terms, the practice of culling on farms within a radius of 1 to 3 km of infected farms is the best method of combating Highly Pathogenic Avian Influenza (HPAI). Vaccinating chickens within a radius of 3 km of an infected farm may at first appear to be cheaper, but it is less effective because the epidemic spreads further and lasts longer. This was one of the findings of a study performed by LEI together with the Central Veterinary Institute (CVI), both part of Wageningen UR.

Matters researched included the consequences of preventative culling and of vaccination programmes within a radius of 1, 3 and 10 km of a farm infected with Highly Pathogenic Avian Influenza, also known as bird flu. The results of this research are described in the report ‘Control of Highly Pathogenic Avian Influenza’. This report demonstrates that an epidemic is shorter in duration when preventative culling takes place, but that this results in culling taking place on more farms than in the case of vaccinations. Emergency vaccinations are less effective in shortening the duration of the epidemic, although they do reduce the number of infected farms. The EU strategy of only implementing culling on infected farms is not effective enough in helping to control an outbreak in a densely-populated poultry-rearing area.

Strategies in the event of an HPAI epidemic

In the report, the researchers describe the various strategies available to the government in the event of an outbreak of HPAI. The report was commissioned by the Ministry of Economic Affairs, Agriculture & Innovation to provide a basis for decisions made in the event of a new HPAI epidemic. In this regard, account must be taken of the fact that large-scale preventative culling is increasingly less acceptable to society, according to the researchers. Society tends to call for alternative control measures such as vaccination.

Persistent Environmental Reservoirs on Farms as Risk Factors for Campylobacter

The Poultry Site
August 25, 2011

Commercial broiler flocks were most likely to become positive for Campylobacter from other infected animals such as cattle, dogs, wildlife and rodents on the farm, according to recently published research from the UK.

Campylobacter is the most common known source of human bacterial enteritis in the developed world and poultry is considered the main source, according to Dr J. Ellis-Iversen of AHVLA and co-authors from the same organisation, the University of Bristol and SAC in a paper published online in Epidemiology and Infection.

Broilers often become colonised with Campylobacter during rearing, and then contaminate the farm environment, they explain. The objective of their study was to identify Campylobacter-positive environmental reservoirs on farms, as these pose a risk to broiler flocks becoming colonised with Campylobacter. The researchers considered the temporal aspects of exposure and colonisation.

A longitudinal study monitored six conventional rearing farms over two years. The broiler flocks, catchers' equipment, vehicles, shed surrounds, shed entrance, other equipment, farm entrance, other animals, puddles, dead birds, mains water and drinkers were systematically sampled two to four times per flock. A multivariable generalised estimating equation model was used to assess associations between contaminated environmental sites and colonised broiler flocks. The associations were adjusted for confounders and other known risk factors.

To further assess temporality of contamination, the sequence of contamination of the different environmental sites and the flocks was established.

Contaminated shed entrances and anterooms, contaminated drinkers and shedding of Campylobacter by other animals such as cattle, dogs, wildlife and rodents were significantly associated with positive flocks, concluded Ellis-Iversen and co-authors. They added that the reservoir of 'other animals' was also the reservoir most commonly positive before the flock became colonised. The other sites usually became contaminated after the flock was colonised.

Reference

Ellis-Iversen J., A. Ridley, V. Morris, A. Sowa, J. Harris, R. Atterbury, N. Sparks and V. Allen. 2011. Persistent environmental reservoirs on farms as risk factors for Campylobacter in commercial poultry. Epidemiology and Infection (article in press) DOI: 10.1017/S095026881100118X

Research uncovers what increases chicken wellbeing

3 October 2011
Source: Bristol University

Study finds that birds are more content with activity objects

Researchers from the University of Bristol's School of Veterinary Sciences have concluded that the wellbeing of barn chickens is increased if they have activity objects, perches and other stimulation.

Around 75 per cent of barn chickens reared for UK households are in barns which don't have natural daylight or activity objects such as pecking blocks .

The study, one of the first of its kind in the UK , looked at the behaviour of birds to find out how content they really were in different conditions.

The aim of the research, funded by Morrisons, was to find out which measures made a genuine difference to the welfare of chickens.

A total of 120,000 birds were observed from birth to determine whether the chickens appeared to be positively occupied, bored, calm, depressed, tense or content, among other measures.

The study found that the chickens were more confident and active in an enriched environment and confirmed that the birds have a greater wellbeing with activity objects, perches and daylight.

Morrisons has therefore decided to move all its standard fresh chickens to the enriched regime and all their chicken will be able to live in barns containing windows, perches, straw bales and pecker blocks - allowing the chickens to express their natural behaviour.

Two researchers spent a total of more than 100 hours over the course of a month watching birds in four houses and measuring their wellbeing based on a number of different indicators.

Dr Claire Weeks, Senior Research Fellow in Animal Welfare at the University of Bristol's School of Veterinary Sciences, said: "Despite the high levels of public interest in chicken

welfare, to date there has been relatively little research into the impact that environmental enrichment can have on their behaviour.

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Impacts of nutrition on health and welfare explored

The PoultrySite
August 3, 2011

Studies on the effects of feeding and nutrition on poultry health and welfare formed a common theme at this year's WPSA UK Branch Meeting in Nottingham in April. Jackie Linden, senior editor of ThePoultrySite, reports.

Lameness in poultry is a major concern for the industry due to its negative implications for both bird welfare and productivity levels, explained Fiona Short of Nottingham Trent University in the introduction to her paper reporting two experiments looking at the effects of a novel form of dietary silicon supplement in reducing lameness in poultry (1).

The results of the first indicated that the supplement has the capacity to reduce lameness in broilers and hence silicon may have a role in improving bird welfare. Using the highest level of inclusion (1,000ppm), clearly fewer birds were unable to stand than the other treatments and more of them stood without encouragement. The second trial demonstrated that the silicon was easily absorbed as the serum silicon concentration was dose-dependent. Overall, the researchers concluded that the novel form of silicon supplementation has high bioavailability. Larger-scale studies are needed to substantiate its potential role as a commercial supplement for reducing the incidence of lameness in broilers, they added.

Bristol University scientists have been examining the possibility of using diets with additional ω-3 fatty acids as a means to improve bone strength and reduce keel bone fractures in laying hens. These fractures are a significant welfare issue, explained Dr Michael Toscano, as evidence has been found of new or old breaks in up to 70 per cent of free-range hens (2). Early research with diets containing short-chain ω-3-enhanced diets were effective in reducing keel bone fractures but they also adversely impacted egg production.

In experimental pens, 23-week-old layers were given one of four diets ranging in ω-3:ω-6 ratio between 0.12 and 1.35, with the ω-3 source being a mixture of flaxseed and salmon oils.

There was no treatment effect on the presence of keel bone fractures, and the number of poor quality shells was found to correlate positively with ω-3:ω-6 ratio in a dose-dependent manner. Looking at the Campylobacter concentration in the caecum, the Bristol researchers found a treatment effect of a parabolic nature and a peak at 0.36 ω-3:ω-6 ratio.

Dr Toscano said the data indicate that some of the long-chain ω-3 diet's negative impacts, e.g. poor egg quality, can be alleviated while sufficient ω-3 egg yolk quality is maintained by providing a mixture of short- and long-chain ω-3 content. Benefits of mixed ration to bone and overall health issues are less clear and require further research, he added.

Wet litter is a multifactorial problem, which has implications for welfare as well as carcass quality issues owing to the links with foot and leg problems and breast blisters in poultry. Soybean meal has been identified as a cause of wet litter. The aim of a study by M.W. Mirza of SAC, presented by Dr Vasil Pirgozliev, was to gain understanding of the relative importance of the protein and potassium in soybean meal on water intake and excretion by turkeys (3).

The results of the study indicate that it is the protein rather than potassium that is the main driver of water intake in turkeys. Dietary potassium may influence water output but the effect of crude protein is more pronounced.

Turning to the effects of feeding on health, researchers at Scottish Agricultural College (SAC) looked at the impact of feed withdrawal on sub-clinical necrotic enteritis. The withdrawal of antimicrobial growth promoters has been accompanied by a resurgence in sub-clinical necrotic enteritis, a disease caused by Clostridium perfringens, explained G. Saleem and colleagues (4). Field evidence indicates that subclinical necrotic enteritis occurs after some disruption to feeding, such as a failure in the feeder system.

The results from SAC showed that the duration of feed withdrawal imposed in the present study did not predispose the birds to necrotic enteritis, with no specific lesions observed and the C. perfringens count in the digesta was low. Feed withdrawal alone does not appear to predispose birds to necrotic enteritis.

Novel Feeds and Additives

There have been a multitude of studies investigating the effects beta-glucanase in broiler diets but the use of this feed enzyme for laying hens has been neglected, according to Dr Helen Masey O'Neill of AB Vista Feed Ingredients, reporting a trial carried out in China (5).

Feeding different levels of beta-glucanase to laying hens from 19 to 48 weeks of age in a diet based on wheat and barley and fed as mash, she and her co-authors concluded that beta-glucanase supplementation can improve the laying performance of hens. In each phase of the trial, laying rate and egg mass were significantly higher for the enzyme-supplemented groups than the for the control ($P<0.05$). However, they noted that, while the benefit of the enzyme was noted within the first 10 weeks of the start of the study, the FCR benefit took considerably longer to develop. Furthermore, the scale of the response to the enzyme seemed to increase with time, in terms of egg mass, laying rate and FCR.

These birds were fed one diet consistently throughout the study. It is possible that more consistent results in egg weight and FCR may be achieved if diets were formulated on a phase basis, added Dr Masey O'Neill.

The rising production of biofuels in the European Union has prompted interest in altering the bio-refining process to improve the nutritive value of the co-products, said Dawn Scholey of Nottingham Trent University, reporting part of her PhD thesis (6).

She and her co-authors fed to broilers from day-old to 15 days of age wheat and soya-based diets containing zero, three, six or nine per cent of two fermented wheat co-products, one from a potable alcohol source and one from a bioethanol source.

Both yeasts increased broiler weight gain at the lower inclusion level. The researchers noted an increase in digesta viscosity for the product from potable yeast production, which could limit its use as a feed ingredient and so they concluded that the yeast derived from bioethanol production appeared to provide a viable alternative protein source for broiler starter diets.

From the University of Developmental Studies in Ghana, H.K. Dei reported an evaluation on the nutritive value of Icacina oliviformis seed meal in broiler diets (7). He explained that I. oliviformis is commonly known is the false yam and that it is a drought- and fire-resistant shrub that grows widely across the savannah regions of West and Central Africa. Its high starch content indicate that Icacina may be a suitable substitute for maize in broiler diets.

The seeds were fed either raw or after processing by boiling or soaking and then drying. Health status of the birds was not affected by treatment and the researchers concluded that processing Icacina seeds by soaking in water improved its nutritive value for broilers up to 100g/kg in the diet.

References

All papers were presented at the WPSA UK Branch Annual Meeting in Nottingham on 4 to 5 April 2011.

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Selecting for better nest acceptance

World Poultry
04 Oct 2011

From January 2012, the EU-wide cage ban for layers will come into practice. This demands a different management approach, specifically for aviary systems, as the behaviour of layers plays a part. Specific selection, such as for nest acceptance, oviposition time and duration of stay in the nest, are important traits for avoiding floor eggs.

In order to meet consumer preferences, breeding goals are constantly being readjusted. A number of different aspects concerning laying performance, egg quality, feed efficiency as well as the health and behaviour of laying hens are considered in the breeding programme of Lohmann Tierzucht (LTZ).

For continuous improvement, more than twenty characteristics are included in the selection index, which is the basis of every breeding programme. In the overall selection index, each characteristic is weighted in relation to market requirements and exactly defined to meet those needs. In recent years, egg producer's demands for good nesting behaviour, especially nest acceptance, have grown, but until now it has been difficult to record the necessary individual bird information.

In order to obtain these data, LTZ developed a completely new testing system together with the Weihenstephan State Research Centre in Freising, Germany. The so-called "Weihenstephan Funnel Nest Box" (FNB), enables hen specific data recording in a non-cage environment. Based on these data, specific selection on nesting behaviour can be carried out.

An extensive article on this selection programme is published in the nr 8 edition of World Poultry, which will appear this month.

Breeder chickens show different behaviors

World Poultry
04 Oct 2011

Behavior patterns for animals develop early in life. Environmental conditions play a significant role in development of social hierarchies. Some aggression is necessary.

However, when female chickens are fearful, they tend to remain on slatted areas. If they do leave the slatted areas, they are often repeatedly mated by several males. This can result in injury or death.

Research on this matter was carried out by the University of Arkansas in Fayetteville, AR, USA.
According to researchers S.M. Sullivan and N.B. Anthony, behaviorists contend that years of cage rearing and artificial insemination of elite populations without selection for behavior traits has caused a failure for males to perform enough courtship behaviors and a failure for females to properly respond by crouching.

Many of the factors that affect rate of mating are; dominance, ratio of male to females, specific breed differences, space, accessibility of males to females, how tolerant individual males are to other males, individual differences in libido, learned behaviors and conditioned responses.

Recorded were 26 different behaviors. These behaviors were then combined into 3 aggressive categories and 1 non-aggressive category. It appeared that more aggression occurs at 20% production than at 50% production.

There were differences between male lines and between time periods. There were no differences of individual aggressive behaviors for production periods except for circling (perhaps a precursor to waltzing). Fertility of lines A x White Rock started high and remained high, lines A x A and White Rock x White Rock started high, dropped significantly, and then returned. Mortality of males was the highest for A males crossed on White Rock females.

Interestingly, there were no mortalities for males crossed on the A female line. The female affect on male aggression is quite evident. There are differences due to hen effects among all lines. Best fertility at 20% production in lines crossed with each other and lines crosses with White Rock males. There appear to be minimal differences between commercial broiler lines crossed on White Rock lines, apart from some individual aggressive behaviors.

Source: Proceedings of the 2011 International Poultry Scientific Forum, Atlanta, GA, USA

Combating heat stress to keep birds productive

World Poultrynet
September 5, 2011

Extremely high temperatures have a much greater effect on the faster growing, higher yielding broiler of today and also in laying chickens. When it’s hot outside, it is essential to create an environment inside the poultry house that allows the birds to dissipate excess body heat and remain comfortable. In these challenging conditions it is essential

that key management techniques are applied in order to gain maximum performance. Making fat digestible in nutrition is such a measure.

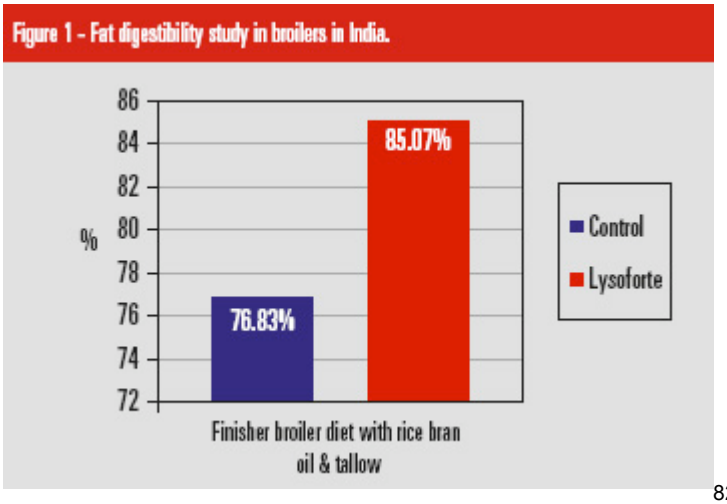
By K.V. Chandrasekar, Kemin AgriFoods, Singapore

Chickens, unlike most other animals, do not possess sweat glands to aid in heat loss in order to maintain a constant body temperature. The chicken removes excess body heat in four ways. Body heat can be lost by radiation from the skin surface through the air to another object (i.e., another bird). Heat can be directly transferred by conduction to cooler objects with which the bird is in contact, such as the cage, litter or slats. Body heat is also lost to the surrounding air by convection.

When the environmental temperatures are between 28°C and 35°C (82°F and 95°F), radiation, conduction, and convection heat losses are usually adequate to maintain the bird's body temperature. The bird dilates the blood vessels in its skin, wattles and comb to bring the internal body heat to the skin surface to facilitate conductive, convective and radiation heat loss. Floor birds will search for cool places in the house and dig into the litter to increase the conductive and convective heat loss. Drooping of the wings promotes convective heat loss by increasing the surface area of the body.

Caged birds are more susceptible to heat stress because they are unable to seek a cooler place and there is less conductive heat loss in cages. As the environmental temperature approaches the body temperature of the bird, 41°C (106°F), the efficiency of these heat loss mechanisms diminishes.
Extremely high temperatures have a much greater effect on the faster growing, higher yielding broiler of today and also in laying chickens. When it's hot outside, it is essential to create an environment inside the poultry house that allows the birds to dissipate excess body heat and remain comfortable. In these challenging conditions it is essential that key management techniques are applied in order to gain maximum

Effects of heat stress
About 75% of the metabolisable energy consumed by the bird will be converted to body heat and require being lost to the environment. Thus reduction in feed intake is an important physiological safety mechanism to reduce heat stress. As temperatures rise, the ability to lose heat by conduction, convection and radiation decreases. At this point, the bird will then try to loose heat by panting, which assists the evaporation of water from the moist linings of the respiratory system. This evaporative cooling initially involves the process of passing air rapidly in and out of the mouth and is the principal means of regulating body temperature in heat stress. However, at higher temperatures



water also evaporates from the air sacs within the lungs during panting, lowering the levels of blood carbon dioxide and inducing a process called respiratory alkalosis. This condition can have a serious impact on bird performance particularly when accompanied by decreased feed intake, due to the decreased potassium and minerals balance. In general, birds with higher metabolic loads e.g. male broilers and laying birds will be more sensitive to heat stress.

When heat production exceeds the bird's ability to dissipate heat, birds will lie prostrate and gasping on the floor, which results in them becoming more weak and susceptible to dying from respiratory, circulatory and or metabolic imbalance. One of the primary effects of high environmental temperatures on a flock is reduced feed intake. A reduction in appetite is the birds' effort to reduce energy intake in response to the increase in the energy in the environment, thereby reducing the energy needed from the feed. Birds may use body fat as a source of energy that produces less heat than digestion or metabolism of proteins or carbohydrates in the feed.

The reduced feed intake and subsequent loss of needed nutrients quickly affect the productivity of the flock. Growth retardation occurs in growing birds. Laying flocks typically have a reduction in egg size, followed by lowered egg production, and reduced egg shell quality. In breeders, high environmental temperatures decrease the hatchability of embryos and the fertility of roosters.
Extremely high temperatures have a much greater effect on the faster growing, higher yielding broiler of today and also in laying chickens. When it's hot outside, it is essential to create an environment inside the poultry house that allows the birds to dissipate excess body heat and remain comfortable. In these challenging conditions it is essential that key management techniques are applied in order to gain maximum performance. Making fat digestible in nutrition is such a measure.

Nutritional management of heat stress
Increasing nutrient intake during heat stress, by changing the feed specification, may have an adverse effect on survivability, but increasing the digestibility of nutrients and the use of specialist micro ingredients has been shown to have benefits. The principle nutrients to consider are:
Proteins and amino acids: nutrient digestibility should be increased rather than nutrient density, minimise excess protein and balance amino acids and minimise the crude protein level in the diet.

Vitamins and minerals: certain vitamins are known to have a positive effect on the birds' response to heat stress including Vitamin E, D, A, C, B2 and nicotinic acid. Under no circumstances should vitamins be withdrawn from the diet.

Energy: the diet should be supplemented with fat rather than carbohydrate. Increasing the energy density of the diet will increase growth rate but will also increase heat output.

As temperatures rise, the bird has to maintain the balance between heat production and heat loss, and so will reduce its feed intake. Trials indicate that feed intake is reduced

by 5% for every 1SDgrC rise in temperature between 32-38SDgrC. Reduced feed intake is the main cause of poor performance. As a general rule, for each 2.5°C (5°F) increase in house temperature above 29°C (85°F), the energy content of the feed should be reduced about 22kcal/kg (10 kcal/lb).

The feed energy content can be decreased because more of the energy requirement of the bird can be met by the increase in environmental temperature. As the total amount of energy in the feed is decreased, the proportion of the total feed energy provided by added fat should be increased. The addition of fat may, in certain instances, be as high as 4.5% of the ration. This may require the use of low-energy feed ingredients such as wheat middlings and/or soy mill feed (soy hulls). A by-product of the digestion or metabolism of feed is the production of body heat (heat increment).

It is widely recognised that fat has the lowest heat increment of the energy nutrients — i.e., carbohydrate, protein, and fat. In comparison to proteins and carbohydrates, the digestion of fat results in less production of body heat per calorie of feed energy. The heat load of the bird can be reduced by replacing other dietary energy with dietary fat. Generally the energy content of the feed should be reduced gradually in increments of 22-33 kcal/kg (10-15 kcal/lb). Calorie reductions of this magnitude can be made at least twice each week.

Extremely high temperatures have a much greater effect on the faster growing, higher yielding broiler of today and also in laying chickens. When it's hot outside, it is essential to create an environment inside the poultry house that allows the birds to dissipate excess body heat and remain comfortable. In these challenging conditions it is essential that key management techniques are applied in order to gain maximum performance. Making fat digestible in nutrition is such a measure.

When the nutrient density of the formula is increased to compensate for the reduction of feed intake, the protein content of the feed may, in some instances, be reduced by about 0.50% below the calculated value. If this is done, the intake of the needed amino acid can be optimised by providing increased quantities of synthetic amino acid such as methionine and lysine.
Adjusting the intake of protein is important because the body heat produced by protein digestion or metabolism is, as noted earlier, the greatest among the energy nutrients — i.e., carbohydrate, fat, and protein. Restrict the intake of feed about three hours before temperatures are expected to exceed 36°C (95°F) for more than three hours. Adjust the lighting schedule to encourage the consumption of feed in the night and early morning. A midnight feeding or an intermittent lighting programme can encourage feed consumption at night. Vitamin C in the ration (50-300 gm/tonne of feed) can protect birds from the effects of heat stress and enhance the survival of birds exposed to acute heat stress.

Increasing fat absorption
One of the nutritional management practices as mentioned above is to supplement more fat in diet as source of energy rather than carbohydrate and protein since the latter

can result in more heat increment and therefore can increase heat stress and death. Fat as a source of energy produces less heat than digestion or metabolism of proteins or carbohydrates in the feed . If the total amount of energy in the feed is decreased, the proportion of the total feed energy provided by added fat should be increased.

Therefore addition of fat in broiler diets during hot weather conditions can go more than 4.5% and also added in higher quantities than normal in layer diets in order to compensate the energy requirements during low feed intake. During such circumstances the fat has to be utilised and absorbed to the maximum extent in order to compensate the energy requirements. However the digestion of fat results in less production of body heat per calorie of feed energy and therefore maximum utilisation of the same will not result in excess heat production when compared to proteins and carbohydrates.

It is clearly understood that fat as a source of energy is a key tactic to combat heat stress in poultry in hot weather climates but however it is important to note that the fat added has to be utilised in order to maintain performance of animals. Broilers and pullets are young chickens and therefore the bile produced is not sufficient to utilise the higher levels of fat added in the diet and therefore it will not be effectively absorbed, as a result the performance of animals will drop. Therefore addition of exogenous biosurfactant technology (such as Lysoforte dry) that is more powerful than bile can help in utilisation of fat to maximum extent and provide energy with less heat increment and can combat heat stress.
Extremely high temperatures have a much greater effect on the faster growing, higher yielding broiler of today and also in laying chickens. When it's hot outside, it is essential to create an environment inside the poultry house that allows the birds to dissipate excess body heat and remain comfortable. In these challenging conditions it is essential that key management techniques are applied in order to gain maximum performance. Making fat digestible in nutrition is such a measure.

Maintaining performance
Lysoforte is a natural biosurfactant which increases the absorption of fat and fat soluble vitamins and maximises performance in animals by formation of smaller emulsion droplets, and also by formation of more number of micelles and thereby rapid absorption of fatty acids. It can also increase the permeability of cell membranes and can increase ion transport and can help in maintaining electrolyte balance during heat stress.

Previous results from a metabolic trial done in India have demonstrated that Lysoforte improves the digestibility of the feed fats and does not affect the performance during heat stress. From the study it became clear that Lysoforte had improved the fat digestibility by 9% (*Figure 1*).

Table 1 - Energy sparing effect of Lysoforte on diets with reduced ME values.

Treatments	Fat source	Dietary ME level	Lysoforte Dry
1	Tallow	Normal ME	–
2	Tallow	Reduced ME	–
3	Tallow	Reduced ME	+
4	Palm oil	Normal ME	–
5	Palm oil	Reduced ME	–
6	Palm oil	Reduced ME	+
7	Rice bran oil	Normal ME	–
8	Rice bran oil	Reduced ME	–
9	Rice bran oil	Reduced ME	+

[1] 3050 kcal/kg in the normal ME diets and a reduction of 1.0% in fat level (replaced by fine sand) in the reduced ME diet

[2] Lysoforte added at 500 g/tonne, replacing fine sand. -/+ indicates no or addition of Lysoforte respectively

Table 2 - Lysoforte AME study at Massey University in New Zealand.

Diets	Tallow based (kcal/kg)	Palm oil based (kcal/kg)	Rice bran oil based (kcal/kg)
Normal AME diet	3085	3073	3076
Reduced AME diet	2982	2937	2964
Reduced AME diet + Lysoforte	3069	3035	3045

Recent studies in Massey University in New Zealand have also confirmed the positive energy sparing effect of Lysoforte on diets with reduced ME values. The diets were formulated with different fat sources as shown in *Table 1*. Lysoforte addition produced a significant increase in Apparent Metabolisable Energy (AME) for all the treatments resulting in a recovery of metabolisable energy of the reduced ME diet through increased absorption of fat, containing different fat sources as indicated in *Table 2*.

To conclude, the improved fat utilisation and sparing effect of Lysoforte during hot weather conditions will not alter the performance of birds, because of less production of body heat per calorie of feed energy.

** References are available from the author*

Breeder chickens show different behaviors

PoultryNet, 04 Oct 2011
Behavior patterns for animals develop early in life. Environmental conditions play a significant role in development of social hierarchies. Some aggression is necessary.

However, when female chickens are fearful, they tend to remain on slatted areas. If they do leave the slatted areas, they are often repeatedly mated by several males. This can result in injury or death.

Research on this matter was carried out by the University of Arkansas in Fayetteville, AR, USA.
According to researchers S.M. Sullivan and N.B. Anthony, behaviorists contend that years of cage rearing and artificial insemination of elite populations without selection for behavior traits has caused a failure for males to perform enough courtship behaviors and a failure for females to properly respond by crouching.

Many of the factors that affect rate of mating are; dominance, ratio of male to females, specific breed differences, space, accessibility of males to females, how tolerant individual males are to other males, individual differences in libido, learned behaviors and conditioned responses.

Recorded were 26 different behaviors. These behaviors were then combined into 3 aggressive categories and 1 non-aggressive category. It appeared that more aggression occurs at 20% production than at 50% production.

There were differences between male lines and between time periods. There were no differences of individual aggressive behaviors for production periods except for circling (perhaps a precursor to waltzing). Fertility of lines A x White Rock started high and remained high, lines A x A and White Rock x White Rock started high, dropped significantly, and then returned. Mortality of males was the highest for A males crossed on White Rock females.

Interestingly, there were no mortalities for males crossed on the A female line. The female affect on male aggression is quite evident. There are differences due to hen effects among all lines. Best fertility at 20% production in lines crossed with each other and lines crosses with White Rock males. There appear to be minimal differences between commercial broiler lines crossed on White Rock lines, apart from some individual aggressive behaviors.

Source: Proceedings of the 2011 International Poultry Scientific Forum, Atlanta, GA, USA

Incubation can affect broiler leg strength

The PoultrySite

August 3, 2011

Bone characteristics, serum calcium levels, early growth rate and later leg weakness could be affected by commonly used incubation programmes, according to P.J. Groves and W.I. Muir of the Faculty of Veterinary Science at the University of Sydney in their paper presented at the 2011 Australian Poultry Science Symposium.

Summary

Leg weakness in broiler chickens remains one of the major animal welfare concerns for the poultry industry worldwide, according to P.J. Groves and W.I. Muir. Recent research has indicated possible effects of incubation conditions on the skeletal integrity of the growing birds. A serendipitous finding of a field occurrence of leg weakness allowed them to target some incubation condition variations which may have been associated with this.

While an attempt to reproduce the same condition experimentally (higher temperature (0.5°C) and lower humidity (three to four per cent relative humidity) was not entirely successful, the researchers were able to demonstrate repeatable effects on bone characteristics and leg strength in broiler chickens hatched from eggs incubated under higher (0.5°C) temperature conditions. These conditions fell within the range normally acceptable for commercial broiler egg incubation.

Introduction

The aetiology of the various forms of leg weakness and lameness in the modern broiler chicken are complex, including factors relating to genetics, nutrition, infection, management and environment. The consequences for the individual bird affected and also for a considerable proportion of some flocks are serious. Bradshaw et al., 2002 stress that the welfare implications of broiler leg weakness include pain, frustration (inability to walk), reduced ability to eat and drink and consequent risk of dehydration or starvation. Birds which have difficulty in moving are also more at risk of excessive disturbance by other birds (Buijs et al., 2010) which can disrupt their sleep/rest patterns. Immobile birds are also more prone to skin damage from scratches which may result in cellulitis and death.

The underlying genetic basis associated with leg weakness is under investigation (as evidenced by Butterworth et al., 2003). Major broiler breeding companies are attempting to address many of the leg weakness issues but this requires years of genetic selection, the results of which may not be seen in the commercial broiler for many years (Elfick, 2010; Hardiman, 2010).

In the meantime, broiler producers can ameliorate the prevalence and severity of leg problems by attention to nutritional, managerial and environmental risk factors. A new area which is emerging as another possible contributor to the incidence of leg weakness problems is variation in egg incubation conditions. Research into fine-tuning incubation

may provide additional management opportunities to further suppress the incidence of leg weakness and lameness.

A short review of leg weakness in broiler chickens

Lameness and leg weakness are considered a serious welfare problem. A plethora of lameness conditions in chickens exist. Bradshaw et al. (2002) summarised these into:

infectious causes (bacterial chondronecrosis with osteomyelitis (so-called femoral head necrosis), tenosynovitis, and infectious stunting syndrome)
developmental issues (varus-valgus deformity, tibial dyschondroplasia, rickets, chondrodystrophies and spondylolisthesis), and
degenerative problems (osteochondrosis, epiphyseolysis, degenerative joint disease, ruptured gastrocnemius tendon and contact dermatitis).

Apart from the obvious clinical entities listed above, difficulty with locomotion is observed in birds which lack visible deformities and it has become conventional to assess the locomotory ability of birds and flocks using a standardised 'gait scoring' technique as described by Kestin et al. (1992).

A wide ranging study using gait scoring as its basis in the UK suggested that 27.6 per cent of broilers had poor locomotory ability and 3.3 per cent were unable to walk at all (Knowles et al., 2008). Many studies have not gone any deeper and the underlying pathology is often not identified. Bradshaw et al. (2002) suggested that bacterial chondronecrosis, contact dermatitis (pododermatitis) and varus-valgus deformity were the most common conditions involved. In most broiler flocks approaching slaughter age, many or all of the described conditions will be present at varying prevalence.

A detailed description of each of these conditions is beyond the scope of this paper but risk factors believed to be involved with the occurrence of the more commonly seen conditions will be summarised.

Rickets describes a condition of inadequate bone mineralisation classically induced by inadequate nutritional levels of calcium, phosphorus or vitamin D3. While broiler nutrition today is well catered for in the provision of a balance of nutrients, the occurrence of conditions which appear rickets-like (soft bendable bones and beaks) is seen commonly in young chicks. Clinical rickets can be seen following occurrences of infectious stunting syndrome (ISS) in flocks, relating to poor absorption of nutrients associated with indigestion induced by the group of viruses. ISS immunity is poorly understood and although the flock condition occurs sporadically, the viruses involved should be expected to be widely present in the broiler environment. One wonders about the possibility that subclinical ISS in many flocks may play a part in subsequent skeletal problems on a wide scale.

Tibial dyschondroplasia (TD) is a disruption of normal ossification as bones grow. An interference with adequate blood supply in the metaphysis of the tibiotarsus results in insufficient nutrients reaching the growth plate and a cartilage plug forms which fails to

be ossified. Bones are subsequently weak, may bend and cause considerable pain in weight bearing. Genetics, incorrect electrolyte balance in feed and mycotoxins have been implicated in TD development. It is a commonly seen entity in broilers and is often correlated with an imbalance of the calcium:phosphorus ratio in the feed, compounded by the difficulty in predicting real available phosphorus levels from available ingredients with and without phytase supplementation.

It is quite feasible that the presence of earlier degenerative conditions, especially rickets-like conditions, may predispose birds to the appearance of other conditions later in the flock's life. In the field, rotated tibia is becoming one of the major leg deformities seen. The aetiology of this condition is not known but early rickets may be a predisposing factor (Crespo & Shivaprasad, 2008). Thorp (2008) also implicated the earlier occurrence of rickets or dyschondroplasia with varus-valgus deformity.

Many of the leg weakness conditions can be modified by management and environmental conditions. Field and laboratory studies, however, are sometimes contradictory in the effects observed. Stocking density has often been implicated with an increased incidence of leg problems (Knowles et al., 2002; Bradshaw et al., 2002; Petek et al., 2010) while other studies have shown leg problems to peak at intermediate levels rather than higher stocking densities (Buijs et al., 2009; Hepworth et al., 2010), or to not be related to stocking density at all (Dawkins et al., 2004).

Lengthy photoperiod has also been incriminated with a higher incidence of leg weakness (Brickett et al., 2007; Bradshaw et al., 2002; Knowles et al., 2008; Petek et al., 2010) as has lack of exercise (Cooper and Wrathall, 2010; Sherlock et al., 2010) which has a relationship to scotoperiod (the length of the dark period). Many relate the primary risk factors to growth rate (Knowles et al., 2008, Bradshaw et al., 2002; Sherlock et al., 2010). Maintenance of dry litter conditions also can have major effects on pododermatitis (Sherlock et al., 2010). Modification of these factors can lead to better outcomes for broiler leg health.

More recent work, including that reported herein, has demonstrated associations of variations in incubation conditions and subsequent leg strength and this will be summarised below.
*
"Fine-tuning incubation may provide additional management opportunities to further suppress the incidence of leg weakness and lameness"
Links to incubation condition

Recent published reviews and research have implicated defects in incubation as possible contributors to some bone irregularities in broiler chickens or turkeys. Spraddle legs in broilers have been associated with high humidity during incubation (Crespo & Shivaprasad, 2008), and Genin et al. (2008) implicated cyclic overheating during the first eight days of incubation in the later incidence of tibial dyschondroplasia via an effect on growth plate hypoxia.

Oviedo-Rondon et al. (2008) showed that pre-heating conditions of eggs prior to incubation could affect bone characteristics of chicks at hatch and the incidence of twisted legs as late as 40 days of age. These authors also described effects on bone development and characteristics following early cool and/or late high temperature profiles and low oxygen tensions used during parts of the incubation process. Soft tissue effects have also been seen. In further experiments, Oviedo-Rondon et al. (2010) demonstrated an effect of an early low and later high incubation temperature profile in producing thinner gastrocnemius tendon fibres and differing collagen banding patterns during subsequent growth. The temperatures used in these studies though were outside the normal realms of incubation practice (36°C and 39°C).

The local field observations have suggested a possible effect of incubation differences on subsequent leg strength and these will be discussed below.

Commercial hatcheries run differing incubation profiles depending on their machine type and whether these run as single or multi-stage incubation. Multi-stage incubators target a single temperature and humidity profile usually between 36.9 and 37.2°C and relative humidity between 51 and 65 per cent.

Single-stage commercial incubation uses a decreasing temperature profile starting at 38°C and decreasing to 37.2°C by 18 days with relative humidities varying between 50 to 58 per cent and sometimes as wide as 30 to 65 per cent.

The experimental profile used in these studies was within these commercially used bounds and basically employed a higher temperature (0.5°C) over later incubation, a lower relative humidity (three per cent) between days 7 to 18, and a pulse reduction in temperature at day 6 of 1°C.

The objectives of this research were to determine whether the variation in incubation conditions described generated a higher incidence of early bone weakness in newly hatched chicks and to then evaluate if later skeletal deformities or leg weakness could be associated with the incubation profile.

Materials and Methods

Experiment 1 used 2,000 and in experiment 2, 560 fertile eggs from breeders of a fast feathering dam line. In each experiment, the eggs were randomised between two incubators. The incubators were set to operate differently up to 18 days of incubation as shown in Figures 1 to 4. The major intended differences were an approximate drop in temperature of about 1°C for one day at six days of incubation, a higher continuous temperature from seven to 18 days of incubation (0.5°C) and a lower relative humidity (three per cent) throughout. These settings were based on an observed field situation where chicks with poor bone quality at hatch were produced, compared to an 'ideal' incubation profile as the control (Jan Meldrum, personal communication). From 18 days of incubation, all eggs were transferred into a common incubator set at 36.9°C and reduced by 0.3°C per day until day 21. Temperature and humidity data loggers (AZ

8829) recording conditions at hourly intervals were placed in each machine amongst the eggs.

At hatch, 44 randomly selected chicks from each incubator group were blood sampled for serum calcium and phosphorus levels and then humanely euthanised and both femurs were collected for bone ash analysis. Remaining chicks were placed in floor pens (240 birds per large pen in experiment 1 and 45 birds per smaller pen in experiment 2) and grown on commercial broiler starter and finisher rations (0-21 days and 22-42 days respectively) supplied by Millmaster Feeds, Enfield, New South Wales.

At two weeks of age, 40 or 44 birds were randomly selected from each group, blood sampled for serum calcium and phosphorus levels and humanely euthanised. The proximal ends of their left tibiae were longitudinally sectioned and the epiphyseal growth plate measured at the midpoint of the bone with a digital calliper. The left femurs were collected for bone ash analysis.

At day 28 in experiment 1, 44 birds were randomly selected and euthanised. The proximal end of their left tibiae were sectioned longitudinally and scored for the presence of tibial dyschondroplasia (TD) lesions (on a scale of 0 to 4, where 0 = no lesion and 4 = large lesion spanning the entire growth plate).

At six weeks of age, 40 or 50 randomly selected chickens from each group were submitted to a Latency-to-Lie (LTL) test (first described by Weeks et al., 2002 and modified by Berg and Sanotra, 2003) for a maximum of five minutes. In experiment 1, a random sample of 30 birds per pen was weighed at 14, 21, 28, 35 and 42 days. In Experiment 2, all birds were weighed on a pen basis at 7, 21, 28, 35 and 42 days.

Where data were normally distributed, comparisons were made using Analysis of Variance (ANOVA) where independent variables included incubator and sex and were compared across both experiments. Where data were not normally distributed, the Mann-Whitney U test was used to separate main effect means. LTL tests were compared using Kaplan-Meier Survival Analysis.

Results

The incubation temperature and relative humidity profiles recorded by the data loggers in each machine (actual) compared to the intended profiles are shown respectively in Figures 1 to 4. In experiment 1, the control incubator ran slightly cooler than intended and its humidity was not well controlled. In experiment 2, intended temperatures were much better matched but humidity was lower than intended and similar in both incubators. At hatch, chicks from the test incubator profile delivered consistently and significantly lower femoral bone ash percentage and higher serum calcium levels than the control profile (Table 1). Moisture loss from both test treatments was significantly higher (Table 1). In experiment 1, in which the test treatment maintained a three to four per cent lower relative humidity, the serum calcium was lower than the serum phosphorus for both control and test treatment (Table 1). At two weeks of age, serum phosphorus exceeded serum calcium in all four groups but this ratio was again

consistently higher for experiment 1. At two weeks, there was a significant interaction for bone ash percentage between the two experiments (Table 2), indicating a different response in this parameter under the differing incubation conditions that actually occurred in the incubators. Growth rate over the first two weeks was significantly greater in the test profile incubated chicks in both experiments but weights after this age were similar. Survival Analysis for the Latency to Lie test results show that birds from the test incubator groups had significantly shorter LTL time (median 94 seconds compared to 136.5 seconds for the control group, P=0.0002, Gehan's Wilcoxon test) and had fewer birds that managed to remain standing for the full five minutes.

Discussion and Conclusions

Although different, the intended temperature profiles used in both incubators fell within acceptable limits for successful incubation (37.1 to 38.2°C; Hill, 2010) Relative humidity was much harder to control with the incubators used. The incubators used in this preliminary work were semi-commercial types, not machines designed to provide fine control necessary for experimental work. Although the incubators did not perform completely as intended, particularly the control machine, significant differences between the chicks from each incubator profile were observed in chick bone ash and serum calcium at hatch and at growth rate to two weeks of age, and this was relatively consistent. The overall higher incubation temperature in the test treatments appears to have increased moisture loss from fertile eggs as well as embryonic growth, with commensurate impacts on bone ash and serum calcium.

High early growth rate has been implicated as contributing to leg weakness problems for some time (Bradshaw et al., 2002; Brickett et al., 2007; Knowles et al., 2008) and the overall increased early growth seen associated with the test incubation profile here may have had its effect on LTL when the birds were older. The two experiments show that bone characteristics, serum calcium levels, early growth rate and later leg weakness could be affected by incubation programmes within the usually acceptable hatchery range.

Acknowledgements

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The authors are indebted to the excellent technical assistance provided by Mrs Joy Gill, Mrs Melinda Hayter and Mr Todd Gill in performing the incubations, care and handling of the birds and assistance with sample collections. Mrs Gill performed the bone ash measurements. Ms Ball and Mrs Sharpe assisted with some of the sampling procedures.

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Influence of Housing System on Salmonella Colonisation of the Gut of Laying Hens

Nordentoft S., L. Molbak, L. Bjerrum, J. De Vylder, F. Van Immerseel and K. Pedersen. 2011. The influence of the cage system and colonisation of Salmonella Enteritidis on the microbial gut flora of laying hens studied by T-RFLP and 454 pyrosequencing. BMC Microbiology, 11:187 doi:10.1186/1471-2180-11-187

Researchers in Denmark observed a more diverse gut microflora in hens housed in furnished cages or aviaries than conventional battery cages but there were no differences in Salmonella colonisation or excretion patterns between the groups.

In the EU, conventional cages for laying hens are forbidden from 1 January 2012, according to Steen Nordentoft of the Technical University of Denmark and co-authors there and at the Danish Technological Institute and the University of Ghent in Belgium. In their paper published in the journal, BMC Microbiology, they say that concerns about a higher transmission rate of Salmonella have been raised for alternative cages systems.

The extent to which cage systems affect the intestinal microbiota of laying hens is not known, and different microbiota may demonstrate different resistance towards colonisation with Salmonella.

To investigate this, the researchers studied ileal and caecal samples from two experimental studies where laying hens were inoculated with Salmonella Enteritidis and housed in different systems – conventional cage, furnished cage or aviary – were compared using Terminal Restriction Fragment Length Polymorphism (T-RFLP). The distribution of genera in the microbiota in caecum was furthermore described by next generation sequencing of 16S rDNA libraries.

They found that hens in the same cage type developed similar T-RFLP fingerprints of the ileal and caecal microbiota, and these could be separated from layers in the other cages types. No significant difference in the fingerprint profiles were observed between Salmonella-positive and Salmonella-negative samples from the same cage.

By deep sequencing of 16S rDNA libraries from caecum, 197 different Operational Taxonomic Units (OTU) were identified, and 195 and 196 OTU respectively, were found in hens in aviary and furnished cages, but only 178 OTU of these were recovered from conventional cages. The ratio between the dominating phyla or families and genera in the microbiota remained fairly constant throughout the study. Faecalibacterium and Butyricimonas were the most prevalent genera found in the caecal microbiota of layers, irrespective of the cage type.

Nordentoft and co-authors concluded that hens confined in the same cage group tend to develop similar microbiota in their ileum and caecum possibly due to isolation, while differences in the microbiota between cages may be caused by environmental or individual bird factors.

Although the cages type had influence on composition of the microbiota in the layers by promoting higher diversity in furnished and aviary systems, the researchers did not observe differences in colonisation and excretion pattern of Salmonella from these groups.

The authors suggest that differences in group size and exposure to an environment more contaminated with faeces with the alternative systems may explain the observed differences in diversity of the caecal microbiota.

Although they found no evidence that the cage systems itself was able to change the intestinal microbiota in a way which made it more likely to encourage colonisation by Salmonella in the birds, Nordentoft and co-authors stressed that hygiene in alternative systems is a particularly critical factor in preventing the spread of Salmonella within a flock.

New study shows tree cover leads to healthier hens

FarmingUK.com
25/08/2011

A new piece of commercial research, conducted by the Food Animal Initiative (FAI) and McDonald's UK, has shown that planting more trees on the range encourages laying hens to roam more freely outdoors which in turn reduces the amount of feather pecking in the flock.

Feather pecking is one of the biggest welfare issues for free range laying hens and a constant economic problem for farmers who are seeing raised mortality rates as a result. The study was carried out to determine whether planting trees on the range led to a reduction in injurious feather pecking and a net increase in animal welfare for laying hens.

The in-depth research, which was also supported by key McDonald's UK suppliers Noble Foods and The Lakes Free Range Egg Company, reveals that without good canopy coverage the full benefits of free-range are often not fully realised. Planting a minimum of 5% canopy cover close to the hen house is both a feasible and practical method of enabling producers to reduce feather damage by feather pecking in their laying hen flocks.

Lead author of the paper, Dr Ashleigh Bright from the FAI said; 'Feather pecking is a constant cause for concern for free range egg producers We hope that our research findings will encourage more free range egg producers to increase the amount of good quality canopy cover on their ranges as there is both a welfare benefit to the laying hens and an economic benefit to the farmer.'

McDonald's UK Agriculture Assurance Manager, Joy Clachan, said; 'At McDonald's we are committed to improving animal welfare and our involvement in this research is a natural extension to the work we do with internationally renowned welfare experts on an ongoing basis to ensure best practices are in place.'

'The need to look into the issue of feather pecking has been widely acknowledged by the industry for some time and we're delighted that our paper has now been published

in the Animal Welfare Journal which will help to spread the word about the proven benefits of tree planting.'

The study also suggests that planting more trees on the range may provide additional environmental benefits such as soil stabilisation, reduced nutrient leaching and carbon sequestration.

McDonald's UK has been working closely with the FAI since its inception in 2001, supporting and investing in research aimed to improve animal welfare standards in a commercial environment. The company has also been using free range eggs on its menu for the last 12 years.

The full paper entitled 'Canopy cover is correlated with reduced injurious feather pecking in commercial flocks of free-range laying hens' has been published in the August edition of the Animal Welfare Journal.

OTHER

Animal Behaviour website

Animalbehaviour.net 28 September 2011
http://www.animalbehaviour.net/index.htm

This site is designed to deliver information about the behaviour of domestic and captive animals to as wide an audience as possible.

Animals behave in ways that fascinate, amuse and amaze us. Observing the behaviour of animals helps us to understand how they survive and reproduce. The more we study the behaviour of animals, the more informed we can be about what is good for them. An understanding of a species' behaviour also allows us to get the best out of them when we keep them for companionship, performance or production purposes. So, animal behaviour and animal welfare are very closely intertwined.

Animal welfare is often a topic that prompts emotional debate. However, it is not sufficient to assume non-human animals' needs are identical to our own. This reality has prompted the development of scientific tools that help to provide data to inform the animal welfare debate. We call this exciting new field animal welfare science. It is by studying the behavioural and physiological responses of animals to different challenges and environments that we can truly determine what is best for them. Animalbehaviour.net is intended to ensure that advances in our understanding of animal welfare science are accessible.

A mulesing miracle?

Farm Online

23 Jul, 2011 04:00 AM

WORLD-FIRST on-farm trials of an injectable pre-operative pain relief treatment for sheep began near Goulburn in New South Wales last week.

The compound Xylazine will be trialled by the University of Sydney Veterinary School in partnership with the creator of the Tri-Solfen mulesing pain-relief spray, Animal Ethics and research partner Bayer, as a pre-operative analgesic treatment before lamb marking, mulesing, castration and tail docking.

Animal Ethics director, Dr Meredith Sheil, said she has been trying to develop effective, affordable and practical analgesia treatments for farm animals comparable to those available for humans.

Large commercial field trials over the next 12 months aimed to finetune Xylazine dosage rates, following mainly laboratory research over the past six months. Xylazine is already registered for use in sheep as a sedative.

"What we've been doing is looking at whether we can develop a way of administering this medication in small doses on farm safely and effectively to provide pre-operative analgesia for the procedures," Dr Sheil said.

Dr Sheil said the treatment being trialled was expected to cost less than 30 cents a lamb, and on-farm use would involve an intramuscular injection in lambs about 20 minutes before any surgical procedure takes place. Tri-Solfen will be applied to control groups and to lambs that receive the Xylazine injection during the trials.

Former Australian Wool Innovation director, Chick Olsson, said the unique research was aimed at allowing sheep producers to perform a complete set of treatments in one operation while reducing pain.

"The on-farm trials are also to ensure that lambs continue to mother up after surgery," he said.

Mr Olsson said it would be difficult for animal rights groups to argue with farmers' on-farm surgery practices when the Xylazine technology became available.

The on-farm trials are being funded by a linkage grant from the Australian Research Council. Mr Olsson's family has shares in Animal Ethics.

Animalbehaviour.net

28 September 2011
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