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BEEF CATTLE

Working To Reduce Cattle Lameness in feedlot and stocker calves

Kansas State University

Source: David Anderson, 785-532-4259, danderso@k-state.edu

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Thursday, Jan. 13, 2011

US - At any given time between 10 and 20 per cent of cattle in the United States are afflicted with lameness, making it one of the most common ailments affecting feedlot and stocker calves.

That's why a Kansas State University research team is working to reduce the percentage of cattle affected by bovine lameness.

Three researchers, David Anderson, professor of clinical sciences; Brad White, associate professor of clinical sciences; and Johann Coetzee, associate professor of clinical sciences, are involved with bovine pain and welfare assessment at K-State's College of Veterinary Medicine. Because of their efforts to understand and treat lameness in cattle, they are becoming leaders in this critically important bovine research.

"K-State is one of the few universities in the country with a farm animal surgery program," Mr Anderson said. "Because of the research we're doing here, we're getting national and international attention about these programmes."

The team is developing a model to assess lameness and identify possible ways to treat it. Lameness can be excruciatingly painful for cattle and is caused by a variety of factors, including nutrition, environment and infectious organisms, Mr Anderson said. When damage to the hoof and sole results in ulcers, abscesses or infection of the deep tissue of the foot, it causes severe pain during weight bearing.

The goal of their research is to identify risk factors for the prevention of lameness, validate tools for early detection, develop recommendations for effective treatment, and ultimately improve the health and welfare of cattle. Each researcher is focusing on a different area of the project.

Mr Anderson is working on pressure map technology, which is a way of measuring the weight bearing and method of stride. Mr White is working on accelerometry, which involves using monitors to measure the behavioral responses of animals. Mr White can monitor an animal for 24 hours to determine how much time it spends lying down, moving around or standing still.

Mr Coetzee, a pharmacokinetic and pharmacodynamic specialist, is working to analyze indicators of pain in the blood and analyzing drugs to determine the dosage to reduce pain.

So far the researchers have developed ways to assess lameness. They are now looking at therapeutic models and identifying drugs -- such as flunixin and meloxicam -- that could help ameliorate pain and lameness.

The researchers recently published work on sodium salicylate in the Journal of Dairy Science and will have an upcoming article about flunixin in the American Journal of Veterinary Research, expected sometime in 2011.

Managing Cows in Cold Weather

Thursday, January 13, 2011

The Dairy Site

US - Winter can pose a number of specific challenges to producers who raise cattle, but proper management can help lessen the impact of cold weather.

That's according to South Dakota Cooperative Extension Beef Specialist Cody Wright, who advises all beef producers to consider cold-weather steps as weather continues to bring snow, winds, and low temperatures. "Among the first things producers can do is to address their lots and land, and look for opportunities for windbreaks," Mr Wright said. "They can utilize bedding, and figure in more bedding materials, because cold weather increases maintenance requirements in general. This is especially true with thinner animals."

Mr Wright said wet, windy weather make the changes in cattle performance more dramatic, and that conditions like those lead to increased dry-matter intake.

"At 10 degrees Fahrenheit, cows need about 3.5-4 pounds of extra hay daily, or 2-2.5 pounds of grain," Mr Wright said. "When temperatures drop to 10 degrees below zero, that figure can double, and cows will need 7-8 pounds of extra hay or 4-6 pounds of extra grain each day to maintain internal temperatures against the elements."

Mr Wright said that allowing free-choice access to good quality hay should generally solve most cold-weather related intake issues. "The cows will adjust their intake accordingly as temperatures decrease. However, it is also a good idea to feed in the afternoon because the maximum heat production from fermentation occurs 4-6 hours after the feed is consumed," he said. "Feeding in the afternoon allows this heat production to be used when temperatures are lowest."

Early Dehorning Advised

TheCattleSite News Desk

Friday, January 28, 2011

CANADA - Producers are strongly advised to dehorn calves as early as possible for two reasons, says the Government of Alberta.

First, the procedure is less invasive in newborn calves, so growth performance is not affected as much. Second, common sense and science both say that removing an established horn from an older animal is much more painful than removing the unattached horn bud from calves.

In some countries, older calves can only be dehorned by a veterinarian using anesthetic and anti-inflammatory drugs. The problem is that most of these injected drugs wear off after a few hours. So while these drugs may make dehorning easier for the operator (the animal likely struggles less if it doesn't hurt as much), they might only delay the pain for the animal. The added cost and lack of long-term pain relief have limited the use of these drugs. In-feed anti-inflammatory drugs may provide more effective and longer-term pain relief, but none of these products have received regulatory approval in Canada.

The other way to dehorn cattle is to use polled genetics. A perfectly reliable DNA test for the horned/polled gene has not yet been developed, but most breeds do have polled bloodlines. A pair of Canadian studies published in 1996 and 1998 found miniscule difference in backfat depth between horned and polled bulls, but no differences in birth, weaning or yearling weight, pre- or post-weaning growth rate, scrotal circumference, carcass weight, marbling score, ribeye area or lean meat yield. This has not entirely stopped the passionate debate about pendulous sheaths and other relative merits of horned vs. polled cattle, however.

The Beef Research Cluster is funded by the Canadian Cattlemen's Association and Agriculture and Agri-Food Canada to advance research and technology transfer supporting the Canadian beef industry's vision to be recognized as a preferred supplier of healthy, high quality beef, cattle and genetics.

Research Reveals Value of Selecting Calm Cattle

University of Mississippi

Mississippi State Agricultural and Forestry Experiment Station

(Jan 25, 2011)

By Justin Ammon

MISSISSIPPI STATE – Recent research has demonstrated the value of cattle with calm temperaments and the price producers pay for keeping wilder animals in their herds.

A five-year Mississippi Agricultural and Forestry Experiment Station study found that cows with poor temperaments can affect the entire herd and reduce producers' bottom lines.

Rhonda Vann, MAFES associate research professor in Mississippi State University's Department of Animal and Dairy Sciences, led the study in Raymond at the Brown Loam Branch Experiment Station.

"We suggest that producers evaluate their herds and the cattle they buy," Vann said. "You don't want a cow or steer that's unreceptive, but one that's a bit more docile. They are going to have less sickness, gain weight better, do better in pastures and be more productive for the producer throughout their entire life span."

Vann said the most applicable findings in her research is to cull cows with poor temperaments out of the herd.

Researchers measured how a trio of cows behaved while in a 12-by-12-foot pen and how a single cow behaved while in a chute similar to what contains bulls before being released at a rodeo.

In both cases, the cows' behavior was measured after they were approached by humans. The research also used laser technology to gauge how fast a cow traveled 6 feet after being released from a chute.

For each part of the experiment, the cows were given a score on a 5-point scale. The scale ranged from 1, describing cows as not aggressive, docile, walks slowly, easily approachable and not excited by humans to 5, describing cows as very aggressive, excitable, and out of control.

The pen scores and chute scores were nearly identical, and the higher-scoring cows almost always exited the chutes at accelerated speeds.

"The pen score measures aggressiveness, and the exit velocity measures their flight response: how quickly they want to get away from the situation," Vann said. "Basically, the more aggressive they are, the quicker they want to get away from the situation."

Vann said anxious, aggressive cows, or those with a pen score of 4 or 5, present a host of problems.

"They become sick more often, have more difficulty gaining weight and damage farm equipment. Their rowdy behavior rubs off on cows that would otherwise be perfectly calm," Vann said. "Cow behavior even affects meat tenderness, as certain hormones such as cortisol and enzymes remain at higher levels in stressed-out cattle, possibly toughening the muscle. All of these problems directly affect a cattle producer's profit margins."

Vann said the primary factor relating to cow behavior is genetics. If a high-strung bull and a wild female mate, the result will be a high-tempered calf.

But genes do not tell the whole story. Vann said a calf's mother usually influences its behavior more than the bull, since the mother raises the animal and provides a constant presence.

However, Vann said that all cattle are susceptible to learned behavior.

"I'd say how humans treat the animal is 25 percent of it, followed by 10 percent being the environment," she said. "The rest would be genetics; however, we are still investigating what makes some animals more aggressive than others."

Danny Martin, the 2009 Mississippi Cattleman of the Year, owns a ranch in Raymond and can attest to these findings from experiences with his own herd.

"Ill-tempered cows have to get antibiotics more often, and they don't come up to eat with the rest of the cows and get the proper nutrition," he said.

Martin said he once sent several cows to a feed lot experiment at MSU, including one that was irritable.

“When I sent the cattle, there was no more than a 50-pound difference between each of them,” Martin said. “However, when the animals returned, the ill-behaved steer weighed 966 pounds, while all the others weighed over 1,200 pounds each.”

According to the study, which was published in the “Professional Animal Scientist,” cattle with high pen scores typically incurred higher medical expenses than lower-scoring cattle.

In addition, ill-tempered cattle typically bring in \$5 or \$6 less per hundred pounds of body weight than do calmer animals, Vann said. An aggressive cow weighing 800 pounds may net \$480 less than its non-aggressive counterpart. However, high scorers usually won’t even reach that weight since they have trouble gaining bulk.

DAIRY AND VEAL

Lameness Impact on Welfare of Dairy Cattle

By Dr. Susan Eicher

USDA-ARS-MWA Dairy Cow Welfare Fact Sheet

Livestock Behavior Research Unit

Fall 2010

Prevalence and Persistence: Dairy lameness is a very visible well-being issue as well as a production and economic issue. Estimates of the percentage of cows that will be affected by lameness during their time in the herd vary from 10 to over 50%. These estimates do not include sub-clinical cases that may be affecting cow comfort, behavior, reproduction, or production in more subtle, undetected ways. Lameness continues to be a common problem across many types of housing. It has many etiologies and is multi-faceted, making it difficult to study. Recently an abundance of literature has focused on this problem. Although some preventative measures and treatments have evolved, the problem persists and prevention remains elusive. **Conditions Associated with Lameness:** Epidemiological studies in the U.S. have shown that lactation number, body condition score, hoof trimming frequency, and stall surface and comfort are associated with lameness. Contrary to popular opinion, some research has shown that high levels of milk production do not affect lameness.

Lameness frequently occurs within 60 days after calving. As the periparturient hormone and nutritional allocations shift, hooves become more susceptible to disease. Joint and hip problems are more frequent because of the hormone shifts that loosen the ligaments and tendons for calving. Add to this the large dietary and consumption changes, and other problems arise as a consequence of lameness. Recent studies have suggested that enhanced growth rate and earlier calving are linked with greater incidence of laminitis and first-lactation foot problems. In contrast, previous work found little evidence for an effect of age at first calving, but differences were observed for calving season. Recent studies have shown greater incidence of lameness during heat stress, typically in August. Seasonality of treatments for lameness caused by white-line disease is more common August through October than are sole ulcers. But, grazing systems have fewer lameness incidences than do zero-grazing systems and cows housed in straw yards have fewer injuries compared with free stall systems.

Flooring Solutions: Remedies already viewed as good dairy practice include the use of foot baths for infectious conditions, frequent hoof trimming, reducing damp environments, properly

fitted stalls, and earlier recognition of problems with the use of technology such as accelerometers. Housing dairy cows on concrete flooring has been shown to be instrumental in the development of lameness; and it has been demonstrated as a risk factor for development of sole hemorrhages. In addition, concrete flooring may not provide the friction necessary for cows to walk in a natural manner. Studies have shown that cows prefer to stand and walk on soft flooring such as soft, textured rubber compared with concrete and will stand in bedded cubicles to obtain relief from concrete passageways. Rubber flooring in alleys is another suggested housing change to increase cow comfort and reduce incidence of lameness. Rubber flooring of housing accommodations has been associated with reduced lameness or risk of lameness for dairy cows. This is important as lameness is considered one of the most serious welfare issues for dairy cows, and its consequences present a significant cost to the dairy industry. Genetic Indicators of Pain and Tissue Repair: Exciting molecular research is focused on changes in pain and tissue repair genes that are associated with clinical and sub-clinical lameness as early indicators. Some peripheral immune cell responses seem to have indicators of both pain and the repair process. Recent data from our laboratory shows that a pain-related gene and as well as a gene involved in cartilage tissue repair changed around parturition for cows that had been housed on rubber rather than concrete. Additionally, immune cell numbers were greater for cows housed on concrete, particularly in their second lactation suggesting an on-going chronic inflammation. Molecular studies of those cells revealed increased inflammatory signals for cows housed on concrete and less of some anti-inflammatory signals, supporting that hypothesis.

Conclusions and Recommendations: While many preventative measures have been developed and embraced as good dairy practices, subclinical lameness continues to affect cow comfort, health, and production. Rubber flooring may be part of the solution. As we further elucidate the impact of pain on the overall functioning of the cow and new lameness detection devices and strategies are tested, we may be able to intervene sooner and reduce incidence or severity of lameness in dairy cattle.

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Hydrate animals before transport

By Dairy Herd news source

Updated: March 30, 2011

Proper hydration of market dairy animals prior to slaughter emphasizes your commitment to animal care and beef quality.

In a study reported in *The Professional Animal Scientist* journal, market dairy cows that were given electrolyte supplementation before leaving the farm for slaughter tended to have a lower percentage of weight loss during transport than untreated cows.

The study's authors say the results demonstrate the potential for treatment with electrolytes preslaughter "to attenuate the negative effects of stressors on cull dairy cows."

Supplementation appeared to be more effective during hot weather and extended feed withdrawal.

Take into consideration the marketing and transport guidelines found in the *Dairy Animal Care & Quality Assurance (DACQA)* manual when the time comes to market or transport dairy animals. The guidelines stress, among other things, that you only market animals that are not dehydrated.

Always handle and transport animals in accordance with accepted animal husbandry practices.

DACQA is a voluntary, national certification program intended to enhance and demonstrate quality animal care practices, which assure food safety, quality and value as well as enhance consumer confidence in the milk and beef products that are harvested from cattle on America's dairy farms.

Concentrated Copper Sulphate Reduces Digital Dermatitis

The DairySite

January 13, 2011

Footbathing in a five per cent compared to a two per cent copper sulphate solution is more effective at reducing digital dermatitis when incidence levels are very high, although at moderate levels a two per cent solution is just as effective, concludes research led by Marijntje Speijers from Hillsborough's Agri-Food and Biosciences Institute.

It is more effective to treat herds with a high prevalence of digital dermatitis with a 5 per cent rather than a 2 per cent copper sulphate solution in a weekly footbathing regime. That was the key finding of a trial, led by Marijntje Speijers from Hillsborough's Agri-Food and Biosciences Institute.

"It appears that when the prevalence of digital dermatitis (DD) is medium – around 25 per cent of the herd with active digital dermatitis lesions – fortnightly footbathing with 5 per cent or 2 per cent copper sulphate will control the disease," she told delegates at this year's British Society of Animal Science's annual conference, held at Queen's University, Belfast.

Digital dermatitis is a world-wide problem in dairy herds that accounts for between 20 and 25 per cent of all cases of lameness. And it is not only a major welfare issue in dairy herds, but it also has serious financial implications.

"Each case of digital dermatitis is estimated to cost between £75 and £82 in the UK," said Dr Speijers.

Often the most practical solution for controlling dermatitis is group topical therapy, in other words footbathing. And for this to be successful, an effective antibacterial product needs to be used. Neither antibiotics nor formalin can be recommended for use in footbaths, according to Dr Speijers.

"This is because antibiotics are expensive and their long-term use may lead to increased antibiotic resistance in cattle, and because formalin is both toxic and carcinogenic.

"Copper sulphate solutions are used extensively in footbaths for cattle, but long-term use may have adverse effects on the environment through increasing soil copper levels. So the aim of our study was to compare the effectiveness of different footbathing regimes using different copper sulphate concentrations in the treatment of digital dermatitis."

Lactating cows from the experimental herd at the Agri-Food and Biosciences Institute were allocated to one of four treatment regimes: weekly footbathing with 5 per cent copper sulphate; weekly footbathing with 2 per cent copper sulphate; fortnightly footbathing with 5 per cent copper sulphate; or fortnightly footbathing with 2 per cent copper sulphate.

Cows allocated to the weekly footbathing regime had, on average, a high prevalence of active DD at the start of the trial – more than 60 per cent - whereas cows allocated to fortnightly footbathing had a lower prevalence of active DD, at less than 25 per cent.

During the seven-week study period, the cows walked through a water bath and then the allocated footbath solution on four consecutive milkings (weekly or fortnightly, respectively). And digital dermatitis was scored on the hind claws of all animals during milking on a weekly basis using a 5-point nominal scale.

“And for cows on the weekly footbathing regime, in other words those with high levels of DD, the prevalence of active DD lesions decreased faster when the 5 per cent rather than the 2 per cent copper sulphate solution was used,” said Dr Speijers.

“Improved healing of DD lesions was also shown with the weekly 5 per cent rather than 2 per cent copper sulphate footbathing regime. And for cows on the fortnightly footbathing regime, with low levels of DD, there was no significant difference in number of active lesions, or in healing of lesions, between the 2 per cent and 5 per cent copper sulphate solutions.”

Full details: Speijers MHM, Baird LG, Logue DN, O’Connell NE: “Effectiveness of different footbath solutions in the treatment of digital dermatitis in dairy cows.”

Breeding Innovation In Action: Does Size Matter?

The DairySite
March 2011

The UK is fortunate to have many great breeds of dairy cow, and over the years these have been bred to suit the wide variety of management systems, climates and dairy products we enjoy in this country, said Peter Willies, Nocton Dairies Ltd, at the British Cattle Breeders Conference.

Background

Last year Nocton Dairies submitted an application for an 8000 milking herd. This was revised in November 2010, for an 3,770 herd.

In mid-February, Nocton announced that they had withdrew the plans completely due to an objection by the Environment Agency.

The Holstein

The Holstein cow, as the most prevalent breed, has been much maligned. To animal activists, she’s behind the woes of the modern dairy industry and frequently criticised for being overbred, fragile and exploited. However, the vast majority of dairy stock in the UK is still Holstein, and with that in mind, those of us who want to have her in our milking systems need to get to grips with her requirements, Mr Willes said.

The important word here is management. If you examine the Holstein, she is bred to naturally give 10,000 to 11,000 litre lactations. Her high yield lends itself to a reduced carbon footprint for milk production, provided other efficiencies, such as a low replacement rate, can be achieved.

"If she is giving less, then I believe she is probably in energy deficit and not receiving the nutrition or management she needs.

"Contrary to the myths put about by ill-informed animal rights groups, I don’t believe Holsteins are being ‘pushed’ when they yield 10,000 litres while maintaining body weight – they are actually in their comfort zone and yielding at a natural level with optimum nutrition – by which I mean high levels of quality, high fibre forage as well as protein and energy. So how do we make sure she gets enough of that feed?"

Mr Willes has been quoted recently, saying "Cows don't belong in fields". He admitted he should have expressed his views differently at the time he first made that comment, but said that the sentiment behind those words still holds true.

The Holstein cow struggles to walk long distances and meet her nutritional needs through grazing. Her needs are so high that time walking to and from fields, foraging on pasture of variable nutritional content, taking in unknown amounts of grass, and even standing for long periods waiting to be milked, all impact on her ability to take in sufficient nutrients to meet her requirements and obtain sufficient rest for her health.

Mr Willes said that this can manifest itself in a variety of ways – a fall in milk yield and loss of body condition, lameness, mastitis, metabolic disorders.

"So if we want a Holstein cow in our system, how can we design that system to allow her to get what she needs and promote maximum welfare while not impacting on her physical and mental welfare?"

This is where the size issue comes in. With the milk price under constant pressure, economies of scale is one way to allow the investment in facilities that give Holsteins the best environment for healthy production.

"Over 50 years' joint experience between myself and my business partner, and recent fact finding visits to the US while developing our ideas for Nocton Dairies, have taught us a great deal about the Holstein and the conditions in which she functions best," he said.

Holsteins ideally need 12 hours each day lying down in their cubicle for adequate rumination and rest. Studies at the University of Wisconsin have found that even lame cows get their 12 hours when they are bedded on deep sand, whereas cows tend to rest for nearer 11 hours on mattresses, with lame cows on mattresses resting even less as they tend to avoid lying down.

One study showed that cows on mattresses spent almost twice as long standing in their cubicles as cows on sand. This had the effect of not only increasing lameness, but also depressing milk yield, possibly because the cows spent less time feeding. In one trial, 305-day yield was projected to be around 700 litres greater for cows on deep sand than on mattresses; there was also a 2.4 per cent decrease in herd turnover and modest increase in conception rates.

Time spent milking is another challenge on farms with Holsteins. Many farms milking twice a day using family labour will find milking taking up around four to six hours a day by the time cows are brought into the collecting yard, go through the milking parlour and return to the field or housing.

Lameness is a big concern with both Holsteins and indoor-based systems. But we've found that if the slurry is removed three times a day, the cows are mainly walking on clean grooved concrete or standing on their sand beds rather than in pooled slurry. This reduces lameness, plus the sterility of the sand beds ensures pathogens don't breed and the comfort promotes rest. The deep sand bed studies in Wisconsin confirm this, finding 42 per cent fewer lame cows on sand than on mattresses.

The European Food Safety Authority report on dairy cow welfare is often quoted by animal rights groups, but the report, when not quoted selectively, is also a very useful collation of

welfare studies over the years. There is a section looking at two versus three times a day milking, and it finds that three times a day is better when twice a day milking can't be performed at 12 hourly intervals, especially with high yielding cows.

Udder pressure has to be a consideration in the Holstein, and three times a day milking, provided the cow flow is right and time spent standing and waiting is minimal, seems to be beneficial in controlling mastitis. Three times a day milking is easier to implement on larger farms with more labour. And returning once again to sand beds, the Wisconsin trials show a 20 per cent reduction in somatic cell counts and 17 per cent fewer cases of clinical mastitis on sand beds, whether a function of rest, the sterility of the sand, or both.

"

Of course, with sand the wonder-bedding, why don't we all switch to it? I've done this on one of my existing farms and while we all love what it does for the cows, the headaches it creates with slurry management are horrendous. Which takes us back again to the economies of scale."

The reason why size is important to us is our research of the best US farms showed a unit size of just over 4,000 cows is big enough to allow investment in sand separation and recycling, as well as anaerobic digestion and full time vets. Sand separation allows us to recover around 90 per cent of sand for reuse. It's washed and left to cure for three weeks before being reused, at which point all pathogens have died and it is largely sterile again.

Concluding, Mr Willes said that if we want Holsteins on our farms, we need to manage them carefully by investing in the systems and quality of management that give them the rest, feed and environment they need.

"Once we've developed these, we know that even if we move away from pure Holsteins in the future and start looking at another breed or crossbred cows, the system remains robust enough to support the best welfare. br>

"Increasing cow numbers is the way we can develop the economies of scale to support that investment and labour. This isn't to say that smaller farms couldn't install all these features and have that same level of management delivered by the farmer himself or a small team, but the challenge, as ever, is obtaining sufficient investment funds in a market environment that remains tough."

How Big A Problem Is Dairy Cow Mortality In The US?

Dairysite

March 11/11

Franlyn Garry from Colorado State University, has said that the frequency of adult dairy cow mortality appears to be increasing, and is related to culling, disease, and injury problems.

Mortality rates in the dairy industry are much higher than those in the cow/calf or feedlot industries. Death losses have not been studied very intensively in the dairy industry. Estimates of these death losses are quite variable. Unless they are focused on monitoring cow deaths, dairy producers may underestimate the amount of adult cow death loss on their operations. The USDA:APHIS:VS National Animal Health Monitoring System (NAHMS) Dairy 2007 survey reported that 5.7 per cent of dairy cows die on-farm across the country each year, an increase from 4.8 per cent of the January 2002 inventory and 3.8 per cent of the January 1996 inventory. These rising mortality levels represent a problem both in terms of financial losses and compromised animal welfare.

Information from computerized dairy record systems suggests that mortality rates have continually increased over the last 10 years. In some states, adult cow mortality exceeds 10 per cent per year. Very few formal studies have focused on this issue, yet dairy cattle death losses are an extremely important problem. Not only are these losses an economic disaster, they also represent very substantial problems with animal well-being. This would seem to be an issue requiring substantial veterinary attention, but at present it does not appear that veterinarians or producers have the information required to manage the problem appropriately.

Why do dairy cows die?

Most studies of dairy cow mortality have come from outside the United States. The US studies on this issue have been primarily focused on culling and herd turnover rates rather than death losses per se. The 2007 national survey of dairies in the US showed that approximately 23.6 per cent of dairy cows left herds permanently during 2007, and that approximately 5.5 per cent of these cows were sold to other dairies, while 94 per cent were culled (i.e., sold and not returned to milk production, sent for slaughter).

The reasons cows were culled included reproductive failure (26.3 per cent of culled cows), mastitis and udder problems (23 per cent), lameness or injury (16 per cent), other disease (3.7 per cent), and poor milk production not related to these other problems (16 per cent), while other miscellaneous reasons accounted for about 8 per cent of culling. Therefore, on average, the overwhelming majority of dairy cows leaving farms are not fit for sale as dairy production animals, and approximately 50 per cent of these cows leave because of disease or injury problems rather than being selectively removed because of low fertility or milk productivity.

Adult cow death losses appear to be attributable to reasons similar to those for culling cows. A recent literature review identified 19 studies between the years 1965 and 2006 that focused on dairy cow mortality in countries with relatively intensive dairy production. While 10 of the 19 studies provided information about causes of death, none of the diagnoses were founded on necropsy evaluation.

Only a single study discriminated between cows that were euthanized or died unassisted. Recorded causes of death were relatively uniform across studies and were categorized as: accidents, calving disorders, digestive disorders, locomotor disorders, metabolic disorders, udder/teat disorders, other known reasons, and unknown reasons. The NAHMS Dairy 2007 survey recorded causes of death similarly to those established through the literature review, documenting the percentage of cow deaths due to: euthanasia due to lameness or injury (20.0 per cent); mastitis (16.5 per cent); calving problems (15.2 per cent); respiratory problems (11.3 per cent); scours, diarrhea, or other digestive problems (10.4 per cent); lack of coordination or severe depression (1.0 per cent); poison (0.4 per cent); other known reasons (10.2 per cent); and unknown reasons (15.0 per cent).

Cause of death entered in dairy record systems is often based on producer assessment and diagnosis. It appears that dairy veterinarians are minimally involved in the diagnosis of cause of death, and relatively few US dairy operations perform necropsies in an effort to determine the cause of cow death. The NAHMS Dairy 2007 study reported that necropsies were performed on only 13 per cent of operations and only 4.4 per cent of cow deaths received a thorough postmortem examination. Therefore, to date, virtually all studies of dairy cow mortality are based on producer assessment rather than veterinary diagnosis. Determining the cause of death provides invaluable information for preventing future deaths and improving herd health.

At present, no specific reason has been identified for the increase in dairy cow death rates. Producers and veterinarians appear to have attributed increasing death rates to a variety of causes. Some have questioned whether the new federal regulations regarding down dairy cows and neurologic disease may have artificially increased recorded death rates.

While this will contribute to recorded mortalities, death rates were increasing prior to the implementation of this rule. Furthermore, if euthanized down cows represent more than a small fraction of dairy mortalities, we need to ask why so many cows need to be euthanized. Others have suggested that specific disease problems such as hemorrhagic bowel disease may be increasing death rates, but the increased mortality rates far exceed the incidence of any specific disease problem. Any conjectures on the cause of increased mortality are difficult to validate without specific diagnoses.

Dairy record systems appear to be an unreliable source of information concerning cause of death. We have been studying the phenomenon of dairy cow mortality over the last couple of years. Our findings suggest that dairy producer assessment of the proximate cause of death is inaccurate approximately 50 per cent of the time. Our results also show that there are multiple causes of dairy cow death. Mortalities tend to occur much more frequently in the early part of lactation, coincident with increases in other health problems. Increased disease rates on dairies appear to be closely related to increased death rates. It seems reasonable to suggest that numerous health problems in dairy cows are not recognized early enough or not treated properly to promote an optimal outcome. Furthermore, without good descriptors and records of the reasons that cows die, preventive measures that should decrease disease and death are not modified or improved to address the problem.

What can be done to decrease dairy cow deaths?

Most decisions in a low-cost production dairy model are made with input cost as the primary driving force, and potential negative impacts on the animals in the production system are seen as problems that must be managed as a consequence. For example, it is common that large-scale expansion of a dairy will capture production cost efficiencies but often with the caveat that expansions are accompanied by substantial problems with animal health. During the time that large numbers of animals are being imported to the herd, it is routine that disease introduction is occurring. Numerous animal health problems are prevalent and even increase with time. Because there are compelling reasons for dairies to expand, there is a real need for the dairy industry and dairy veterinarians to reevaluate dairy management systems with a focus on optimum animal health.

An overview of the health challenges faced by dairy cows needs to recognize that some changes in the modern dairy industry may result in systematic problems with animal care. The labor force on most dairies is primarily composed of low-wage workers without extensive, preexisting dairy cow management skills. The ability of dairy personnel to adequately identify disease in individual animals and respond with prompt individual animal attention is limited by the extent of their experience and training.

The overwhelming majority of sick cows on dairies are identified, diagnosed, and treated by farm workers rather than veterinarians. Poor outcomes could be an issue of poor clinical disease management in addition to any preexisting problems with cow physiology. Furthermore, record-keeping systems are not focused on assessment of health challenges or causes of cow health problems. While these systems are very good at generating "to-do" lists and monitoring cow production and cow status in the herd, they are not designed to assess cause and effect of health problems.

Therefore, most producers do not have good access to the information they need to monitor health performance and to identify effective management changes that would improve cow health outcomes. Components of a program for decreasing dairy mortality would include education of the workers in the system, monitoring of processes that are used, and analysis of outcomes to identify trends.

Farm necropsy examinations should be an invaluable tool to help assess cause of adult cow death. Necropsy of dead animals to assess and monitor cause of death is rarely performed on dairies. This is in sharp contrast to other intensive livestock management systems, including poultry, swine, and feedlot enterprises where necropsy monitoring is routine. Most dairy veterinarians focus considerable effort on dairy reproduction but little time on mortality evaluation.

This presents a very significant liability to the dairy industry because efforts to effectively decrease mortality losses are hampered by a lack of monitoring and information that provide accurate assessment of the problem. We believe that dairy workers could be trained to more effectively monitor death losses and to perform on-farm necropsy examinations in consultation with veterinarians when the veterinarian cannot be present to perform the examination on a freshly dead carcass. We have presented this recommendation to producer groups and produced the Dairy Cattle Necropsy Manual. Very few producers or veterinarians have pursued this approach, attesting to the notion that monitoring actual cause of death has not been seen as a valuable pursuit.

Necropsy examinations will provide good information, but we also need to develop new recording systems that allow the necropsy results to be recorded as usable information. On their own, necropsy diagnoses provide great detail about the specific cause of death but do not necessarily provide information about why that specific cause occurred. Therefore, necropsy information needs to be combined with other historical information about the affected animals to help direct management changes. Our studies suggest that at least 50 per cent of cow death losses are attributable to causes that could be mitigated with proper management.

Because of the complex nature of dairy management systems, a variety of causes are responsible for high disease and mortality rates, with different rates of occurrence on different operations. The wide range of lactational incidence risk for common diseases (milk fever: 0.03 per cent-22.3 per cent, RP: 1.3–39.2 per cent, metritis: 2.2-37.3 per cent, ketosis: 1.3-18.3 per cent, LDA: 0.3-6.3, lameness: 1.8-30 per cent) attests to the complexity of the system.

To adequately address such a complex problem requires more accurate information about current losses, followed by management alterations that address the underlying problems. This will require changing the nature of information used in dairy management systems. An example of mastitis prevalence can illustrate this point. The specific infectious organism that causes a clinical mastitis episode can have a dramatic impact on outcome, and appropriate preventative or therapeutic measures need to be tailored to the specific cause, e.g., gram negative versus gram positive, environmental versus contagious, *Escherichia coli* versus *Staphylococcus aureus*.

Assessments and record systems that track “mastitis” without identifying other specific details do not provide sufficient information to promote effective interventions. Similarly, monitoring death losses with generic terms such as “lameness” or “mastitis” and performing this monitoring

on the basis of presumption will not allow correction of management problems that may underlie the death.

There will not be a single simple answer to the problem of high mortality on dairies. Steps toward managing this challenge will require recognizing and defining the problem, improving information systems to provide details necessary to take action, and monitoring appropriate metrics that promote ongoing attention to management corrections.

Facility Characteristics and Cow Comfort on US Dairy Operations

The DairySite

January 21, 2011

The Dairy 2007 study, by the USDA marks the first time that the National Animal Health Monitoring System has studied parameters associated with cow comfort on dairy operations.

More than four of five dairy cows in the United States were raised on conventional dairy operations in which the majority of forage was harvested and delivered to the cows. About one of three operations was a combination of conventional and grazing operations types.

During the last 50 years, housing types on US dairies have changed from predominantly stanchion facilities to tie stalls, freestalls, and dry lots. In 2007, almost three of four lactating cows were housed in freestall or dry lot/ multiple-animal areas, and these cows were milked in parlor facilities. The more modern housing types allow cows more freedom of movement compared with the traditional tie-stall and stanchion facilities. Data from the Dairy 2007 study indicate that freestall housing provided an environment that promoted improved hygiene and reduced hock injuries; however, freestall facilities had the highest percentage of cows with lameness compared with other housing types. Unless allowed access to dry lots or pasture, cows in freestall housing were typically on concrete flooring, which may have contributed to the increased lameness reported.

On tie-stall and stanchion operations, cows have their own stall where they eat, drink, and rest, so space allotment in square footage per cow, cows per stall, feedbunk space, and cows per headlock is not applicable. In freestall housing, all cows are not typically doing the same activity, so it is not necessary to have the same amount of stalls, bunk space, or headlocks, if present, for all the cows in the pen.

Freestall features

The type of freestall barn impacts the ratio of stalls to feed bunk space or, if present, headlocks. Two- and four-row barns provide more feed bunk space and square footage per cow than three- or six-row barns. More than 6 of 10 freestall barns were two- or four-row barns. Research indicates that having up to 10 percent more cows than stalls in a pen (1.1 cows per stall) does not affect the cows' behavior. At the time of the Dairy 2007 assessment, about 7 of 10 freestall operations had less than 1.1 cows per stall. However, when these operations were at maximum cow numbers, only 5 of 10 had less than 1.1 cows per stall. On freestall operations with headlocks, about one-third of operations had less than one cow per headlock at the time of the assessment, and when at maximum cow numbers, about one of six operations had less than one cow per headlock.

Stall management

Stall management is important in providing a clean, comfortable place for cows to lie down. One of the most important aspects of stall management involves the stall base (floor upon which

bedding is added) and bedding. Typical stall bases are composed of concrete, dirt, rubber mats, and mattresses. Straw, sawdust, sand, or combinations of the three were the most common bedding types for all housing types.

Stall base, bedding type, and management differed by housing type. Tie-stall and stanchion operations primarily used concrete, rubber mats, and mattresses as stall bases. In general, tie-stall and stanchion operations used straw or sawdust as bedding and changed or added bedding every 1 to 2 days. At the time of the Dairy 2007 assessment, the stall base was exposed—not covered by bedding—on about three of four operations with tie-stall and stanchion housing.

For operations with freestall and other multiple-animal area housing (including dry lots), the most commonly used stall bases were concrete, dirt, and mattresses. The most common bedding used on these operations were straw, sawdust, sand and, in the case of other multiple-animal areas, none. Bedding on freestall and other multiple-animal area housing was added or changed less frequently than on tie-stall or stanchion housing. However, even though these operations added/changed bedding less frequently than tie-stall or stanchion operations, at the time of the Dairy 2007 assessment the overall bedding quality/stall condition was better in freestall housing because a higher percentage did not have exposed stall bases.

Cow health

Housing type did appear to have an influence on the health of dairy cows. Although freestall and other multiple-animal area housing improve production, hygiene, and reduce hock injuries, health problems still exist in these housing types. While more clinical mastitis, infertility, and displaced abomasums were reported on tie-stall and stanchion operations, a higher percentage of lameness was reported for cows on freestall operations. A lower percentage of cows on stanchion operations were permanently removed compared with cows on tie-stall or freestall operations. Mastitis accounted for a higher percentage of cow deaths on freestall operations and operations with other multiple-animal areas compared with stanchion operations.

Hygiene scoring

Hygiene is important in reducing cows' exposure to pathogens, especially in regard to mastitis and lameness. Features of cow housing generally thought to improve cow hygiene include bedding and bedding management, and the presence of neck rails, brisket locators, gutter grates, and cow trainers.

There were no differences by housing type in the percentages of cows with hygiene scores of 1 (clean). A lower percentage of cows had a hygiene score of 3 (dirty) on freestall operations compared with cows on tie-stall, stanchion, and dry lot operations. The higher percentage of cows with hygiene scores of 3 on tie-stall, stanchion, and dry lot operations might be due to the fact that cows on these operations typically have access to dirt or pasture. Hygiene on freestall operations, in which cows are not allowed on dirt or pasture, is dependent on freestall and alleyway management.

The use of concrete or rubber mats as stall bases was associated with poorer hygiene compared with the use of dirt or mattresses as stall bases. The use of coarse sand or dried or composted manure was associated with better hygiene compared with the use of other bedding types. Deep, well-bedded stalls were also associated with cleaner cows compared with stalls with less bedding. Moveable neck rails were associated with a higher percentage of cows with hygiene scores of 1, but the horizontal distance from the curb or the vertical distance from the bed did not influence cow hygiene. There were no consistent trends in the effect of brisket

locators on hygiene scores; operations that used wood locators had a higher percentage of dirty cows compared with the operations that did not use any brisket locators. The use of gutter grates and cow trainers were both associated with improved hygiene.

Hock scoring

Hock injuries are generally assumed to be related to the surfaces upon which cows lie. Cows housed in dry lot facilities and other multiple-animal areas where cows lie primarily on dirt had the highest percentage of cows without hair loss or lesions of the hocks (hock score=1). Hock lesions were generally more prevalent in tie-stall and stanchion housing types. Stall bases constructed of concrete, mattresses, and rubber mats were associated with increased hock lesions compared with dirt stall bases. Typical bedding types used in freestalls and facilities that generally do not use bedding (e.g., dry lots) were associated with better hock scores than facilities that bedded primarily with straw or sawdust (e.g., tie-stall and stanchions). Hock scores of 1 increased with the days since bedding was added, which was highly associated with housing type and bedding type. Fewer hock lesions were observed when bedding quantity was good and the stall base was not exposed than when bedding quantity was poor and the stall base was exposed.

Comfort parameters

Four comfort parameters were assessed during the study: perching (standing with the front feet inside the stall), standing (with all feet inside the stall), lying, and the cow comfort index (CCI), which is the proportion of cows in contact with a stall that are lying down. These comfort parameters were evaluated only on freestall operations or operations with other multiple-animal areas that included a combination of freestalls and other housing types, such as dry lots. Since cows spend almost 12 hours a day lying, it is important that they do not spend an inordinate amount of time perching or standing in the stall, although cows entering and leaving stalls are included in these two categories. Bedding type and management and specific stall features such as neck rails, brisket locators, stall length and width, and temperature have been shown to influence these parameters.

Perching

The percentage of cows perching increased when the stall base was completely covered with bedding, regardless of the type of stall base or bedding type. Although perching has been associated with shorter stalls and stalls with restrictive neck rails, neither impacted perching in this assessment. Curb height was associated with perching, as curb heights of 13.0 or more inches resulted in less perching, possibly due to increased proportion of weight being placed on the rear legs. Perching was also increased in summer months compared with spring months, likely due to cows attempting to dissipate heat during the summer.

Standing

Contrary to findings associated with perching, standing in stalls was not associated with bedding quantity but was associated with certain bedding types; a lower percentage of cows were standing in stalls bedded with straw, coarse sand, composted manure or no bedding compared with most other bedding types. Operations without neck rails had the lowest percentage of cows standing compared with operations with neck rails. Stall length did not impact standing. These were unexpected findings, since it was thought that less restrictive stalls (i.e., longer stalls, no neck rail) would lead to more cows standing in the stall.

Lying

A higher percentage of cows lying occurred on operations that used coarse sand as bedding compared with cows on operations that used straw, composted or dried manure, or "other"

bedding types. In addition, a higher percentage of cows were lying when bedding had been changed/added within 1 to 2 days of the assessment than when bedding had been changed/added within 7 or more days of the assessment. Other features of bedding and stall management were not associated with the percentage of cows lying. Stall widths of 50 inches or more were associated with increased lying but stall length was not associated with lying. The absence of a neck rail was associated with a lower percentage of cows perching and standing and was also associated with a lower percentage of cows lying. Similarly, the absence of a brisket locator was associated with a lower percentage of cows lying. Curb height was also associated with lying, as curb heights of 13 inches or more were associated with a lower percentage of cows lying. The percentage of cows lying also decreased in summer compared with spring, which was likely due to improved dissipation of heat.

Cow comfort index

The CCI was higher for cows housed in facilities bedded with coarse sand compared with most other bedding types. The CCI was higher when bedding was level with the curb than when bedding was slightly dished out or more than 50 percent of the base was exposed. Season, which was associated with perching and lying, was also associated with the CCI, as a higher CCI was observed during the spring months.

Summary

Components of freestalls designed to keep cows comfortable, clean, and free of injury—such as neck rails and brisket locators—did not have much of an impact on hygiene, hock health, and comfort, which was unexpected. Stall base, bedding type and frequency, and bedding quality/stall condition were important for improving hygiene, hock health, and cow comfort. There also appears to be a trade off in keeping cows clean and keeping hocks healthy, as dry lots generally had dirtier cows but also had cows with much healthier hocks compared with cows housed in stalls. The findings in this report should assist in determining areas for improvement for each housing type, while also providing relevant information that may contribute to the development of new housing systems that provide optimal welfare for dairy cows.

Selected Highlights

The Dairy 2007 study marks the first time that the National Animal Health Monitoring System has studied parameters associated with cow comfort on dairy operations. A few highlights from this report follow. Almost one-half of operations (49.2 percent) housed lactating cows primarily in a tie-stall/ stanchion facility and nearly one of three operations (32.6 percent) housed cows in freestalls. However, almost 60 percent of cows were housed on freestall operations due to the fact that a high percentage of large operations use freestalls.

Concrete was the predominant flooring type on approximately one-half of operations and for 55.6 percent of cows. Pasture was the predominant flooring type on 10.1 percent of operations and for 5.1 percent of cows. Dirt was the predominant flooring type on 5.4 percent of operations and for 20.0 percent of cows, which likely reflects the use of dry lots on large operations. Heat abatement methods, including shade, fans, sprinklers, or misters, were provided during the summer months by more than 9 of 10 operations.

The following highlights refer only to operations that completed the facility, cow, and/or comfort assessments (see Section II, p 49).

About 8 of 10 operations used tie stalls or freestalls to house cattle. On average, stanchion barns were constructed in 1949 and were the oldest housing type. Freestall barns and other

multiple-animal areas were constructed more recently than tie-stall barns. For all operations, 1976 was the average year of construction for all housing types.

A total of 69.6 percent of freestall operations housed fewer than 1.10 cows per stall at the time of the assessment. By design, tie-stall and stanchion operations housed one cow per stall. All tie-stall and stanchion operations provided 32 inches or more of bunk space per cow. In contrast, 57.1 percent of freestall operations provided less than the minimum recommended 24 inches of bunk space per cow at the time of the assessment. At maximum cow numbers (i.e., minimum feedbunk space), 67.9 percent of freestall operations provided less than the recommended minimum of 24 inches.

Hygiene scoring was performed on 477 operations. Freestall operations accounted for 282 of these operations and provided the majority (68.3 percent) of all cows scored. Approximately twice as many cows were scored on freestall, dry lot, and other multiple-animal area operations than operations with tie stalls or stanchions. These differences in animals scored among different housing types are directly related to herd size.

There were no differences by housing type in the percentages of cows with hygiene scores of 1 (clean). A lower percentage of cows had a hygiene score of 3 (dirty) on freestall operations (10.0 percent) compared with tie-stall, stanchion, and dry lot operations (16.2, 21.4, and 22.3 percent, respectively). Bedding type influenced hygiene scores. The lowest percentage of cows with a hygiene score of 3 were on operations that bedded stalls with coarse sand, composted manure, or dried manure (primarily freestall operations). As bedding quantity/stall condition decreased until the stall base was exposed, the percentage of cows with a hygiene score of 3 increased.

Freestall operations with stall lengths of less than 82.0 inches or 96.0 inches or more had a higher percentage of cows with a hygiene score of 1 (61.1 and 54.8 percent, respectively) compared with freestall operations with stall lengths of 86.0 to 91.9 inches (35.7 percent). The width of stalls did not have an impact on hygiene scores. The forward location of the neck rail was not associated with the percentage of cows by hygiene score. Operations with any gutter grates had a higher percentage of cows assigned a hygiene score of 1 compared with operations without gutter grates. The presence of cow trainers was also associated with cleaner cows; 50.3 percent of cows on operations with trainers had a hygiene score of 1 compared with 37.6 percent of cows on operations without trainers. Almost twice the percentage of cows on operations that did not use trainers had a hygiene score of 3 compared with operations that used trainers (23.6 and 14.1 percent, respectively).

No differences were observed in spring (March– May) and summer (June–September) in the percentage of cows by hygiene score. Hock scoring was performed on 477 operations; freestall operations accounted for 282 of these operations, providing the majority of all cows scored (67.9 percent). Approximately twice as many cows were scored on freestall, dry lot, and other multiple-animal area operations compared with operations that used tie stalls or stanchions. These differences in animals scored among different housing types are directly related to herd size.

Operations with dry lots and other multiple-animal areas had the highest percentage of cows assigned a hock score of 1 [no hair loss or swelling] (91.1 and 90.8 percent, respectively). Approximately three of four cows on freestall operations (76.8 percent) were assigned a hock score of 1, while tie-stall and stanchion operations had the lowest percentage of cows with a score of 1 (65.7 and 61.9 percent, respectively). Dry-lot operations had a lower percentage of

cows with hock scores of 3 (swelling or skin lesion present) compared with tie-stall, stanchion, and freestall operations.

Almost 9 of 10 cows (89.5 percent) on operations that used dirt as a stall base were assigned a hock score of 1. The lowest percentage of cows assigned a hock score of 1 were on operations that used concrete, rubber mats, or mattresses as a stall base (72.8, 65.9, and 60.6 percent, respectively). The lowest percentage of cows assigned a hock score of 3 were on operations that used dirt as a stall base (0.7 percent), while the highest percentage of cows with a score of 3 were on operations that used concrete, rubber mats, or mattresses as a stall base (5.6, 7.2, and 5.0 percent, respectively).

A higher percentage of cows bedded with fine or coarse sand, composted or dried manure, or no bedding (primarily operations with freestalls, dry lots, or other multiple-animal areas) had hock scores of 1 compared with cows bedded with straw or sawdust (primarily tie-stall and stanchion operations). Similarly, a lower percentage of cows bedded in coarse sand and composted manure had hock scores of 3 compared with cows on straw, sawdust, or “other” bedding. As the number of days since bedding was added increased, the percentage of cows assigned a hock score of 1 increased. The percentage of cows by hock scores was associated with bedding quantity. As bedding quantity decreased until the stall base was mostly exposed, a lower percentage of cows had hock scores of 1. In addition, a higher percentage of cows had hock scores of 1 when no bedding was present than when the stall base was exposed.

The season in which assessments were made (spring or summer) did not impact hock scores. Comfort parameters were evaluated on 485 operations, and the pens and areas evaluated housed 52,490 cows. The majority of operations (290) and cows (39,014) assessed were on freestall operations. Four comfort parameters were assessed: perching (standing with the front feet inside the stall), standing (with all feet inside the stall), lying, and the cow comfort index (the proportion of cows in contact with a stall that are lying down) [CCI].

The percentages of cows perching were similar across all bedding types. Standing in stalls was observed for a lower percentage of cows when straw, coarse sand, composted manure, or no bedding was used compared with most other bedding types. A higher percentage of cows were lying in stalls bedded with coarse sand (48.0 percent) compared with stalls bedded with straw, composted or dried manure, or “other” bedding types (33.6, 30.2, 28.5, and 30.8 percent, respectively). With the exception of composted manure, the CCI was highest for operations that bedded with coarse sand compared with all other bedding types.

The percentage of cows perching in stalls was higher on operations in which the stall base was not exposed, bedding level with curb or slightly dishd out (8.2 and 10.2 percent, respectively) compared with operations in which the stall base was less than 50 percent exposed (6.0 percent). Bedding quantity/stall condition was not associated with standing or lying parameters. The CCI was higher when bedding was level with the curb (74.2 percent) compared with bedding slightly dishd out or more than 50 percent of the base exposed (63.7 and 66.2 percent, respectively).

The type or presence of a neck rail did not impact the percentage of cows perching or the CCI. A lower percentage of cows were standing in the stall when no neck rail was present (4.0 percent) compared with either the presence of a stationary or moveable neck rail (9.7 and 11.9 percent, respectively). Similarly, a lower percentage of cows were lying when no neck rail was present compared with operations with stationary or moveable neck rails. The presence of a brisket locator or the locator material did not affect the percentage of cows that were perching,

standing, or the CCI. However, operations that did not have a brisket locator had a lower percentage of cows lying (32.6 percent) compared with operations that had brisket locators made of wood (41.9 percent) or PVC or other plastic pipe (46.4 percent). Season had a significant impact on the percentage of cows perching, lying, and on the CCI. The percentage of cows perching was lower in spring (March–May) than in summer (June–September), while the percentage of cows lying and the CCI were higher in spring than in summer.

Does Feed Space Allowance Impact Performance?

The Dairysite

January 13, 2011

Research has shown that a feed space allowance of 20 cm per cow is ‘adequate’ for optimal milk production as long as sufficient feed is always pushed up in front of the feed barrier.

There’s no evidence that reducing feed space allowances, when feeding an ad-lib ration, had a detrimental effect on dairy cow performance parameters measured. So says Conrad Ferris, from Northern Ireland’s Agri-Food and Biosciences Institute, whose trial examined, purely from an animal production point of view, a space allowance of 20cm per cow.

“That would appear to be adequate,” he told delegates at this year’s British Society of Animal Science’s annual conference, held at Queen’s University, Belfast.

“However, at a feed space allowance of 20cm per cow, we did see practical difficulties in being able to place the full allowance of food for a 24-hour period in front of the space available at the barrier,” he added.

Meeting the higher nutrient requirements of high yielding dairy cows remains a key challenge for dairy producers and while many studies have examined nutritional approaches to achieve increased food intakes, for example increasing the nutrient density of the diet, ‘non nutritional strategies’ may also have an important role in achieving higher intakes.

“As most food consumed by housed cows is consumed at a feed barrier, options for optimising the feed barrier environment is one of these ‘non nutritional strategies’,” said Dr Ferris. “This is particularly important at present in view of rapidly expanding herd sizes on many farms.

“As herds expand, some producers continue to make use of existing feed barriers – reducing the feed space per cow – while others add additional barrier space at considerable cost.

“But there does not appear to be an agreed ‘optimum’ space allowance per cow, with recommendations ranging from 20cm to 100cm per cow. If feed space is inadequate, this may have a detrimental effect on food intake, performance and welfare, and it might be expected that primiparous animals would be particularly affected,” he said, explaining the rationale behind his team’s work.

Forty-two Holstein-Friesian dairy cows were allocated to one of three treatment groups at calving. The three groups were housed in adjacent, but visually isolated, pens of equal size and similar layout, with 16 cubicles per pen. Within each pen cows accessed food via a ‘post and rail’ type feed barrier. Treatments examined comprised three horizontal feed space allowances – 20cm, 40cm and 60 cm/cow.

Cows remained in their experimental groups for an average of 127 days post-calving, with the period from the last cow calved until the end of the experiment being 88 days. And throughout the experiment cows had ad-lib access to a diet comprising grass silage and concentrates. Fresh food was offered at 10.30am each day in the form of a mixed diet.

Group intakes were recorded daily, but were not analysed statistically due to the unreplicated nature of the intake data.

“And we found that average dry matter intakes with the 20cm, 40cm and 60cm/cow treatments were 19.0, 18.7 and 19.3kg/cow/day respectively,” said Dr Ferris. “So feed space allowance had no significant effect on milk yield per cow, milk composition, milk somatic cell count, or on cow liveweight or condition score at the end of the experiment.”

Nutritional Influences on the Prevalence and Severity of Mastitis in Dairy Cows

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http://images.vancepublishing.com/pdfs/dairyherd/dairy_mastitis.pdf

The risk that a cow will develop mastitis is largely a function of pathogen load at the teat end and the cow's ability to prevent a bacterial infection from becoming established in the mammary gland. Nutrition indirectly affects teat end exposure via changes in the amount of manure produced and by altering characteristics of manure (e.g., moisture concentration, pH), but effects on mastitis would probably be small. Conversely, nutrition can have significant effects on the immune system thereby affecting infection rate and severity of mastitis. The highest rates of mastitis generally occur at or shortly after parturition (Smith et al., 1985). Early lactation is also the time when most cows experience short-term malnutrition, i.e., intake of nutrients does not meet nutrient requirements. The immune system, as any physiological system, does not function optimally during periods of malnutrition. In addition, the immune system has high requirements for specific nutrients and when these nutrients are not provided in adequate amounts, immune function may suffer. This review will concentrate on nutritional influences on immune function and mastitis during the periparturient period.

Energy and Protein

During late gestation and early lactation, dry matter intake (DMI) by dairy cows is quite low whereas nutrient demand, especially post-partum is extremely high. This leads to cows being in negative protein and energy balance. Body fat and protein are mobilized by the cow for the energy and amino acids needed for basic maintenance functions and to produce milk. The protein deficient is short-lived because: 1) protein intake by cows can be increased easily by increasing the concentration of protein in the diet and 2) labile body protein reserves are depleted quickly and once they are exhausted, milk production will decrease to match protein supply. An immune response can include antibody production and cellular proliferation both of which require amino acids. However, compared to the kilogram quantity of milk protein produced daily by early lactation cows, the amino acid needs of the immune system are small. No direct data are available showing that mitigating the moderate protein deficiency that occurs in early lactation improves immune function and increases resistance to mastitis. However, one study reported very modest beneficial effects on immune function when peripartum cows were infused with 300 g of glutamine per day (Doepel et al., 2006) but this likely has little practical

significance. If protein nutrition is adequate for milk production in early lactation, it likely is adequate for proper immune function.

The energy deficient experienced by most cows lasts much longer than the protein deficient and usually starts a few days before calving and continues for several weeks after parturition. Body energy reserves in a cow are usually much greater than body protein reserves, and it is very difficult to increase energy intake in early lactation via diet changes. Normal, healthy cows lose 0.25 to 0.5 body condition score (BCS) units (5 point scale, 1= emaciated, 5 = obese) in early lactation and reach their BCS nadir by 4 to 7 wk of lactation. Some cows start losing body condition several days or even a few weeks before calving, continue losing condition after calving and lose more than 1 BCS unit in early lactation. This severe negative energy balance is either a consequent of health disorders (e.g., milk fever, retained fetal membranes, or metritis) or will lead to health problems (e.g., ketosis and displaced abomasum). Negative energy balance has also been identified as a risk factor for mastitis. The degree of negative energy balance experienced by cows is correlated with immune function.

Various measures of energy balance [(calculated energy balance, plasma concentrations of nonesterified fatty acids (NEFA) and B-hydroxy-butyrate (BHBA)] were negatively correlated with concentrations of antibodies in plasma and with milk SCC in early lactation cows (van Knegsel et al., 2007). In that study, all treatment average energy balances were reasonable and based on

BHBA and NEFA cows were not suffering from clinical ketosis. Experimentally induced negative energy balance in steers (DMI was severely restricted) did not negatively affect neutrophil function (Perkins et al., 2001), but neutrophils from cows naturally afflicted with subclinical or clinical ketosis had reduced functionality (Zerbe et al., 2000). An epidemiological study found that high concentrations of plasma ketones or a loss of more than 0.5 BCS units were significant risk factors for the development of udder edema, which then was a risk factor for the development of clinical mastitis (Compton et al., 2007); however, they also found that low concentrations of NEFA was associated with increased risk of mastitis. In support of that finding, (Berry et al., 2007) reported that increased BCS loss was associated with lower SCC.

During the peripartum period, negative energy balance and elevated concentrations of NEFA and BHBA coincides with numerous other events including hormonal changes, hypocalcemia, and changes in vitamin status, therefore it is not possible to determine unequivocally that energy balance direct affect on immune function. However, enough data are available to strongly suggest that excessive mobilization of body fat and the associated increase in NEFA and BHBA during the peripartum period contributes to immunosuppression. Management and dietary practices that should help reduce excessive body condition loss include:

1. Prevent cows from becoming too fat in late lactation and the dry period. This may require a pen dedicated to fat lactating cows so that they can be fed a low energy diet. Excess energy consumption is a common problem during the dry period because dry cows only require about 14 Mcal of NEL/day. To meet, but not exceed, the energy requirement a diet based on less digestible feeds is needed so that the rumen gets full before overconsumption of NEL occurs.
2. Avoid a large decrease in dry matter intake (DMI) during the prepartum period. DMI can decrease by more than 20% during the last 1-2 weeks of gestation. This large drop in intake causes cows to mobilize fat, which can infiltrate the liver and cause fatty liver and ketosis. The drop in intake can be mitigated by feeding a less digestible diet to far-off dry cows so that average DMI for a Holstein cow during the dry period is around 25-26 lbs./day (~12 kg). Cows with high DMI during the early dry period tend to have a greater decrease in DMI during late

gestation than do cows that have more moderate DMI during the early dry period (Douglas et al., 2006). The peripartum decrease in DMI can also be moderated by feeding a well-balanced prefresh diet (e.g., 30 to 35% NDF, 30 to 40% concentrate with good forage). Intake by specific animals can be reduced when pens are overcrowded. Make sure pens containing prefresh animals have adequate bunk space and stalls.

3. Promote a rapid increase in energy intake post calving, which usually requires a rapid increase in DMI. Feeding excessive grain (i.e., starch) or fat to increase the energy density of diets (i.e., Mcal/kg) usually is counterproductive because it often reduces DMI. Feeding a well-balanced diet based on high quality forage, which contains moderate concentrations of fiber (approximately 30% NDF) and starch (22 to 25%) and <5% total fat improves DMI.

Overcrowding fresh cows also restricts their intake. Energy Source (Specific Fatty Acids)
Neutrophils and other types of immune cell have high concentrations of polyunsaturated fatty acids (PUFA) in their membranes (Knight, 2000) and higher concentrations of specific PUFA are related to improved neutrophil function (Kew et al., 2003). In nonruminants, fatty acid profiles of cells reflect the diet composition but in ruminants, dietary unsaturated fatty acids are often biohydrogenated to saturated fatty acids making it difficult to substantially change fatty acid profiles of cells. In two separate studies with transition cows from the same group (Lessard et al., 2004; Lessard et al., 2003) the exact opposite response to fat supplements was observed. In one study lymphocyte proliferation was enhanced when flax seed was fed (a source of n-3 PUFA) compared with cows fed soybeans (a source of n-6 PUFA) but in the other study, cows fed soybeans had enhanced lymphocyte proliferation. At this time, no compelling data are available to support feeding specific types of fat to improve mammary gland health and reduce mastitis.

Calcium and Other Minerals Related to Hypocalcemia

Cows with milk fever are much more likely to get clinical mastitis than cows without milk fever (Curtis et al., 1985) because:

1. Calcium is required for muscle contractions and the teat sphincter of cows with hypocalcemia may not contract as quickly or as completely as for cows with normal blood Ca increasing the risk of bacterial invasion.

2. Cows with hypocalcemia spend more time lying down, which increases teat end exposure.

3. Cows with milk fever have higher concentrations of plasma cortisol than normal cows (Horst and Jorgensen, 1982) and cortisol suppresses immune function.

4. Ca status of monocytes is impaired in cows with milk fever (Kimura et al., 2006). When monocytes are activated intracellular Ca is released but the amount of Ca released is less in cows with milk fever. This reduces the ability of the monocyte to function properly. Available data clearly show that preventing subclinical and clinical milk will reduce the prevalence of mastitis in early lactation. Dietary concentrations of Ca, phosphorus, magnesium, potassium, chloride, sulfur, and vitamin D are related to milk fever. One approach is to feed slightly less Ca to dry cow than their requirement. The marginal Ca deficiency increases mobilization of Ca from bone. Another approach is to feed an anionic diet (elevated concentrations of chloride and sulfur without elevated concentrations of sodium and potassium). This induces metabolic acidosis, which is then compensated by mobilizing phosphate from the bone bringing Ca with it. If possible, avoid feeding diets with excessive concentrations of K and make sure dietary Mg is adequate (>0.25% of diet DM).

Antioxidant Nutrients

Substantial amounts of free radical are produced during an inflammatory response such as that which occurs when the mammary gland becomes infected. When adequate antioxidants are present, free radicals are kept in check, which increases the lifespan of certain immune cells. When antioxidant capacity is limited, the lifespan of those immune cells is reduced and the

infection can become established or severity of the infection can increase. Cells and animals have developed sophisticated systems to control oxidative stress. Components of the antioxidant system include enzymes (many of which contain metal cofactors), vitamins, and numerous other compounds. A simplified version of the antioxidant system is shown in Figure 1.

Vitamin A and B-Carotene

The effects of vitamin A and B-carotene on mastitis measures have been inconsistent. Some studies have found positive effects on neutrophil and lymphocyte function when cows are supplemented with approximately 70,000 IU/d of vitamin A or 300 to 600 mg of B-carotene (Michal et al., 1994), but in a clinical study similar treatments had no effect on mammary gland health (Oldham et al., 1991). A likely reason for different responses among studies is differences in vitamin A and B-carotene status of the control cows. Jukola et al. (1996) suggested that plasma concentrations of B-carotene in dairy cows should be >3 mg/L to optimize udder health. Currently available data do not support feeding vitamin A in excess of the current NRC requirement (approximately 70,000 IU/d) to improve mammary gland health. Supplemental Bcarotene may have some benefit if cows are in low B-carotene status (i.e., fed a diet based largely on weathered, low quality hay).

Copper and Zinc

Cows and heifers fed diets with 20 ppm supplemental copper had less severe mastitis following a mammary gland challenge (*E. coli*) and fewer natural infections (Harmon and Torre, 1994; Scaletti et al., 2003). Tomlinson et al. (2002) summarized results of 12 experiments and reported an overall significant reduction (196,000 vs. 294,000) in SCC when Zn-met was supplemented (between 200 and 380 mg of Zn/d). In that summary, 4 of the experiments used a control diet that did not meet NRC (2001) requirements for Zn. Whitaker et al. (1997) compared providing supplemental Zn from a mixture of Zn proteinate and inorganic Zn or from all inorganic sources. Source of Zn had no effect on infection rate, new infections, clinical mastitis and SCC. Currently available data suggest that diets should contain about 20 ppm of copper (assuming no antagonists) and 50 to 60 ppm of Zn. Obtaining at least a portion of the supplemental zinc from zinc methionine may be beneficial.

Selenium and Vitamin E

Supplemental vitamin E and/or Se has been shown to reduced prevalence and severity of mastitis (Smith et al., 1997). Based on mammary challenge experiments, the positive effects of Se were greater when clinical responses are more severe (i.e., *E. coli* vs. *S. aureus* challenge) (Erskine et al., 1989; Erskine et al., 1990). The positive effects of supplemental Se on mammary gland health are well-established; a more recent question concerns source of supplemental Se. In the U.S., supplemental Se can be provided by sodium selenate or selenite (inorganic) or by Se-yeast (organic). Cows fed Se-yeast usually have higher concentrations of Se in plasma, whole blood, and milk, compared with cows fed an equal amount of inorganic Se. But, neutrophil function has not been affected by Se source (Weiss and Hogan, 2005). The current NRC recommendations for vitamin E appear adequate for most situations.

Accumulating data suggest that higher intakes (>1000 IU/d) of vitamin E during the periparturient period may be beneficial (Baldi et al., 2000; Politis et al., 2004; Weiss et al., 1997). In those studies, prefresh cows fed 2000 to 4000 IU of vitamin E/day had improved mammary gland health compared with cows fed 1000 IU of vitamin E/day. Conversely, a study conducted on commercial farms in Sweden found no reduction in clinical mastitis or SCC in early lactation when cows were supplemented with approximately 2200 IU of vitamin E/day (Waller et al., 2007). Control cows in that study received between 150 and 2800 IU/day of

supplemental vitamin E and the supplemental vitamin E was RRR-alpha-tocopheryl. The form of vitamin E used in the studies that showed a link between vitamin E supplementation and mastitis was all-rac-alpha-tocopheryl acetate. This form of vitamin E consists of 8 different stereoisomers whereas the tocopherol synthesized by living plants consists of only one isomer (RRR-alpha-tocopherol). The acetate form of this isomer is available commercially and can be used to provide supplemental vitamin E. Direct comparisons between vitamin E sources on their effects on mammary gland health are lacking. Cows that consume the same number of IU of vitamin E from RRR usually have higher concentrations of tocopherol in plasma than those fed all-rac vitamin E but that did not translate into improved neutrophil function (Weiss et al., 2009). Under normal conditions, inorganic Se and Se-yeast appear similar with respect to neutrophil function. When Se antagonists are present (e.g., sulfate) obtaining a portion of Se from Se-yeast, especially during the dry period and early lactation should be beneficial. The exact quantity of vitamin E needed by peripartum cows is not known; however, feeding more than 1000 IU/d during this period probably is beneficial.

Vitamin C

Vitamin C (ascorbic acid) is probably the most important water soluble antioxidant in mammals. Most forms of vitamin C are extensively degraded in the rumen, but cows can synthesize vitamin C and it is not considered an essential nutrient for cattle. The concentration of ascorbic acid is high in neutrophils and increases as much as 30-fold when the neutrophil is stimulated. Within a limited range (67,000 to 158,000 cells/ml), SCC was not correlated with plasma ascorbic acid concentrations in cows (Santos et al., 2001). Injecting ascorbic acid (IV) following intramammary challenge with endotoxin had only very limited effects on inflammation and other clinical signs in cows (Chaiyotwittayakun et al., 2002). We conducted an experiment to examine changes in ascorbic acid status following an intramammary challenge with *E. coli* and found significant correlations between vitamin C concentrations in milk and plasma and clinical signs of mastitis (Figure 2) (Weiss et al., 2004). That does not mean that increasing vitamin C status of cows will reduce the prevalence or severity of mastitis. A follow-up experiment was conducted to determine whether feeding supplemental vitamin C to periparturient cows would enhance neutrophil function and reduce the inflammatory response following an endotoxin challenge (Weiss and Hogan, 2007). We were successful in enhancing ascorbic acid status of cows; however, supplemental vitamin C had no effect on neutrophil function or inflammation. Based on current data, vitamin C is not recommended for either prophylactic or therapeutic treatment of mastitis.

Conclusions

To improve mammary gland health:

1. Feed and manage late-lactation and dry cows to maintain proper body condition. Avoid a large decrease in feed intake around parturition and a large loss in BCS in early lactation.
2. Prevent hypocalcemia via proper mineral nutrition for dry cows.
3. Feed adequate, but not excessive amounts of trace minerals and vitamins. Selenium and vitamin E are especially critical. Consider increasing vitamin E supplementation during the prefresh period.

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New Zealand Cows Like Shade Better Than Showers

TheCattleSite News Desk

Friday, March 25, 2011

NEW ZEALAND - Summer sun has long been known to affect the health of cows and farm productivity. The issue for farmers is what is the most successful way to combat it?

AgResearch animal behaviour and welfare scientist Dr Karin Schütz and colleagues set out to determine the effectiveness of shading and sprinklers, the most commonly used ways to address heat and also measure cow preferences.

Funded by DairyNZ and the Foundation for Research, Science and Technology the project looked at Holstein-Friesian dairy cows during average air temperatures of 22.3 degrees celcius. The research showed that while sprinklers were more effective at keeping the animals cool, and keeping away insects, the cows preferred shade.

“The cows showed no preference for sprinklers over standing in the sun but their preference for shade increased with higher air temperatures, increased solar radiation, and higher winds,” said Dr Schütz. “We tested all the cows over three days and were surprised the cows wanted shade no matter how much cooler the sprinklers made them”. The results are interesting since Dr Schütz’s collaborative research with the University of California has shown that non-lactating cows used a specially designed cow shower on average, three hours per day. “We think that the previous experience and degree of control over the water can have something to do with the choice to use water,” said Dr Schütz.

Dr Adele Arnold, Animal Welfare Developer at DairyNZ, says the results are useful in demonstrating the preference cows have for shade over sprinklers; even if that option does not provide faster relief from the symptoms of heat stress.

“In the end when cows have done their afternoon walk to the dairy shed, which is the really critical window for onset of heat stress symptoms, spraying with water is still the most effective means to achieve a rapid drop in body temperature for an animal in a critical state, but it isn’t always practical for all farmers.

“Farmers are also using other preventative options like grazing cows close to the dairy shed on hot afternoons so they don’t have to walk as far to be milked; milking later in the evening when it’s cooler, and ensuring a good supply of clean drinking water for cows during the day.”

Dr Schütz thinks there is a lot more to learn; “we would like to do more work on preferences for design features of water cooling, such as droplet size and impact, the role of previous experience and control over delivery.”

First four months have lasting impact

By Dairy Herd news source

March 8, 2011|

Source: Penn State Dairy Digest

Editor's note: This article was written by Jud Heinrichs, professor of Dairy and Animal Science, and Coleen Jones, research associate, Penn State Department of Dairy and Animal Science and first appeared in the Penn State Dairy Digest.

The final results of a long-term research project conducted by Penn State were published in the January 2011 issue of the Journal of Dairy Science. The study investigated possible relationships between management and health events that occurred during calves' first four months of life and their future performance. Data for this study was collected over 10 years and included management, nutrition, and health information for calves, measurements at first calving, lifetime lactation records, and age at culling. Calves in the study were housed on 18 farms in Wyoming and Susquehanna counties in Pennsylvania. The study was funded initially by the USDA and the lifetime production part by the Pennsylvania Department of Agriculture Animal Health Commission.

Results at first calving (published by Heinrichs et al. in the Journal of Dairy Science in 2005) showed that calves experiencing a difficult birth were older when they calved for the first time. Environmental factors of higher humidity and temperature also were related to older age at first calving. Four other factors: antibiotic treatment for illness, feeding an increased amount of milk or milk replacer before weaning, feeding low quality forage to weaned calves, and ammonia levels in calf housing, tended to be associated with increased age at first calving. Ammonia in calf housing was related to increased body weight at calving, possibly because heifers were older. Body weight at calving also tended to be greater for calves born to cows rather than first-calf heifers; however, sires were not followed in this study.

A difficult birth was associated with reduced first-lactation milk and protein yield. In addition, there was a tendency for difficult birth to be related to lower milk and protein yields over the cow's entire life. The age at which calves first consumed 2 pounds per day of grain was related to lifetime production of milk, fat, and protein; later grain intake was associated with higher production and also longer productive life, assessed by age at culling. The explanation for this association is not clear from these data. Scours or respiratory illness and treatment for these conditions during the first four months of life were related to production of milk, fat, and protein in the first lactation. Greater days ill reduced production, and greater days of antibiotic treatment improved production. The effect of antibiotic treatment could be related to overall management of calf health and closer attention to finding and treating sick calves, in certain farms, resulting in calves that were healthier overall. Calf health was not related with lifetime production or age at culling in this study. Increased age at first calving was negatively related to 305-day mature equivalent production of milk, fat, and protein. Increasing body weight at calving had a positive relationship with fat production and tended to increase milk and protein production as well (305-day mature equivalent basis).

This study showed that events early in life can have significant long-term impacts on heifer growth and cow productivity. In addition, these results underscore the importance of proper care for calves at birth and throughout their first few months of life. The study reinforces the importance of optimum age and body weight at first calving to first lactation milk production. Finally, this investigation showed the impacts of calf health and treating calf health events on the later productivity of the dairy cow.

A mother's touch?

By Dairy Herd news source

Updated: March 7, 2011

Source: Dairy Calf and Heifer Association

It doesn't seem to matter to a newborn calf — or at least to her immune system — if she receives vigorous stimulation by humans or none at all following birth.

According to research reported in the March 2011 issue of the Journal of Dairy Science, "artificial mothering," or verbal and physical stimulation by humans, had "no significant effect" on passive transfer of immunoglobulins (IgG) in newborn calves.

During the study, newborn heifer calves, delivered without dystocia, were assigned to one of two treatment groups: no verbal or physical stimulation (other than that required for feeding) or artificial mothering, which consisted of 15 minutes of vigorous physical and verbal stimulation at the time of first colostrum feeding and again one to two hours later. All calves were tube fed 2.25 liters (150 grams of IgG) of a commercially available colostrum replacement product.

Blood serum samples showed that IgG levels and efficiency of IgG absorption were no different between the two treatment groups at 24 hours of age.

Previous research shows that there can be significant variation in passive transfer, even in calves that receive an early feeding of colostrum containing high levels of IgG. Why this happens is not well understood, say the study's authors. So, too, is the role that mothering behavior plays on passive transfer, which is the driving factor behind this study.

The researchers fed a commercial colostrum replacer to maintain consistency in the amount and quality of IgG fed to the calves. Guidelines about colostrum management can be found in the Dairy Calf & Heifer Association's Gold Standards I.

Straw works with a limit-fed ration

By Dairy Herd news source

March 9, 2011 |

If heifers are in a limit-feeding regime, they may benefit from the inclusion of straw alongside their limit-fed ration. In an experiment reported in the February edition of the Journal of Dairy Science, researchers at the University of Guelph in Canada examined the behavioral and growth responses of dairy heifers when straw was provided with (either within or alongside) a limit-fed ration.

There has been much interest in limit-feeding of heifers. However, there are some behavioral concerns, since limit-feeding reduces feeding time and increases inactive standing time. "With the inclusion of straw alongside a limit-fed ration, heifers are able to increase their feeding time (to a similar amount of time observed for heifers fed ad libitum), increase rumination, decrease inactive standing time, and maintain their average daily gain," they said. The straw ends up helping the heifers to satisfy their natural foraging behavior, which helps improve the overall welfare status of the animals.

HOGS

Research Key to Evaluating Alternative Sow Housing Systems

Source: Apr. 1, 2011 www.farmscape.ca Bruce Cochrane

The chair of Manitoba Pork Council's research committee says, before any alternative system for housing gestating sows can be endorsed for widespread adoption, it needs to be thoroughly assessed. The Manitoba pork industry's vision for long-term sustainability, "Embracing a Sustainable Future", was released last month. The document outlines 82 commitments being made by the province's pork producers on a range of issues, including investing in research. Manitoba Pork Council research committee chair Rick Bergmann says, although there's been a lot of pressure to look at different methods for housing sows, Manitoba's pork producers want to ensure that before any changes are made on a large scale that the research is conducted beforehand.

Clip-Rick Bergmann-Manitoba Pork Council: One of the research priorities that we have now that we're exploring with the University of Manitoba is a project on alternative sow housing. Currently we're meeting with the university, with Dr. Laurie Connor's department in pulling together a pilot project on alternative sow housing. There are lots of styles of sow housing, not only in Manitoba but around the world, and certainly we want to be aware of the best practices out there. Council's perspective is before producers make all kinds of changes it's imperative that we do some research and development on potential new ways of housing sows to ensure that if there is a model that's better, that it's explored and the kinks are taken out a research and development level. Bergmann says, to mirror what's happening within the industry right now, the multi-year pilot project will be conducted on a large-scale farm which will provide real life data.

Analgesics in Farrowing and Castration

The PigSite

January 16, 2011

Preliminary data indicate no economic benefit from providing analgesia to sows at farrowing or to piglets at castration, writes Ed Barrie, Sow Weaner Pig Specialist at Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA), reviewing research presented at the University of Guelph.

In a paper delivered to the University of Guelph Swine Research Day entitled "The effect of pain relief at castration and farrowing on piglet performance" by S. Taylor, R. Friendship and G. Cassar, the subject of castration of piglets without the use of anaesthesia or analgesia was examined.

To date, there have been few research studies that evaluated the use of analgesia for this procedure and whether pain relief might be associated with improved piglet performance.

A second part of the same study was directed at whether there was any economic benefit or reduction in still births or perinatal death losses if sows receive medication to reduce the pain associated with farrowing. In the castration study male piglets were randomly sorted into a control group or a treatment group at five to seven days of age. Piglets were ear-notched for identification purposes, and weighed. The procedure was that they received a saline injection or Anafen® (Ketoprofen injection 100 mg/mL, 1mL/50 kg body weight, respectively). Piglets were

castrated 30 minutes after receiving the injection, and observations were made 10 minutes after castration for signs of discomfort. Piglets were weighed at 21 days of age, and mortality was recorded.

In the sow study, sows were randomly assigned to a control group or a treatment group. The treatment group received an IM injection of 1 mL/50kg body weight of Anafen prior to farrowing and again the day of farrowing. Piglets from both control and treated sows were ear-notched and weighed on the day of farrowing and day 21, and pre-weaning mortality was recorded.

Castration trial results to date showed no apparent difference in both the average daily gain and pre-weaning mortality of male piglets in both the control and treatment groups. No difference was noted in post-castration behaviour between the two groups. The cost of analgesia was \$0.22 per piglet and it did increase the time to castrate.

The farrowing trial showed no differences between stillbirth rate, weaning weights or pre-weaning mortality between treated and control animals. The cost of Ketoprofen was 13.05/sow/dose.

These preliminary data indicate no economic benefit from providing analgesia to sows at farrowing or to piglets at castration. Further analysis or further studies might show benefits to using analgesia where a small sow is delivering large piglets.

This work to date suggests that the routine use of ketoprofen to piglets at castration or to sows at parturition did not result in improved performance and was therefore not cost-beneficial. In general, the decision to use analgesia will most likely be based on ethical concerns and not on financial concerns.

Quantitative trait loci analysis for leg weakness-related traits in a Duroc x Pietrain crossbred population

7th Space interactive

March 2011

Author: Watchara Laenoi Muhammad Jasim Uddin Mehmet Ulas Cinar Christine GroSZe-Brinkhaus Dawit Tesfaye Elisabeth Jonas Armin M. Scholz Ernst Tholen Christian Looft Klaus Wimmers Chirawath Phatsara Heinz Juengst Helga Sauerwein Manfred Mielenz Karl Schellander

Leg weakness issues are a great concern for the pig breeding industry, especially with regard to animal welfare. Traits associated with leg weakness are partly influenced by the genetic background of the animals but the genetic basis of these traits is not yet fully understood.

The aim of this study was to identify quantitative trait loci (QTL) affecting leg weakness in pigs.

Methods: Three hundred and ten F2 pigs from a Duroc x Pietrain resource population were genotyped using 82 genetic markers. Front and rear legs and feet scores were based on the standard scoring system.

Osteochondrosis lesions were examined histologically at the head and the condylus medialis of the left femur and humerus. Bone mineral density, bone mineral content and bone mineral area were measured in the whole ulna and radius bones using dual energy X-ray absorptiometry.

A line-cross model was applied to determine QTL regions associated with leg weakness using the QTL Express software.

Results: Eleven QTL affecting leg weakness were identified on eight autosomes. All QTL reached the 5% chromosome-wide significance level.

Three QTL were associated with osteochondrosis on the humerus end, two with the fore feet score and two with the rear leg score. QTL on SSC2 and SSC3 influencing bone mineral content and bone mineral density, respectively, reached the 5% genome-wide significance level.

Conclusions: Our results confirm previous studies and provide information on new QTL associated with leg weakness in pigs. These results contribute towards a better understanding of the genetic background of leg weakness in pigs.

Gilt and First Litter Sow Management

The PigSite
March 2011

Tips on housing and feeding young sows for a long productive life from Ed Barrie, Sow Weaner Pig Specialist with the Ontario ministry of agriculture in the latest issue of Pork News and Views from OMAFRA.

In recent years, genetic programmes have made significant progress in increasing the number of live piglets born to sows. As the number of live births have increased, so too have the death rate of sows, as well as serious decrease in sow longevity. These events lead to the conclusion that we need to improve the management of the gilts prior to breeding. This points to a need to review the areas of nutrition, environment and management.

Environment is the living space the young animal grows and develops in. Historically, we have paid little attention to this area and often considered crowding and concern over temperature controls, to be the norm. When we consider that the gilts today are, in fact, significantly leaner – absolutely less body and back fat, and selected for efficiencies in feed conversion and growth rate, we realise the need for a different approach to housing and management.

"We need to improve the management of the gilts prior to breeding"

Gilt housing should have non-slip surfaces, as much as possible, for footing. It is not good production economics to lose valuable selected gilts because of physical damage resulting from slippery flooring. Similarly, walls and partitions should have animal-friendly rounded corners or posts to reduce the chances of injury from bruising and scraping during routine pen events. The pen should be equipped with suitable feeder spaces so that all animals can eat at once to eliminate aggressive behaviour during feedings.

Watering systems should be examined regularly to ensure both adequate delivery rates, and availability throughout the pen area. This is a situation where chain suspended nipple drinkers provide plenty of water without being a fixed object capable of injuring an animal.

Room temperature is another area that is often overlooked in gilt housing. Temperatures for gilt housing should be maintained in the range of 21°C where possible (70°F). Cooler air

temperatures mean more feed is consumed by the animal to keep warm. Higher temperatures are best dealt with by moving large quantities of air, to provide a cooling effect to the animal.

Nutrition is a very important part of gilt and sow development. Current thinking leans toward a programme that avoids overfeeding gestating gilts with the object of improving first lactation feed intake. This, of course, requires strict control of the quantity of feed fed and to which animals it is fed. Electronic feeders or feeding stalls do very well in this situation.

"It is becoming an accepted practice to top-dress or supplemental feed gilts and lactating sows"

Diet formulation is another area of great concern. This is best worked out between yourself, your feed supplier and your genetic supplier. Not all genetics are the same, nor are all feeds the same. If possible, an increased level of lysine is added to gilt diets during lactation. It is also becoming an accepted practice to top- dress or supplemental feed gilts and lactating sows at levels of between 0.5 and 1.0kg per day. This feeding is usually delivered at some point in the day when the feeder is empty. It is a carefully formulated product possibly containing energy, protein, fats or oils, and vitamins and minerals. The small amounts ensure it is consumed and do not interfere with the regular feeding programme in the barn. It is often delivered manually and this allows another opportunity for the barn manager to visually check the animals in the farrowing rooms and to locate any which may require assistance or are not eating.

If you choose to try some of these strategies, their basic intent is to get a healthy, productive gilt into the third to sixth parity period, while reducing culling losses, unexpected death losses and improving vigour and piglet numbers produced per sow. Much of this information can also be applied to sows in the three to six parity grouping as well.

Simple Changes Can Reduce Risk of Pigs Becoming Fatigued

FarmScape

Bruce Cochrane

Mar. 29, 2011

Elanco Animal Health reports a few simple changes can often go a long way toward reducing the stresses that can result in losses due to pigs becoming fatigued. The stresses that can cause pigs to become fatigued include everything from the temperature of the barn to density in the pens to handling during loading and transport. The recognizable early symptoms include open mouthed breathing, skin discoloration and refusal to move. Over the past four years Elanco has been working with producers to conduct load site assessments to help identify and reduce those stresses. Corporate pork account manager for western Canada and Ontario Don Down says the assessments look at handling prior to transport, building and load-out design, handling during loading, vocalization of workers and pigs and the behavior of the handlers and the drivers.

Clip-Don Down-Elanco Animal Health: Some of the key points that I have discovered through these assessments is producers may be trying to move too many hogs at once up the ramp and that's quite often an issue on the top deck. Communication with the driver, compartment planning, weights and numbers, making sure that they're on the same page, sorting hogs in the barn and making sure that there's no heavy stress through fighting and stuff a little bit of time before the hogs go on the trailer, we need to avoid high stress hogs being loaded. Avoid loading the truck too soon and arriving at the plant and then sitting for an hour or so before they unload. Ultimately that just leads to stress on the trailer and they might as well be in the barn so it's

good communication and planning for your dock time. Those are some of the key things that we have learned. Some others would be, if those pigs are moving, leave them alone. It's not a race, let them move at their own pace and let them be. Down says, by improving animal handling and welfare, we know we're improving meat quality, we're helping decrease trim loss and we're helping reduce transport loss, all factors that can improve the bottom line of the farm.

Colostrum Key for Piglet Survival

www.thepigsite.com

Mar. 29, 2011

UK - Maternal colostrum is vital for newborn piglets as both their primary energy supply and for immune protection. Yannig Le Treut, of French nutrition company Lallemand, left no doubt as to why pig producers must ensure quick and adequate colostrum during three conferences last week. More than 300 producers attended the Two-Tonne Sow (2TS) Focus on Farrowing conferences, organised by the BPEX Knowledge Transfer team. Yannig was one of four technical experts who joined local pig producers to discuss management of both the sow and piglet to deliver a strong litter through to weaning. Yannig said: "Colostrum provides energy and immune protection as well as helping the gut mature in the first few hours of life, which is one of its lesser-known functions. It is essential that the piglet has its first colostrum intake as quickly as possible as its body fat reserves and glycogen levels are very low at birth, making colostrum its main source of energy. It cannot survive without it. "The best pig producers spend a lot of time with a newborn litter making sure that all the piglets, particularly the weakest, get to suckle, ideally within the first six hours. After that, the quality and level of immunity colostrum provides reduces rapidly. "Where practical, producers should not cross-foster until at least 24 hours after birth as maternal colostrum intake must be the priority. Just mark the piglets ready for moving later. It is important that piglets drink colostrum from their own mothers, which ensures that piglets are equipped with the exactly the same type and level of immune protection as the sow." One producer said afterwards: "We always learn something new from BPEX meetings and this was a really excellent event. We will be re-thinking how quickly we start cross-fostering piglets and make sure they have had enough maternal colostrum first."

Advantages of Covered Creep Areas

ThePigSite News Desk

March 14, 2011

There are a number of advantages of covering creep areas, some of which are highlighted in Knowledge Transfer Bulletin No. 11 from BPEX.

In farrowing houses, lower temperatures are needed for the sow than for the piglets. If the room temperature rises above 16°C the sow's appetite will begin to decrease; a realistic operating temperature is 18 to 20°C. One frequently-used way to achieve this is to maintain a low room air temperature that is suitable for the sow and to provide a covered creep area for the piglets. There are a number of advantages of covering creep areas, some of which are highlighted below.

Covered creeps enable piglets to stay warm while the farrowing house is maintained at a lower temperature.

A winch system facilitates observation

Take the temperature of the covered creep to ensure optimum benefits from the creep area
Check boxes and repair any damage after each weaning

Advantages of Covered Creep Areas

Thermostatic temperature control – optimal environment for piglets

Piglets can stay warm in their creep area instead of using energy to produce body heat

Heat conservation – reduced energy consumption

Fewer draughts

Farrowing house can be maintained at a lower temperature which is more appropriate for the
sow

Encourages optimum feed intake by lactating sows

Enables creep training – reduces overlays

Allows split suckling to be easily managed

Litter work is easily managed.

Disadvantages of Covered Creep Areas

Piglet observation – not a problem with a creep winch system (as shown in the photo) or if
they are hinged or can slide

Maintenance

More to wash at the end of the batch.

Best Practice for Covered Creeps

It is important to bed up covered creeps properly, most commonly with paper or shavings;
beds should be kept dry during the lactating period

Make sure there are no holes in creep boxes as they will not only create drafts but allow heat
to escape

Measure the temperature of the covered creep to ensure optimum benefits from the creep
area

Wooden creep boxes can become damaged so it is important to inspect them during cleaning
and disinfection after each weaning and repair any damage

When cleaning and disinfecting crates make sure creep boxes are thoroughly washed,
including the corners, which are most likely to harbour residue

Make sure they are fully dry before adding bedding and are up to temperature at the start of
farrowing

It is advisable to set your heat lamps on a temperature gradient so that as your piglets grow
and their heat requirement decreases, the heat lamps emit less heat and energy costs are also
reduced.

Note piglet lying behaviour during each litter inspection. Piglets lying outside the creep boxes, or
away from the lamp inside the creep box, indicates that something is wrong and the
temperature is not optimal for the piglets.

Eliminating Castration to Reduce Boar Taint Has Advantages

ThePigSite News Desk

Thursday, February 10, 2011

CANADA - An animal science professor with the University of Guelph says eliminating the need for castration to reduce the potential for boar taint in pork promises a range of advantages, writes Bruce Cochrane.

Boar taint, a potential off-odour and off-flavour that affects the meat of intact male pigs, is typically prevented by castration at an early age.

A number of alternatives to castration are either available or under development including the use of dietary additives to bind the compounds that cause boar taint, the use of an immunocastration vaccine or through the genetic selection of boars less prone to the problem.

Dr James Squires, an animal science professor with the University of Guelph, says pressure to eliminate castration is building.

Dr Squires addressed the 25th Manitoba Swine Seminar last week in Winnipeg.

Dr James Squires – University of Guelph
When you castrate a male pig you really decrease production efficiency.

A barrow is going to be a lot fatter, going to produce less lean yield and less feed efficiency as well.

But I guess one of the key things why it's currently important is because, particularly in the EU, animal welfare concerns against castration are becoming really really significant and so there's been laws banning castration in several EU countries.

I see this being a problem certainly in North America as those attitudes move from the EU to here.

I think it's just one of those things where you have to look down the road and see what might be coming over the hill.

I see the concerns about animal welfare in the EU eventually affecting North American markets as well and consumer opinions in North America, they're certainly growing.

I've had enquiries from different groups who are interested in trying to petition supermarkets not to accept meat from castrates for example.

This is coming and I think we need to be proactive and do what we can to solve the problem since we are developing the tools and we should try to implement them as is feasible.

Dr Squires says eliminating the need for castration will improve pork quality and consistency and animal welfare, reduce the environmental impact of pork production and boost producer profitability.

Life is too short for many pigs: mortality increases with litter size

Source: Aarhus University – Faculty of Agricultural Sciences

(Text: Janne Hansen)

Pigs Progress

23 Feb 2011

Piglet mortality in Denmark has been increasing in line with increasing litter size. Scientists from the Faculty of Agricultural Sciences have reviewed existing knowledge about the problem and suggest methods to reducing it.

Danish pig farmers excel at producing many pigs per sow per year but there is also a downside to their success. Many of the pigs that are born die before they are a few hours or a few days old. Identifying the causes of this high mortality and investigating the potential means of reducing it are the subjects of a new report from the Faculty of Agricultural Sciences at Aarhus University.

In Denmark the number of pigs born per litter has been increasing steadily for the past 15 years and has now reached an average of 16.1 pigs per litter. Unfortunately, the number of dead pigs – whether stillborn or dead within the first few days after birth – has also increased. The proportion of dead pigs has been approximately 24 percent of total born piglets in commercial herds during the past six years.

Based on the recent public debate on piglet mortality in Denmark, the Danish Veterinary and Food Administration requested scientists from the Faculty of Agricultural Sciences to prepare a report outlining the problem.

Many – but small and weak – pigs

The scientists point out that the increase in piglet mortality has several causes.

The emphasis on breeding towards larger litter sizes during the period 1992-2004 seems to be a major part of the problem of the high percentage of stillborn pigs and pigs that die within the first few days after birth. The total number of born piglets is phenotypically strongly related to the number of pigs born undersized, weak or underdeveloped. These piglets have an increased risk of dying either during or shortly after birth.

The Danish breeding index is defined by Danish Pig Production. In 2004 the trait “Live pigs at day 5” replaced the trait “Total number of born pigs” in the selection index. Based on Danish data, it was expected to result in a decrease in mortality rate. However, the expected decrease in piglet mortality rate has so far not shown up in data from production herds. Litter size has increased while mortality has stagnated.

The direct causes of mortality are several. Some pigs suffer from a lack of oxygen during birth. They may end up as stillborn pigs. In other cases they survive birth but are weak due to the lack of oxygen. Small and weak piglets cool easily because they are typically less vigorous and their chances of survival are not good. They are, for example, less apt to move out of the way when the sow lies down.

This brings us to another important cause of the high piglet mortality: being crushed by the sow. Pigs with a low birth weight and a low body temperature are particularly susceptible to being crushed the first days after birth.

Starvation and cooling are also a problem because small and cold piglets are more susceptible to disease.

Reduced welfare

Hunger, cold, lack of oxygen, disease and being crushed by a large sow – these are the fates of approximately four piglets in every litter born in Denmark. Apart from reducing production due to losing so many pigs, it is also a welfare problem for the liveborn piglets that die after birth.

- A large proportion of the pigs that die within the first few days after birth have in all likelihood suffered from pain, hunger, fear or stress for anywhere from a few minutes up to half a day. The high proportion of dead piglets therefore poses an ethical and welfare problem, the scientists state in their report.

A side effect of large litter sizes is that there are not enough nipples on the sow to provide for all her piglets. In order to solve this problem pig farmers use nursing sows. A nursing sow raises her own litter for three to four weeks after which her pigs are weaned and the sow is given a new litter to raise. This poses welfare problems for the sow because she is penned for a longer period than if she only has to raise her own litter.

Improvements in several areas

Fortunately, reducing the present high piglet mortality is not impossible. The report outlines several possibilities.

Including piglet mortality directly in the breeding index is an obvious choice for reducing mortality. However, the report points out that it would not lead to an immediate fall in piglet mortality on commercial farms, as it takes three to four years for breeding results to work their way through the breeding system and into the animals on commercial farms.

An effect can also be achieved through improved management and better pen conditions. Increased monitoring of farrowing can potentially reduce the number of stillborn pigs and neonatal deaths, as can improvements in the pigs' local environment. The latter practice requires the development of methods that are practical to use. Means such as straw and extra heat sources placed in the right locations in the pen could comprise some of the possibilities. An intensification of expert advice regarding sow health may also improve conditions for the piglets.

Meeting the Challenge of Feeding Just-Weaned Pigs

The PigSite

February 21, 2011

Feeding newly-weaned pigs can be a challenge, but remember, good care at the beginning translates into more profit in the end. PIC offers advice on how proper feed management for newly-weaned pigs can help to overcome these challenges.

Feed Management

Remember, extreme nutritional changes occur in the pig at time of weaning. While on the sow, pigs are told when to eat by the sow, given equally spaced small meals throughout the day, conditioned to eat at the same time, and provided with a highly digestible milk diet.

There is little or no transition period when pigs are weaned, yet they are expected to adapt to a new programme, which includes a dry meal or pellet feed of different composition.

In addition, pigs have an unfamiliar feed delivery system and have to learn how to feed themselves. By carefully managing the nutrition and management of newly weaned pigs, these challenges can be overcome.

Feed Quality

Provide weaned pigs with a high quality starter ration that meets nutritional requirements. Fill feeders with no more than two-days-worth of fresh feed.

Only fill the feeders for the pigs being received. For example, don't fill all feeders with a two- to three-day spread in delivery because it will become stale. And clean feeders twice daily.

Creep Feeding

Creep feeding stimulates the pig to eat and helps them find feed. Scatter 1lb. of feed on the mat four to six times per day.

Discontinue creep feeding after one week. The purpose of creep feeding is to stimulate appetite so pigs look for feed when the mat is cleaned. Creep feeding for too long a period trains the pigs to wait for the caretaker.

Natural Behaviour Makes Moving Pigs Faster Easier

Friday, February 18, 2011

ThePigSite News Desk

CANADA - A Saskatchewan based low stress pig handling trainer says by understanding of the natural instincts that drive behaviour swine handlers can make the job of moving pigs easier, faster and less stressful, according to Bruce Cochrane.

Low stress pig handling techniques involve the use of the animals' natural behaviours to get them to move.

Nancy Lidster, a low stress pig handling trainer with Whitefox, Saskatchewan based DNL Farms, says once stock people understand how animals behave the job of moving them becomes much easier.

Nancy Lidster-DNL Farms

Most of our instincts, if we don't understand the pig's responses we will tend to push too hard.

We tend to want to chase, we tend to if they resist to want to push harder which is exactly the opposite of what we need to do.

That's why it's so important to understand the pig behaviour so that instead of letting our instincts kick in and do things automatically without us even thinking about it we have to be able to make conscious choices and consciously understand what's going to happen and how they're going to respond and to make proper choices to get the responses that we want.

The main thing that we're looking at is animals' fear levels.

The things that we don't like them doing like bunching up and refusing to move or circling back on us are typically fear responses so if we can understand how to keep them calm and use our position and use our pressure in ways that make it easier for them to keep track of us and stay calm then we can get them to work more easily.

Part of the fear and defensive responses are also being able to keep track of us and also feel comfortable with where we're working and with what we're asking them to do.

Mr Lidster says, if we can get animals to move on their own they'll actually move themselves and that's what we're looking for.

She says, if pigs are moving easily, it makes the job more enjoyable, it saves time, it reduces injuries to both animals and handlers and results in higher quality end products.

Trailer Design Affects Market Pig Welfare

Michigan State University Extension

February 2011

Trailer design may be one of several factors that influence the level of stress for pigs being transported, according to Tom Guthrie, Extension Educator for the Pork Team at Jackson in his review of trials on this topic in the latest Pork Quarterly from Michigan State University.

Transportation of livestock in general has created a significant amount of interest in regard to animal welfare, primarily transport losses. Transport losses are referred to as pigs that die or become non-ambulatory, i.e. unable to walk, during any part of the marketing process. These losses may be identified as a multi-factorial problem which includes factors such as human-animal interaction, the environment of the animal and the individual animal.

Ritter and co-workers (2008) reviewed 22 field studies containing more than four million pigs and reported that mortality losses averaged 0.25 per cent (10,000 out of four million hogs). In addition, Fitzgerald et al. (2009) collected data on more than two million pigs transported from nine farms to a single packing plant and also observed a mortality rate of 0.25 per cent. Furthermore, transport losses represent multiple challenges to the entire US food chain with major implications to animal well being and economics such as direct financial losses to the pork producer and pork processor. Trailer design may be one of the many factors that may influence the level of stress for pigs being transported.

Trailer Types

In a study by Kephart et al (2010), the unloading of 41,474 market pigs was observed that represented 242 trailer loads (171 pig average per load).

Trailer types used in this study included:

- potbelly (PB) with a standard roll up door (37 inches wide)
- straight-deck conventional (SDC) with a roll-up unloading door 37 inches wide, and
- straight-deck wide-opening (SDW) with a standard roll-up door (37 inches wide) and an additional hinged door (31 inches wide) adjacent to the roll-up door for a total opening of 68 inches.

In this study, 73 loads were delivered on potbelly trailers, 88 loads delivered on straight-deck conventional trailers and 81 loads on straight-wide trailers.

Results of this study (Table 1) indicated that the percentage of pigs exhibiting open-mouth breathing transported on potbelly trailers was greater than that of pigs transported straight deck conventional and straight-deck wide-opening trailers. The observation of more pigs exhibiting open-mouth breathing and skin discoloration that were unloaded from potbelly trailers may be directly related to pigs loaded in the 'belly' of the trailer and pigs loaded in the front compartment of the middle deck had to negotiate an internal ramp of approximately 20. compared to the other two types of trailers in which no internal ramps were used.

Similar results were reported by Ritter et al (2008) that studied the effects of season and distance moved during loading on transport losses of market-weight pigs comparing two

different trailer types. In this study, 109 loads of pigs were evaluated (53 loads loaded and transported on a potbelly trailer and 56 loads loaded and transported on a straight deck trailer, respectively). Results indicated that signs of open-mouth breathing in pigs unloaded from potbelly trailers were greater in the spring and summer than pigs unloaded from the straight-deck trailer type. Additionally, the incidence of skin discoloration was greater in pigs unloaded from potbelly trailers in the spring, summer and winter.

| Table 1. Influence of trailer type on pig behaviour | | |
|--|---------------------------------|------------------------------|
| Trailer type | Open-Mouth Breathing (%) | Unloading Time (min.) |
| Potbelly | 2.99 | 17.3 |
| Straight | 1.62 | 12.4 |
| Straight-wide | 0.66 | 10.3 |

Adapted from Kephart et al., 2010

Loading times were similar for the two trailer types, however, the time to unload was considerably greater for the potbelly trailers (Table 2). This could be attributed to the difficulty experienced by handlers to move pigs easily from the potbelly trailer. Therefore, pigs may experience greater stress during unloading from the potbelly trailers compared to straight deck trailers. Moreover, it should be noted that there was no significant effect of trailer design on either transport losses or carcass trim loss.

| Table 2. Effect of trailer design on physical indicators of stress after loading and unloading | | |
|---|-----------------------|----------------------|
| Item | Trailer design | |
| | Potbelly | Straight-deck |
| Open mouth breathing after loading (%) | 9.68 | 11.5 |
| Skin discoloration after loading (%) | 2.81 | 3.58 |
| Muscle tremors after loading (%) | 0.04 | 0.02 |
| Muscle tremors after unloading (%) | 0.22 | 0.13 |
| Loading time (minutes) | 68.7 | 63.7 |
| Unloading time (minutes) | 35.9 | 20.2 |

Adapted from Ritter et al., 2008

Take Home Message

In summary, it is imperative that producers and transporters need to be aware of the many factors associated with transportation management of pigs with trailer design being one of those factors.

With proper transportation management practices and an extensive understanding of animal handling techniques, the pork industry can assure that a proactive approach is being taken to address the concerns for animal well being and economics. In turn, this benefits all parties involved including the pigs, pork producers and packing plants.

Resources

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Pigs in long distance transport to be unloaded for break or not?

Source: Aarhus University

Pigs Progress

29 Mar 2011

Is it best for a pig to be unloaded from the transport vehicle for a break in its long distance journey or should it remain on the vehicle until it reaches its final destination? Scientists have monitored pigs to provide some answers.

According to regulations, pigs transported over long distances must be unloaded from the transport vehicle and herded into a resting station at the latest after 24 hours of transportation. Once unloaded, they must stay in the resting station for another 24 hours before they are permitted to continue their journey. The question is whether or not this is the best solution for the pigs.

Scientists from the Faculty of Agricultural Sciences, Aarhus University, have tried to find an answer to the question by studying what pigs get up to during the driving time and during the rest periods. The study included video surveillance of the pigs during their transport.

The results of the study show that with regard to the pigs' resting behaviour and several physiological reactions there are only limited differences between pigs that remained in the vehicle during their break and pigs that were unloaded for their break.

Pigs on the go

The pigs in the study were split in two groups. One group was transported for more than 4,000 km over a period of almost five days. The transportation took place in three stages that were interrupted by two 24-hour breaks. One of the pig groups remained on the upper floor of the transport vehicle during the breaks while the other group was unloaded from the lower floor of the vehicle and herded into pens in a resting station.

The pigs had approximately 0.8m² per pig at their disposal in the vehicle and in the resting station. The pigs were mixed at the beginning of their journey but were thereafter kept in stable groups.

Apart from the first couple of hours of the journey the pigs spent most of their time lying down and there was no difference between the groups. During the breaks the pigs were inactive for

about nine to twelve hours during the night and they drank more or less no water during these periods.

The scientists recorded the pigs' behaviour, physiology, clinical health, body weight, and water consumption. They also measured air temperature, humidity and CO₂ content as well as vehicle movements.

The results

The results indicate that if the transport vehicle is equipped properly, then it is beneficial for the pigs to remain in it during the breaks. Unloading them at a resting station often subjects the pigs to stress factors such as the actual unloading and re-loading process, a new environment, and a new social environment at the resting station, where they are typically mixed with other pigs.

There were no significant indications that the pigs' reactions to being transported increased with repeated transportation. The only clinical symptoms were cuts and scratches that came about during the first day's battles to find a new rank order.

There were indications that the pigs were slightly dehydrated, especially in the groups that remained in the transport vehicle during the breaks. This proves how important it is to have drinking facilities in the vehicle that are easy for the pigs to find and use.

The project was financed by the Pig Levy Fund, Aarhus University, and the Ministry of Food, Agriculture and Fisheries.

Effects of Housing Grow-Finish Pigs in Two Different Group Sizes

Prairie Swine Centre

(Jan 27, 2011)

Past studies on small groups (10-40) of pigs have found a negative impact of crowding on productivity and welfare. Studies examining groups of greater than 40 pigs per pen have found setbacks in the growth rate of pigs soon after mixing. Research into the effects of crowding on grow-finish pigs housed in large groups is minimal, although it has been suggested that pigs housed in large groups may be able to use space more efficiently. This study was designed to assess the space requirements of both large and small groups, and the effects of space restriction on pig performance, behaviour, physiology, health and welfare.

For this study, space allowance was expressed using an allometric approach relating body weight (BW) to floor area, as determined by the equation: $k = \text{area(m}^2\text{)}/\text{BW}^{.667}$. Past research has indicated that, above $k = 0.035$, growth is normal. Below $k = 0.035$, space becomes restrictive and growth depression begins. Due to previously set animal care guidelines, the crowding treatment in the current study was terminated at $k = 0.025$ (approximately 94 kg BW at 0.52 m²/pig (5.59 sq. ft./pig)).

Eight, 8-week blocks of 288 pigs were carried out. Group sizes were small (18 pigs) or large (108 pigs) and space allowances were crowded (0.52 m²/pig (5.59 sq. ft./pig)) or uncrowded (0.78 m²/pig (8.39 sq. ft./pig)), creating four treatment groups: small uncrowded, small crowded, large uncrowded and large crowded (Figure 1 a-d, respectively). Gains, feed intake, and feed efficiency were calculated on a weekly basis.

Postural and feeding behaviour were assessed on a biweekly basis, as were injuries and salivary cortisol concentrations (indicative of acute stress). Adrenal gland (indicative of chronic

stress) and carcass data were collected at slaughter. One wet/dry free choice feeder space was provided for every nine pigs. One environmental enrichment device was provided for every 18 pigs. Barrows gained more than gilts (1.0644 vs. 1.0124 ± 0.0094 kg/d, $P < 0.018$) and had a higher fat depth at slaughter (20.57 vs. 18.022 ± 0.25 mm, $P < 0.002$). Gilts had a higher carcass index than barrows (114.01 vs. 111.95 ± 0.32 , $P = 0.011$). There were no indications that one gender was more affected by large group housing or reduced space allowance than the other. Overall, crowded pigs had a lower growth rate and a lower final body weight than uncrowded pigs. Growth rate was depressed by 9.8% during the final week of the study. Pigs housed in large groups had a lower overall growth rate than pigs housed in small groups. Among pigs housed in large groups, daily gain was most affected during the first two weeks, at which time it was depressed by 5.4%. The difference in initial body weights of pigs housed in the large groups indicated that growth depression began within the first four days after group formation.

The first sign of growth depression in response to crowding occurred much sooner for pigs in large groups compared with pigs in small groups. In the large groups, the critical point (k value) at which crowding and growth depression began was $k = 0.042$ (43 kg BW), while $k = 0.035$ (57 kg BW) was the critical point for pigs housed in the small groups. However, the rate of depression in gains was more gradual for pigs in large groups. Growth was depressed by 0.5% for every 1% reduction in space below the critical point in the small groups, but growth was only depressed by 0.2% for every 1% reduction in space below the critical point in the large groups. Thus, by the final week of the trial, pigs in both large and small crowded groups had similar gains.

Overall, crowded pigs had a lower feed efficiency than uncrowded pigs. Efficiency was depressed by 11% during the final week of the study. Crowded pigs ate fewer meals and spent less time eating overall, but feed intake did not differ from that of uncrowded pigs. This suggests that they were consuming feed at a faster rate than uncrowded pigs. The level of crowding did not affect injury scores or the severity of lameness, flank bites, tail bites, or leg lesions. Similarly, it did not affect the number of animals requiring medical treatment (antibiotics) or removal from the trial, or the level of acute or chronic stress experienced by the pigs.

Pigs housed in large groups ate fewer meals, but took longer to eat each meal, than pigs housed in small groups. Pigs housed in large groups also had a greater severity of lameness and leg injuries than pigs housed in small groups. Pigs housed in small groups spent more time sitting and lying on their sternum (chest), and less time lying on their side, than pigs housed in large groups. Group size did not affect stress levels, the number of animals requiring medical treatment, or the number of animals requiring removal from the trial. Pigs in uncrowded small groups had the highest carcass lean yield while pigs in uncrowded large groups had the highest fat depth. Pigs in crowded large groups had the highest lameness scores.

Feeding and Social Behaviours and Impacts on Social Stress

Source: PrairieSwineCentre

Jan 28, 2011

Most studies on feeding and social behaviours of pigs have been conducted on groups of fewer than 40 pigs/group. However, these group sizes are much smaller than some that are now used in some commercial operations (100-1000 pigs/group) in North America and elsewhere. The social dynamics of feeding and other behavioural activities of pigs in large social groups are not well understood and the competition for and the utilization of important resources such as

feeders by pigs in larger social groups is therefore unclear. The present study was conducted to gain a better understanding of feeding and other behavioural activities and the impacts of larger social groups on social stress in grower-finisher pigs.

To address this question, two blocks, which consisted two group-size treatments, 18 (Small Group) and 108 (Large Group) grower-finisher pigs per pen, were carried out. Each block, which lasted 10 weeks in duration, consisted of two pens of Large Group and four pens of Small Group size. A total of five hundred seventy six barrows and gilts (Pig Improvement Canada) were used in the experiment at the PSC Elstow Research Farm. The animals were weaned at approximately 18-days of age, were then held in nurseries for eight weeks, before being used in the experiment. The ratio of barrows to gilts was kept constant (1:1) between the two group sizes and the average starting weight of pigs was $34.6 \text{ kg} \pm 4.1 \text{ kg}$ (S.D). Pigs were housed on access the feeders without any difficulty. The individual pig feeding behaviour and group feeding patterns were studied during weeks 1, 5, 7 and 10 of the grower-finisher cycle. In addition, other behavioural activities such as percentage of time spent on eating/drinking, resting (lying) and standing/walking and diurnal patterns of these activities of pigs in both large and small groups were studied during weeks 2, 5 and 10 following re-grouping.

To evaluate the group size effect on social stress, salivary cortisol levels were measured periodically throughout the grower-finisher cycle i.e. during weeks 1, 2, 5 and 10. In addition, morphological parameters of the adrenal glands were measured at the end of grower finisher cycle to understand any effects of chronic stress on pigs that were formed into larger groups. The pigs in large groups had more bouts of feeding (35 vs. 25, $P < 0.05$) and the feeding bouts were shorter in duration (232 vs. 301 sec, $P < 0.05$) during day 3 following re-grouping. However, no differences in number of feeding bouts and bout lengths were found during weeks 5, 7 and 10.

More importantly, we found that the percentage of pigs queuing at the feeders to be high in larger groups than in smaller groups during day 3 (0.90 vs. 0.59 %, $P < 0.05$). This trend of higher percentage of queuing at feeders were also apparent during day 6 following re-grouping (0.79 vs. 0.60 %, for large and small groups, $P = 0.08$) but not thereafter. There were similar 24 hr group feeding patterns in pigs of both SG and LG during weeks 1, 5, 7 and 10 (Figure 1). Furthermore, the average percentage of feeder spaces occupied (mean day 3 and 6 and week 5, 7 and 10) was also similar between the two group sizes (55.7 vs. 56.2 %, for large and small groups). The average times spent on eating/drinking (5.2 vs. 5.2 %, for small and large groups), standing/walking (5.1 vs. 5.4 %, for small and large groups) and resting (89.6 vs. 89.3 %, for small and large groups) did not differ between the two group sizes. Furthermore, the diurnal patterns of these activities were also not affected by the large groups.

One main concern of large group sizes for pigs is the potential for increased social stressors. Interestingly however in our study, during the entire 10 wk experimental period, pigs in larger groups did not demonstrate any short-term (acute) or long-term (chronic) responses of social stress. Therefore, it was apparent that the pigs had not gone through any adverse social stressors by living in larger groups.

Exploring Alternative Sow Housing Options

ThePigSite News Desk

April 1, 2011

CANADA - Researchers with the University of Manitoba have kicked off a study intended to provide pork producers options for switching from conventional to group systems for housing gestating sows, writes Bruce Cochrane.

In response to public pressure for the elimination of gestation stalls Manitoba's pork producers have identified alternative housing for sows as one of their top research priorities.

The University of Manitoba's Faculty of Agricultural and Food Sciences in partnership with Manitoba Pork Council has launched a project aimed at devising strategies that will allow pork producers to convert conventional sow barns to a form of loose or group housing.

Dr Laurie Connor, the head of the University of Manitoba's Department of Animal Science, says the goal is to identify options.

Dr Laurie Connor University of Manitoba

We title it actually "Successful Sow Barn Conversion."

That is really the focus of it, is to have information that will actually help producers to make the decisions so that they can successfully convert their barns to housing systems that will help them maintain animal welfare, animal health, similarly maintain or improve actual productivity within that system as well as minimize environmental impact, maintain that healthy environment and likewise ensure that they are economically viable and therefor economically sustainable.

Dr Connor says the final document will explore the pros and cons of several of the most common alternatives for housing sows to help producers decide the most economically viable option for their particular operation and management and to plan their conversions.

The project began in January and is expected to be complete in about 18 months. Dr Connor expects the first useful results within six to 12 months.

Group Housing Does Not Impair Sow Welfare

The PigSite

April 4, 2011

To improve welfare – and to comply with regulations in some countries – group housing systems for pregnant sows are gaining popularity. Despite concerns over the welfare of the animals in these dynamic groups, research at Giessen University in Germany indicates that there is no severe or long-term impairment of animal welfare.

Verena Krauss and Steffen Hoy at the Justus Liebig University in Giessen, Germany, have investigated the social behaviour of sows in dynamic groups. Their paper was published recently in the journal, Applied Animal Behaviour Science.

In their investigation, 22 groups of sows (with a total number of 73 sows, partially observed repeatedly) were consecutively observed for 96 hours with the AgId of video technology after the introduction of five new sows into a group of 10 resident sows, thus creating a dynamic group of 15 animals.

The aim, explain the researchers, was to analyse the frequency of antagonistic interactions (AgI) and the lying behaviour of new and resident sows. Additionally, the lying behaviour three weeks after the introduction of new sows was recorded in half of the 22 groups.

The number of Agl per group was 45.2 on the first day and decreased significantly to 30.0 Agl/group on the fourth day after the introduction. Between 82.4 and 87.9 per cent of all Agl included the participation of at least one new sow.

Including all days of observation 2.3 Agl per dyad occurred between resident and new sows (n=50 dyads), 0.5 Agl/dyad within the subgroup of resident sows (n=45 dyads) and 1 Agl/dyad within the subgroup of new sows (n=10 dyads).

Altogether 12,454 lying events were recorded from which 6,134 occurred clearly either next to a member of the own subgroup (resident and resident, new and new) or next to a member of the other subgroup (resident and new or vice versa).

On the first day, new sows showed significantly more lying events than resident sows (21.2 and 14.9 in 24 hours, respectively).

By the 21st day this number decreased significantly (to 13.9 in 24 hours), which no longer showing significant difference from the number observed for resident sows (14.2).

On the first day, both resident and new sows lay down significantly more often next to a member of the own sub-group (new sows, 94.3 per cent; resident sows, 96.8 per cent). The number of lying events next to a member of the same sub-group decreased significantly within three weeks after the introduction of new sows, indicating the advancing integration of new sows into the dynamic group (new: first day, 94.3 per cent, 21st day 46.0 per cent; resident: first day 96.8 per cent, 21st day 74.6 per cent).

The researchers concluded that in general, providing environment and management are at least adequate, the process of introducing new sows into a dynamic group does lead to an increased level of aggression and agitation, but since this is only a short-term effect, no severe impairment on animal welfare is to be expected.

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Krauss V. and S. Hoy. 2011. Dry sows in dynamic groups: An investigation of social behaviour when introducing new sows. *Applied Animal Behaviour Science*, 130:20-27.

Housing and Welfare of Sows during Gestation

U S D A - A R S - M W A Livestock Behavior Research Unit

Sow Welfare Fact Sheet

Fall 2010

By Dr. Jeremy N. Marchant-Forde

Background: Over the last few decades, sow housing has generally moved from somewhat extensive systems towards intensive systems, with sows housed indoors, in non-bedded individual enclosures called gestation crates or stalls. These housing systems offer some benefits for the farmer, such as housing more sows per unit area compared with loose housing systems, incorporation of a mechanized manure handling system reducing both straw and labor costs and making monitoring and care of individual sows easier. However, gestation stalls may also have a number of disadvantages for sow welfare, and this evidence, together with society's ethical issues regarding close confinement, has led to increased scrutiny of these systems, resulting in legislation banning these systems in the European Union and a number of

states within the U.S. The main alternative is to house the sows in groups in open pens. However, group housing also has welfare concerns, mostly centered on aggressive social behavior. There is a growing realization that ultimately the issue of sow welfare in gestation housing systems may be outside the welfare scientists' sphere of influence.

Close confinement of livestock is an emotive subject for the general population and ethical viewpoints can greatly affect the evaluation of different systems and the associated scientific data. Notwithstanding, the aim of this paper is to summarize the effects of different housing systems on the welfare of the sow during gestation.

Gestation stall: In its simplest form, the gestation stall is a pen designed to encompass the sow's static space requirements – that is, the space occupied by a sow when standing or lying on her sternum. Stalls are typically constructed of tubular metal frames with a feed trough and drinker at the front, and are about 2.2 m long, 0.6 m wide and 1.0 m high, although there are variations on these dimensions on commercial farms. Within the stall, the sow is unable to turn around and simple movements such as standing up or lying down may be difficult if the sow is large, because the dynamic space requirements needed to carry out these posture changes are greater than the static space requirements. Most stalls are situated within fully-enclosed, climate-controlled buildings with no bedding; slatted floors allowing urine and feces to pass through into a slurry pit under the floor.

Group housing: When sows are not kept in individual stalls, they are kept in groups. The term "group housing" however, does not describe one simple type of system, but rather a wide variety of systems, with many varying features, all of which can impact the welfare of the sows within them to varying extents. Group housing can be based in fully-enclosed buildings, in open-fronted buildings, in buildings with access to outdoors or fully outdoors with temporary shelters. The number of sows in each group can vary greatly in size from 3 to hundreds and the amount of space per sow may differ greatly. The group may be stable, meaning sows are mixed once when the group is formed and then have few changes, or may be dynamic, with sows leaving and entering the established group multiple times. Depending on the type of housing, the floor may be fully-slatted, part-slatted, solid floored and non-bedded or solid floored and bedded with straw, corn stalks or wood shavings. Outdoor systems may be on grass paddocks or dirt lots. The feeding system will have a major impact on overall welfare depending on whether it is competitive, such as floor or trough feeding, or allows sows to feed without being displaced, such as electronic sow feeders or individual feeding stalls into which the sows are secured.

Welfare concerns: The major issues surrounding the housing of sows during gestation are focused on the detrimental effects of close confinement and barren environment afforded by stalls on the one hand versus the detrimental effects of aggressive social behavior afforded by group housing on the other. When assessing welfare, it is important to use an amalgam of measures, including behavior, anatomy, physiology, health and productivity. Looking at all the data contained within the scientific literature, a clear conclusion cannot be drawn. The most common error is making the false assumption that it is a simple stall versus group comparison. Major literature reviews conclude that either sow welfare is improved in groups or that there are no real welfare differences between stalls and groups.

Welfare in gestation stalls: Certainly, close confinement restricts the sow's behavioral repertoire and may increase the incidence of stereotypic behavior, but the latter is also attributable to barren environments, and thus where the quality of space in a group is equivalent to a typical stall, behavioral differences will be slight. Stalls also reduce cardiac function, alter body conformation, reduce bone strength and makes posture changes more difficult. The

physiological assessment of the sow's welfare has produced ambiguous data. Typical welfare measures of activation of the hypothalamic-pituitary-adrenal axis show stalls to be better or worse than groups, depending on the study. Aggression does occur between sows in neighboring stalls and may have high intensity due to the lack of opportunity to reach a clear outcome. Regarding health, it would appear that the balance of data shows sows in stalls to have more problems. Lameness appears to be higher for sows in stalls, with lower immune function and higher disease incidence than group housing, but hygiene management is a crucial factor. Skin lesions attributed to pressure, such as decubital ulcers, are more common in stalls. Productivity, using measures of sow reproductive output, shows no advantages for stalls.

Welfare in groups: In open pens, sows are able to perform more of their normal behavioral repertoire. The presence of bedding or outdoor access will increase the repertoire further. The ability to walk about increases cardiac function, muscle and bone strength and makes posture-changing easier. Some studies show HPA axis activity to be elevated in groups compared to stalls, whereas other studies show the opposite. Being social animals, sows will use aggression to establish and maintain a social hierarchy, and gain access to resources. Ordinarily, aggression is only prevalent when a new group is being formed. Once hierarchy is established, aggressive interactions are low in incidence and severity. Aggression in group housing systems cannot be eradicated completely, but aggression can be kept at a minimal level by a combination of environmental and management factors. Lameness is lower in groups, especially in bedded systems, but skin lesions attributed to aggression are more common in groups. Productivity, using measures of sow reproductive output, shows no advantages for groups.

Conclusions: The welfare of sows during gestation remains a contentious issue. The most important aspects to consider are, firstly, that aggregating housing systems into simple categories such as groups and stalls is not beneficial in understanding the welfare of gestating sows, and secondly, that no matter what the system, the management (quality of stockmanship) used within that system will have the greatest impact on the welfare of the sows. Each specific system has to be looked at individually and different systems have different advantages and disadvantages in terms of animal welfare. In group housing, low levels of aggression are facilitated by using a noncompetitive feeding system, establishing stable groups where possible and housing the sows with greater than minimum recommended space allowances with, where possible, access to bedding or manipulable material. When mixing occurs, pre-exposing sows prior to mixing is advantageous, as is having a pen design that allows sows to avoid aggressive interactions as much as possible, or to readily escape if an agonistic interaction is initiated. The minimum recommendations for a gestation system should include the following key features:

- A design that minimizes aggression and competition for all individuals
- A design that allows sows to express normal patterns of behavior
- A design that protects from environmental extremes
- A design that protects from potential sources of injuries, pain and disease
- A design that is safe for the stockperson and is relatively uncomplicated to manage successfully

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Influence of Feed Flavour on Pre-Weaning Pig Performance

Pork News and Views from OMAFRA.

February 2011

Recent research indicates providing a feed flavour in creep feed does little to increase pre-weaning performance or the number of creep-eaters within a litter although it is an important tool in starting piglets on solid feed, writes Greg Simpson, swine nutritionist for the Ontario agriculture ministry in the latest issue of *Pork News and Views from OMAFRA*.

A flavour is the sensory impression of a food or other substance, and is determined mainly by the senses of taste and smell. Feed flavours are commonly used in swine nursery diets to improve diet palatability and stimulate intake. However, evidence of the potential effects of adding flavours to creep feed on pre-weaning feed intake and performance is quite limited.

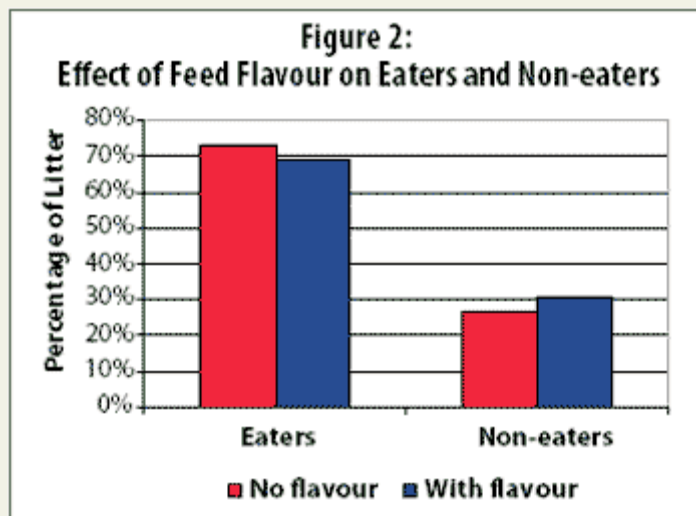
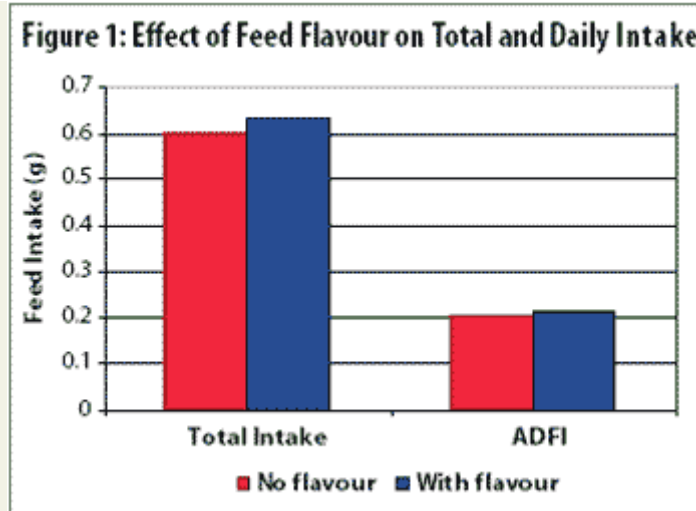
Historically, early research examining creep feeding used feed disappearance for the entire litter to determine if the creep feed was being consumed. This could be misleading as it assumes that all piglets in a litter consumed the creep feed. Recent creep feed studies, using colour markers in the feed, have shown that only a certain proportion of piglets actually consume creep feed. These 'eaters', as a result, have better initial post-weaning feed intake and growth performance than those in the litter that do not consume creep feed.

Subsequently, researchers have tried to identify factors that increase the proportion of eaters within a litter to improve overall nursery performance. One key dietary factor may be how the creep feed smells. It is also thought that exposure to the flavour in the pre-weaning period may also improve post-weaning performance when the same flavour is added to the nursery diets.

In a recent study, researchers at Kansas State University examined the role of using a feed flavour to increase pre-weaning and post-weaning performance. In the first part of the experiment the researchers used two experimental diets: a creep diet with no flavour added and a creep diet with a flavour added. Both diets were offered free choice from day 18 of lactation to weaning at day 21. In addition, both creep diets contained a colour marker which was used to

evaluate whether piglets were eaters or non-eaters. All sows were fed the same lactation diet, and water was offered free choice to both sows and piglets.

The results of this study found that overall litter weaning weight, total body weight gain and average daily gain (ADG) between litters fed creep with or without flavour were not different. On an individual basis, piglet weaning weight, total body weight gain and ADG between the two diet treatments also was not different. The addition of a feed flavour to the creep feed did not influence total or daily creep feed intake (ADFI) or the proportion of creep feed eaters in whole litters (Figures 1 and 2).



The lack of response to the feed flavour may be due to the limited time of creep feeding. In this study, the researchers chose a period of three days to reflect the current practice of US pig producers to provide creep feed for two to seven days before weaning. They felt that for the addition of flavour to be warranted, any effect must be visible in a short duration.

In their previous studies, researchers at Kansas State University found that 75 per cent of the total litter creep feed intake was consumed in the last seven days before weaning. They also found that piglets given access to creep feed for two days before weaning consumed the same or greater amounts of creep feed than litters that were creep-fed for seven to 11 days. These observations seem to indicate that creep feed intake is related to maturity of piglets rather than the duration of creep feeding.

However, before producers start reducing the length of creep feeding, previous research at Kansas State University found that creep feeding duration does influence the proportion of eaters in whole litters. In their study, litters provided with creep feed for 13 days produced approximately 14 per cent more eaters than litters fed creep for six days or two days (80 per cent, 70 per cent and 71 per cent, respectively). However, for a litter of 10 pigs, a 14 per cent increase in eaters translates to only one additional eater per litter.

In summary, based on this study, providing a feed flavour in creep feed does little to increase pre-weaning performance or the number of eaters within a litter. This research highlights that creep feed is an important tool in starting piglets on solid feed. Piglets that are eaters of creep have improved feed intake and growth performance in the post weaning period and the longer the duration of creep feeding the higher number of eaters within a litter. However, the economic cost/benefit of the additional feed and labour required should be balanced against the potential increase in nursery performance.

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Sow Lameness and Longevity

U S D A - A R S - M W A L i v e s t o c k B e h a v i o r R e s e a r c h U n i t

Sow Welfare Fact Sheet

Fall 2010

By Erin L. Schenck, Dr. Jeremy N. Marchant-Forde and Dr. Donald C. Lay, Jr.

Current Challenge: Data from 2008 indicate that the total annual culling and death rate for sows and gilts is 45.7 and 8.3 percent respectively. The average parity at culling is 3 (approximately 23 months of age) with 50- 69% of sows being culled by parity 4. Fifteen percent of the sows culled between January and June of 2006 were due to lameness. The three main reasons for culling from the herd are age (36.6%), reproductive failure (26.3%), and lameness (15.2%). Young sows may be at a higher risk of locomotor problems due to slight nutritional problems, poor conformation, management, and the environment. The occurrence of culling for locomotor problems decreases with sow age, possibly because unsound sows have already been removed from the herd.

Reproducing females are the most valuable animals in the herd. The length of a sow's reproductive life influences many economic factors such as cost per pig sold and profit per sow. Decreasing the replacement rate of productive females increases returns by decreasing sow replacement costs and increasing sow output. Increasing sow longevity will increase the size and weight of litters, decrease non-productive days, increase sow salvage value and decrease replacement costs. Estimates of economic loss, calculated in 1989, due to lameness in the

United States was over \$24 million. Of major importance is that concern for sow welfare is paramount, because sows that are culled due to lameness likely are in a state of poor welfare prior to the time at which they are removed from the herd.

Causes of Lameness: Conditions that may be responsible for locomotor problems include osteochondrosis, osteoarthritis, arthritis (3 diseases related to cartilage integrity problems), leg weakness, foot rot, foot and leg injuries, and fractures. Osteochondrosis and foot lesions were found to be the primary causes for culling of growing and breeding age swine. Osteomalacia and osteoporosis are more commonly found in gilts and parity 1 sows. Older sows are more prone to foot problems than younger sows, likely due to increased time on rough or improper flooring. Several different factors are considered to be responsible for causing the various presentations of lameness. Housing systems can influence the amount of physical trauma to the body and the feet. For example, group-housed sows tend to have more injuries and stall-housed sows tend to have more joint, foot, and leg problems. Another factor that affects lameness is the type of feeding system. Longevity has been shown to be shorter and incidence of injuries higher for sows fed individually with electronic sow feeders (3.0 parities) than sows fed as a group in individual feeding stalls (3.9 parities). Genetic selection has also been identified as a major catalyst of lameness due to selectively breeding for desirable production traits while not attending to causes of lameness. For example, low levels of back fat have been associated with leg weakness problems. Research in our laboratory has shown that, stall-housed parity 1 sows already have negative effects on their musculo-skeletal system, in particular, the condition of the articular cartilage and hooves.

Recommendations: Every housing system poses its unique set of challenges when managing the herd to reduce lameness. Slatted-floor systems which have inappropriate widths need to be eliminated. A flooring material which is resilient to the activity of the sow, yet yielding enough to relieve strain on the sow would help to decrease lameness. The interaction between genetics and nutrition, relative to osteochondrosis, osteoarthritis, and osteomalacia needs to be fully understood. Genetic selection against these diseases, while keeping productivity stable, will help decrease lameness over the long run. It is important to remember that skeletal adaptations occur in young animals, indicating that the best time for prevention of musculo-skeletal problems is early in development.

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New Online Pork Production Library Introduced

Source: www.porknetwork.com

Mar. 8, 2011

Looking for a reliable place to find all information related to pigs, pork and hog production? The U.S. Pork Center of Excellence (USPCE) has a solution. It supplies the content for the "Hogs, Pigs and Pork" Community of Practice on <http://www.extension.org/swine>. This vast online library offers material on: * production and management systems * business management, marketing and human resources * swine health and nutrition * animal behavior and welfare issues * breeding and genetics * facilities and equipment * environmental stewardship * pork quality and safety* youth projects * statistics * worker health and safety * niche production and * consumer issues. The site provides beneficial content for producers, veterinarians, agribusiness professionals, educators, students and consumers. eXtension, a part of the Cooperative Extension System, is an interactive learning environment delivering researched knowledge from land-grant university researchers and educators across the U.S. David Meisinger, USPCE executive director and leader of the swine information section on eXtension, sees "Hogs, Pigs and Pork" as a valuable resource area for a broad range of people on both the producer and consumer sides of pork production. "The information on eXtension is just a fabulous resource for anyone remotely interested in hogs, pork and the areas it touches," Meisinger said. "That includes everything from manure and odor management and care for the environment to pork quality and nutrition." Todd See, professor of animal science at North Carolina State University and lead editor for the "Hogs, Pigs and Pork" website agrees that eXtension is an extremely valuable tool for today's pork producers. "The quality of information on eXtension is just outstanding," See said. "This material was written by top-notch researchers at some of the major state ag universities. Producers should know it's all science-based and reliable. They can utilize that information in their day-to-day operations. On top of that, the information is peer-reviewed by equally competent researchers. Producers have nothing to lose and everything to gain by adding this website to their artillery of resources." The "Hogs, Pigs and Pork" community of practice receives the majority of its information from the Pork Information Gateway (PIG) website, which also is managed by the USPCE. PIG also contains information produced by researchers at many state agricultural universities. Visit the "Hogs, Pigs and Pork" resource area at eXtension at www.extension.org/swine.

POULTRY

Study: Egg laying behavior in broiler breeders influenced by feeding

World Poultry Net

11 Apr 2011

[Source: British Poultry Science, Volume 52, Issue 1, 2011, Pages 20 - 29]

In Canada, the University of Guelph's Department of Animal and Poultry Science examined how feeding might influence egg laying behaviour in commercial broiler breeder hens.

The team conducted a study to determine whether feeding feed-restricted broiler breeder hens during the sitting phase of nesting results in a higher incidence of floor eggs and/or retained eggs.

They report randomly assigning 60 broiler breeder females (Ross 308) to 6 deep litter pens containing 10 nest-boxes. At 35 weeks of age and for 9 weeks, the researchers say, feed was distributed to all pens at lights-on every second day (fed normally, FN). On alternate days (feeding delay, FD), feed was distributed when two to three hens per pen were sitting in a nest box.

At 41 weeks of age, behaviour was sampled for 26 days. i.e. eggs and egg location data were collected daily, and eggs were scored for extra-cuticular calcium.

Of 81 instances in which the hen was sitting firmly in a nest box at the time of feeding, the hen left the nest-box to feed in 80 cases, and in one case the hen laid its egg then exited to the feeder. Of these 80 instances, Sheppard and Duncan write, the hen returned to a nest-box to lay her egg in 58 cases; in twelve, the hen returned to the nest-box but laid no egg; in seven, the hen did not return to the nest box and laid no egg; and in three the hen laid her egg on the floor.

Thus, they found that the mean floor egg percentage did not differ significantly between days with normal feeding and with feeding delay – $13.3 \pm 3.2\%$ and $13.3 \pm 4.7\%$ – respectively. The mean extra-cuticular calcium score over all pens was 0.9 ± 0.06 on FN days and 1.2 ± 0.06 on FD days. These scores differed significantly, the investigators point out.

In conclusion, they say, feeding broiler breeder hens during nesting results in a conflict between feeding and nesting motivation and higher numbers of extraneously calcified eggs. However, it did not significantly increase the amount of floor eggs, even though nesting hens will leave the nest box for food.

Camera Technology Poised to Improve Welfare

ThePoultrySite News Desk

Tuesday, February 22, 2011

UK - An ingenious small-scale camera and computer set-up that is poised to improve the welfare of broiler chickens, say researchers.

With meat consumption rising worldwide and poultry meat the most popular by far, there is pressure to increase production. This must be done alongside commensurate improvements in animal welfare. Today (22 February), researchers describe an ingenious small-scale camera and computer set-up that is poised to improve the welfare of farm animals including, in particular, broiler chickens.

The research is funded by the Biotechnology and Biological Sciences Research Council (BBSRC) Animal Welfare Programme and will be presented later today at a BBSRC event in London.

Lead researcher, Professor Marian Dawkins from the University of Oxford said: "We have been working from the outset with industry partners to ensure that we develop something that is useful on commercial farms and is an improvement on the traditional ways of measuring the welfare of animal flocks."

The welfare of broiler chicken flocks is often assessed by examining the health of the birds' feet and legs at the point of slaughter. The alternative is to have teams of people go into poultry sheds and assess how well the birds are walking and moving around, eventually calculating a so-called 'gait score'.

"Waiting until the birds are slaughtered is obviously not an ideal way of monitoring animal welfare on farms and the gait score method is rather labour intensive and expensive for an industry that is already hard pressed by cheap imports. Our invention correlates well with the gait score method and is at least as sensitive at picking up the very early warning signs that something is wrong. It has the potential to become totally automated to raise an alarm when a problem is detected," Professor Dawkins added.

A small box mounted on the wall in a chicken shed contains a camera and computer that can use a technique called 'optical flow' to monitor the shifting patterns of movement in the flock. If there are a lot of slow-moving birds the overall pattern of movement is disrupted and the monitoring device detects that there may be a welfare issue such as illness or lameness in a proportion of the birds.

"Imagine if all the people running the London Marathon were equally able to run the distance, all moved roughly in the same way, and all ran at about the same speed – from the air you'd see a strong, steady flow of movement. On the other hand, if half the runners were very unfit or dressed in those heavy comedy outfits some of them wear, you wouldn't see the same strong flow – it would be very disrupted, even if they were all moving in the same direction. It's the same with the chickens – ill or injured birds disrupt the flow of movement and our camera set-up can detect that disruption and alert us quickly to any problems in the flock," said Professor Dawkins.

Professor Dawkins and her team are now working to test the system further and so develop it as an important management and welfare managing tool.

Professor Douglas Kell, Chief Executive, BBSRC said: "With an increased emphasis on food production we must never lose sight of the importance of farm animal welfare. We must use science to assess welfare levels, spot issues and intervene early to ensure that the health and wellbeing of farmed animals is protected. Research such as this has clear and immediate applications and will become even more important as the global population increases so that we have to feed nine billion people in 2050."

Current Developments in Beak-Trimming

U S D A - A R S - M W A Livestock Behaviour Research Unit
Laying Hen Welfare Fact Sheet
Fall 2010

By Dr. Heng-wei Cheng

Background: Beak trimming, removal of 1/3 to 1/2 of the beak, is a routine husbandry procedure practiced in the poultry industry to prevent feather pecking and cannibalism. Domestic chickens possess natural behavior and motivational systems inherited from their ancestors (Red Jungle fowls), such as dust bathing and foraging behavior-associated scratching and ground pecking. Preventing chickens from performing those behaviors due to living environments results in stress, which leads to the expression of harmful behaviors. Currently, there is no single housing system to meet all the chicken's behavioral and physiological needs. Feather pecking and cannibalism occur in all current housing systems and can lead to suffering and death in laying hens that have not been beak trimmed. Issues Related to Beak Trimming: Beak trimming has elicited a great deal of debate and research concerning the relative advantages and disadvantages of the practice from an animal welfare perspective. The bestowed benefits of lowered aggression, feather pecking, and cannibalism may indeed favor improved welfare during the laying cycle. However, a chicken's beak is a complex, functional organ with an extensive nerve supply. Following beak trimming, several anatomical, physiological, and biochemical changes occur in cut peripheral nerves and damaged tissues. There is a considerable body of morphological, neurophysiological, behavioral and production research demonstrating the emergence of several markers of acute and chronic pain (e.g., persistent lethargy and guarding behaviors, reduced feed intake, and development of neuromas) as a result of trimming. This is of more concern when the beak trimming is conducted in birds which are 5 weeks old or older using a hotblade beak trimmer.

Hot-Blade Beak Trimming: There are several methods used for beak trimming in the United States but the most popular method is hot-blade beak trimming. It employs a heated (650-750°C), 'guillotine'- type, blade that both cuts and cauterizes the beak tissue when birds are 5 to 10 days old. A second beak trimming may be conducted on birds when they are 5 to 8 weeks old if a trimmed beak grows back. Infrared Beak Trimming: Infrared beak treatment is an automated process carried out at the hatchery on 1-day old birds. Birds are immobilized using a head restraint and infrared energy is focused on the area of the beak requiring trimming. High intensity (radiant at 50 to 60 watt) heat penetrates down through the beak's corneum layer to the corneum generating basal tissue and inhibits further germ layer growth. After treatment the corneum layer remains intact until 7 to 10 days post-trimming after which the tip of the beak begins to soften and erode away with use. Recommendation: Infrared beak trimming has several immediate advantages when compared to hot-blade beak trimming: 1) the elimination of open wounds that contribute to bleeding, inflammation, and pain; 2) better adaptation to eating because the changes in beak length and shape occur gradually over a 2-week period, which may better enable birds to alter their beak related behavior, resulting from a progressive adaptation, rather than an instantaneous change in the beak shape; and 3) a reduction in the number of stressors, such as catching, mixing, transfer, and handling, associated with the hot-blade beak trimming when it is performed on birds at 5 to 10 days of age. Long-term observation indicates that infrared beak trimming is more effective at reducing beak re-growth and resulted in less negative effect on feed intake and body weight than hot-blade beak trimming.

Until hens which express very low levels of aggression are commercially available or new housing systems are designed which better meet hens' behavioral and physiological requirements for minimizing damage imposed by feather pecking and cannibalism, infrared beak trimming is a useful alternative to hot-blade beak trimming. However, the results of beak trimming are affected by multiple factors. It should be noted that the effects of beak trimming on bird wellbeing is genetic-, lesion- and age-dependent. A future approach for controlling feather pecking and

cannibalism in chickens should be the combination of breed, housing design and management practices, which will provide a more promising option for preventing the need for beak trimming.

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Omega-Acids Could Reduce Bone Breakage in Laying Hens

ThePoultrySite News Desk
Wednesday, April 06, 2011

UK - Researchers at the University of Bristol funded by the Biotechnology and Biological Sciences Research Council have found that adding the right combination of fatty acids to the diets of laying hens can significantly reduce bone breakage during lay. The research, funded by the Biotechnology and Biological Sciences Research Council (BBSRC), could provide a potentially significant route to maintaining food production whilst promoting animal welfare. The scientists are speaking about their research at The Association of Veterinary Teaching and Research Work (AVTRW), ASF, British Society of Animal Science (BSAS), World Poultry Science Association (WPSA) Annual Conference at the University of Nottingham yesterday, 5 April 2011.

Bone breakage is a considerable welfare issue in laying hens and of the 29 million egg-laying birds in the UK a large proportion experience varying degrees of bone damage. Whilst increased food production is important to combat the challenges of global food security, this must not be achieved at the cost of the welfare of farmed animals. Therefore, reducing bone breakages in laying hens is an important issue.

Lindsay Wilkins at the University of Bristol said: "Laying hens are particularly susceptible to high levels of damage to the keel (breast bone) which result from their relatively poor bone health. This is an increasing issue as the industry moves towards production systems that allow for more movement and access to outside. Whilst these systems have obvious welfare benefits they also increase the higher risk of accidents and breakages."

John Tarlton who leads the present study added: "Our research has shown that omega-3 fatty acid added to the diet of free-range egg laying hens resulted in the birds' bones being significantly stronger, with up to 40 per cent fewer breaks".

The researchers worked with Noble Foods as an industrial partner and their findings are already being implemented to produce improved feeds.

Professor Douglas Kell, Chief Executive of BBSRC said: "To ensure that we can feed a growing world population sustainably and well it is essential that farmers maximise production, but this cannot be done at the expense of animal welfare. By working with industrial partners researchers are able to implement their work more quickly to the benefit of farmers and their hens."

Another member of the Bristol group, Michael Toscano, continued: "In addition to benefits to the chicken, omega-3 fatty acids are also beneficial for human health. One objective of our research has been to produce an egg with fatty acid content that benefits consumers, whilst achieving the same bone strengthening effect in the chicken. Our next challenge is to find the ideal balance of

different fatty acids to maximise the hen's welfare whilst producing more nutritious eggs resulting in a positive outcome for chickens, producers and consumers."

This work was also carried out with support from the Department for Environment, Food and Rural Affairs.

Selective breeding reduces mortality by two-thirds

World Poultry Net

Source: Wageningen UR

11 Mar 2011

Feather picking is a reoccurring problem that affects farms with a large number of animals. Beak trimming is becoming less accepted by the public so alternatives are being sought to reduce aggressive behaviour among chickens. Selective breeding is one of them.

Piter Bijma is researcher at the Breeding and Genetics Group from Wageningen University in the Netherlands. About four years ago, Bijma started a project – together with postdoc Esther Ellen – that involved 1,000 layers in cages that were beak trimmed. He showed that the mortality among these white Leghorn layers was around 30%, due to aggressive picking. However, the researchers noticed that mortality numbers differed per cage.

Bijma and Ellen therefore selected the chickens in the cages that had the lowest mortality figures and used these animals for further breeding. With the second generation “social chickens” produced, the mortality rate was dropped to 33%. After the third selection round, the numbers even dropped to 18 and 12%. "These figures come close to the figures of beak trimmed layers, where the normal mortality rate is around 10%" Bijma explained.

The Dutch researchers want to further fine-tune the breeding programme to come closer to the 10%. They plan to breed another two generations of layers to see if this is possible. Bijma carries out the studies together with breeding organisation Hendrix Genetics. The commercial breeding company is very optimistic about the results and sees commercial opportunities for this type of selection programmes.

Get the light right

Source: World Poultry, volume 27, no. 1. 2011

01 Mar 2011

By Naheeda Portocarero, UK

Light is an important management tool in broiler production. If used successfully it can influence aspects of growth, productivity and behaviour, and is therefore the subject of intense research. From presentations at the 2010 PSA meeting in the USA, it became clear that proper lighting regimes will lead to good flock performance.

While we know that light intensity has an impact on behaviour and physiology, there is debate surrounding the optimum level that should be used. A comparison of different light intensities; 1, 10, 20 and 40 lux carried out at the University of Saskatchewan showed that birds exposed to 1 lux rested more and showed reduced foraging, preening, dust-bathing, stretching and wing-flapping behaviours in comparison to birds exposed to brighter light intensities.

These birds also had bigger and heavier eyes. While there was no effect of light intensity on skeletal health, deep ulcerative footpad lesions decreased linearly as light intensity was increased. And although diurnal rhythms of serum melatonin were unaffected, these results suggest that very low light intensities can compromise the welfare of birds.

Intensity influences behaviour

In practise, however, long periods of dim lighting are commonly used, despite a growing awareness that moderate-length photoperiods with brighter light intensities could benefit the welfare of the birds. Work at the University of California looked at the effects of long and moderate photoperiods at dim and bright light intensities on behaviour and health of broilers. The long photoperiod consisted of 20 hours light and 4 hours dark, while the moderate photoperiod was made up of 16 hours light and 8 hours dark. The dim photoperiods consisted of 1 lux during the day and 0.5 lux during the night whereas the bright photoperiod was 200 lux in the day and 0.5 lux at night.

There were no differences in feed conversion ratio, but the birds subjected to dim lighting were around 70g heavier than those in bright light. The birds in bright light were more active and fed more during the day but less active and fed less at night than those reared with dim light. Birds on low light intensity had larger and heavier eyes than those receiving bright light. These results suggest that light intensity, rather than photoperiod, has more influence on broiler behaviour and eye health and that very low intensity appears to dampen behavioural rhythms.

Light is an important management tool in broiler production. If used successfully it can influence aspects of growth, productivity and behaviour, and is therefore the subject of intense research. From presentations at the 2010 PSA meeting in the USA, it became clear that proper lighting regimes will lead to good flock performance.

Photoperiod and sleep deprivation

Turning attention from light intensity to photoperiod, new research has focused on sleep fragmentation, a form of sleep deprivation. Based on measurements of melatonin and behavioural data, there is a strong suggestion that flocks raised under 23 hours of light do not develop synchronised circadian rhythms. Such unsynchronised activity can lead to sleep fragmentation.

The joint study by Aviagen and the University of Saskatchewan looked at the impact of day length (14, 17, 20 and 23 hours) on melatonin and behavioural rhythms in Ross male broilers. Serum melatonin in birds raised on 14, 17 and 20 hour day length showed quadratic relationships with time of day. High values coincided with the dark phase whereas low values coincided with the light phase; this suggested flock synchrony. However, no relationship between behaviour and time was found for birds raised under 23 hours, suggesting unsynchronised free-running rhythms. Clearly, this should be avoided.

Abrupt changes should be avoided

Abrupt changes to a lighting programme cause an immediate and dramatic decline in feed intake and feed conversion efficiency, which can be avoided when the changes are made gradually. This has been tested using three lighting programmes: control - 23 hours light (at 20 lux) followed by 1 hour dark; abrupt - whereby an abrupt change to the lighting schedule was made on day 10, or gradual, whereby changes to lighting rhythm were increased gradually.

At 14 and 21 days of age, birds raised under the abrupt programme were lighter than those raised under the other programmes. Daily feed consumption measured from day 7 to 13,

showed a significant drop in intake when the abrupt lighting change took place, while no decline was noted in the gradual change. Feed conversion ratios were poorest for control birds, and were better for gradual birds until 14 days after which gradual and abrupt birds showed similar ratios.

Fear of the dark

Because lighting conditions during incubation affect brain development and hormone regulation, there may be an effect on post-hatch behaviour, including fear-related behaviour. A trial looked at the effects of four incubation lighting conditions on the fear responses of broilers post-hatch.

Throughout incubation, Cobb broiler eggs were provided with either 0, 1, 6, or 12 hours of 550 lux full-spectrum fluorescent light daily. Post-hatch, the broilers were subjected to a range of fear tests. During all tests, the responses of the birds receiving 12 hours of light indicated that they were less fearful than broilers in other treatment groups, indicating that providing 12 hours of light during incubation reduced the fear response of the broilers when compared with the broilers incubated in complete darkness. Further work, as indicated by corticosterone and IgG concentrations, has shown that broilers provided with 12 hours of light during incubation were less affected by stressors post-hatch.

Lighting affects meat yield

Lighting in broiler houses can have more of an influence on bird performance even than strain, and this is particularly seen in breast meat yield. Researchers at Auburn University used different lighting programmes on two different strains of broilers, either tray pack or breast yield, to look at differences in meat yields. Lighting programmes used were (1) long-bright photoperiod of 23 hours light and 1 hour dark (2) increasing-dim; ie varying the number of dark hours throughout the growth cycle, and (3) split dark period and bright intensity treatment of 16 hours light, 4 dark, 2 light and 2 dark.

Body weights at day 47 were greater for the increasing dim and split dark bright treatments than for the light bright photoperiod. Feed conversion was improved at 15 days in increasing dim light relative to the other two lighting programmes. Increasing dim yielded higher wing and drum weights compared to the two other lighting programmes, while total breast yields, fillet yields and tender yields were greater when the long bright photoperiod was used. In contrast, no strain effects were seen on meat yields.

Light is an important management tool in broiler production. If used successfully it can influence aspects of growth, productivity and behaviour, and is therefore the subject of intense research. From presentations at the 2010 PSA meeting in the USA, it became clear that proper lighting regimes will lead to good flock performance.

Assessing LED

Light emitting diode (LED) light sources may be potentially beneficial to lower energy costs. The efficacy of LEDs as a light source for growing broilers has been tested using different light intensities from 5 to 25 lux, in increments of 5 lux (W325). Dimmers were installed in each pen to allow ease of adjusting lux intensities. Birds were raised for the first three days using incandescent ceiling bulbs, and on day four the LED lights were lowered to treatment intensities and the overhead lights were turned off. The LED lights were left on a 24-hour light schedule, but during daylight hours the curtains were occasionally dropped to prevent birds from overheating.

Body weight gain under 5 to 25 lux was 1472g, 1480g, 1481g, 1536g, and 1541g, respectively, although the differences were not significant. Feed to gain ratios were not affected. It was observed that birds raised under higher intensities of light exhibited more physical activity than those raised under lower light intensity. The data concluded that it is possible to raise broilers under as low as 5 lux of light, from LED sources.

Switch lights to save costs

Finally, a study of lighting in broiler houses in Kentucky looked at floor level illuminance in 37 broiler houses on 25 farms in five different production complexes in Kentucky, using a light meter to measure light intensity under both “bright” and “dimmed” light conditions that were typically used. Bright light intensities ranged from 3.2 to 49.5 lux, with the intensity on most farms being concentrated in the mid to lower part of that range. The highest intensity occurred in a house that was using oversized compact fluorescent bulbs. Dim light intensities were all less than 6 lux with most farms operating at less than 3 lux. Depending on the farm, changing existing incandescent bulbs to cold cathode or compact fluorescent bulbs may save 8,000 - 12,000 kWh/house/year.

UK study examines empathetic nature of domestic hens

Source: Bristol veterinary school
10 Mar 2011

A study by the University of Bristol’s School of Veterinary Sciences is the first to demonstrate that birds possess one of the important attributes that underpins empathy, and is the first study to use both behavioural and physiological methods to measure these traits in birds.

Using a well-controlled experimental procedure and making use of technical advances in non-invasive physiological monitoring, the researchers found that domestic hens show a clear physiological and behavioural response to their chicks’ distress.

During one of the controlled procedures, when the chicks were exposed to a puff of air, the hens’ heart rate increased and eye temperature decreased. The hens also changed their behaviour, and reacted with increased alertness, decreased preening and increased vocalisations directed to their chicks.

Some of these responses have previously been used as indicators of an emotional response in animals. In domestic chickens, time spent standing alert is associated with higher levels of fear. Previous research carried out by the same group has shown that hens also selectively avoid surroundings associated with high levels of standing and low levels of preening.

Jo Edgar, PhD student in the School of Veterinary Sciences, said: “The extent to which animals are affected by the distress of others is of high relevance to the welfare of farm and laboratory animals. “Our research has addressed the fundamental question of whether birds have the capacity to show empathic responses.

“We found that adult female birds possess at least one of the essential underpinning attributes of ‘empathy’; the ability to be affected by, and share, the emotional state of another.”

The researchers used chickens as a model species because, under commercial conditions, chickens will regularly encounter other chickens showing signs of pain or distress due to routine

husbandry practices or because of the high levels of conditions such as bone fractures or leg disorders.

Hens Feel for Their Chicks' Discomfort

by Jennifer Welsh, LiveScience Staff Writer

Date: 08 March 2011 Time: 09:01 PM ET

A worried mother is often called a mother hen, and new research is showing how true this expression may be. When her chicks are in distress, a hen will react physically, showing empathy.

"It's very fascinating to find out about the emotional lives of animals, but also it's highly relevant for animal welfare," said researcher Joanne Edgar of the University of Bristol, in southern England. The finding is important in farming or laboratory situations, where birds and other animals are often exposed to the pain and distress of their co-habitants in tight quarters. If they feel empathy toward their injured coop-mates, they could be put under extra stress.

To simulate this stress, the researchers exposed hens and chicks to puffs of air (as from a keyboard-cleaning canister), causing the birds mild distress without harm or pain.

The hens, which were separated from the chicks but could see, smell and hear them, paid more attention to their surroundings when the puff of air was directed at them. But when it was directed at their chicks, the mama birds responded more intensely with a stress response equivalent to fight-or-flight behavior: The hens' heart rates increased and their external temperatures changed (even though the chicks weren't making distress calls, ruling out the possibility that this was a protective-mom response).

They also emitted a "maternal vocalization" call, which is used to call their chicks back to them, Edgar told LiveScience. "It also enhances memory formation of the chicks. Then they know what to do in these circumstances if it ever arises again," she said.

Primatologist Frans de Waal of Emory University, who wasn't involved in the study, called the findings very interesting. "Not only is the mother hen emotionally affected, she also starts calling, which seems an 'other-oriented' response. She is trying to change the situation," de Waal said.

Edgar said she is currently studying whether this same reaction happens in response to other adult chickens, and seeing what actions the hens might be reacting to. Also, the team is seeing whether this reaction could be called an emotion, by determining if it can be classified as an "adverse" or protective reaction by the hen.

Most empathy studies in animals have been conducted in mammals, assuming that such a response evolved with parental care of children, an obligate behavior in mammals. This new study, along with others, suggests empathy might have evolved from an older common ancestor – possibly a reptile, de Waal told LiveScience in an e-mail. Empathy could be over 200 million years old, he wrote.

The study was published in Today's (March 8) issue of the journal Proceedings of the Royal Society B

Incubation Conditions Affect Broiler Leg Strength

March 2011

The PoultrySite

Initial findings from a new study the University of Sydney, Australia, showed that there were measurable effects on broiler leg strength from alterations in temperature and humidity during incubation.

Temperature and humidity during egg incubation can affect the long-term leg strength of fast growing meat chickens (broilers). A recent study at The University of Sydney, funded by the Poultry CRC, examined the impact from two differing sets of incubation conditions on early growth rate, bone composition and leg weakness measurements in a pure line broiler breed. Initial findings showed that there were, indeed, measurable effects from alterations in temperature and humidity.

Doctors Peter Groves and Wendy Muir were intrigued by a field report of an unusually high incidence of leg deformity in two separate hatches of pure line grandparent chicks at a primary broiler breeder facility. Both problem hatches were hatched in the same incubator, which had suffered a sudden drop in temperature for two days and which, despite correction, had run with a lower relative humidity throughout the incubation period.

According to Dr Groves: "Leg weakness is currently targeted through proper nutrition, management practices and environmental conditions. But if incubation regimes affect long-term leg strength, it's another avenue for research to ameliorate this important welfare issue."

Taking advantage of this serendipitous event, Drs Groves and Muir ran a preliminary study to investigate if chicks hatched under test incubation conditions differed from those hatched under control conditions. The results did not reproduce the deformities seen in the field report.

"The test incubation conditions compromised bone development before hatch, possibly causing leg weakness later in life"

However, the results did demonstrate that the test chicks had, at hatch, lower bone ash (mineral deposits in their bones) and higher levels of calcium and phosphorus in their blood than the control chicks. At 13 days of age, the test chicks had higher bone ash levels and equivalent amounts of calcium and phosphorus in their blood compared to the control chicks. At seven and 13 days of age, the test chicks had higher body weights, although this was not seen in subsequent weeks.

Importantly, at 41 days, the test birds had a shorter 'latency to lie', i.e. how quickly they choose to sit rather than stand, than did the control birds. This indicates that the test birds were not as comfortable standing for as long as were the control birds. While it is too early to be definitive, Drs Groves and Muir suspect that the test incubation conditions compromised bone development before hatch, possibly causing leg weakness later in life.

Further work is needed, particularly focussing on the effects of relative humidity. The semi-commercial incubators used in this preliminary trial did not provide the fine control required for experimental work, although they did perform largely as expected. Nevertheless, it is a promising start, holding the potential to further reduce the incidence of leg weakness in broilers and improve the welfare of birds worldwide.

Broiler Welfare Can Be Improved Through Nutrition

Based on a paper presented at the European Poultry Conference (EPC) 2010, changes in the diet can reduce the severity of pododermatitis in broilers, writes Jackie Linden, senior editor of ThePoultrySite.

At the EPC last year in Tours, France, Drs Marcus Kenny, Carolyne Kemp and Colin Fisher from Aviagen Ltd's Nutrition group in Scotland, presented the results of series of experiments investigating the effects of feeding on the incidence of pododermatitis (foot pad dermatitis) in broilers. They found that, by combining all the dietary variables believed to prevent pododermatitis, they could reduce the incidence of lesions to very low levels.

Contact dermatitis of the foot pads of broilers (pododermatitis) is an important commercial condition in the rearing of broilers, they explained. The welfare implications of the condition have been proposed for EU legislation, while economic costs are incurred as the result of carcass downgrading, especially in markets where the foot is valued. Contact dermatitis affects the surface of skin that is in prolonged contact with the litter and when the feet are involved, the skin turns black, erodes and fibrosis develops. In severe cases, lameness and secondary infections may result.

Identification of the Dietary Factors Impacting Foot Health

Dr Kenny and colleagues explained that the severity of the condition has been linked to litter moisture, nitrogen content and pH and so they investigated the effects of some nutritional variables – balanced protein level, energy levels, cereal sources and the effects of feed processing – on the severity of foot pad dermatitis in a series of trials.

In each case, the diets were fed to day-old Ross 308 broilers housed in pens with wood shavings as litter. A three-phase feed programme was used and the birds were kept to 40 days of age. A complete range of production and processing traits were measured.

The results showed that increasing balanced protein levels or reducing dietary energy levels increased the incidence of pododermatitis lesions. On the other hand, lesions were reduced by using lower mineral levels, by feeding maize rather than wheat and by coarse grinding of the feed ingredients.

Effects of a Preventative Diet on Pododermatitis Incidence

The Aviagen group then examined the total effect of the nutritional response under trial conditions. Again, using a three-phase feeding programme, they combined all the factors shown or believed to reduce the incidence of pododermatitis in a diet they called the 'preventative' treatment. Compared to the control diet ('normal'), it had:

- a reduced level of balanced protein in the grower (95 per cent of the control)
 - maize (at 25 and 15 per cent, respectively in the starter and grower) in place of wheat
 - reduced mineral levels (see Table 1)
 - betaine supplement (1g per kg)
 - some chelated trace minerals (10, 40 and 40 mg per kg copper, zinc and manganese, respectively)
 - protected butyric acid (1.5 and 1.1g/kg) in addition to the usual organic acid supplement.
- the diets were prepared by 'coarse' grinding, achieved by regrinding standard pellets.

Table 1. Mineral levels used in the dietary treatments

| Mineral levels ¹ | Feed | Ca mg/kg | Av. P mg/kg | Na mg/kg |
|-----------------------------|----------|----------|-------------|----------|
| Normal | Starter | 10.5 | 5.0 | 2.0 |
| | Grower | 9.0 | 4.5 | 1.8 |
| | Finisher | 8.5 | 4.2 | 1.8 |
| Reduced | Starter | 9.5 | 4.5 | 1.5 |
| | Grower | 8.0 | 4.0 | 1.4 |
| | Finisher | 7.5 | 3.7 | 1.4 |

1 All feeds contained phytase and Ca, P and Na levels include components from phytase addition

The results of the experiment are shown in Table 2 and Figure 1. The 'preventative' treatment resulted in poorer performance, which Kenny and colleagues attributed to the reduced protein content. Mortality, however, was improved and they suggested this was for the same reason. Litter condition and the incidence of pododermatitis lesion were greatly improved.

Table 2. Effects of a diet designed to prevent pododermatitis in male broilers on performance and litter condition

| Diet | Liveweight at 32 days (g) | FCR ¹ at 2kg | Mortality at 32 days (%) | Litter capping ² | Litter moisture (g/100g) |
|---------------------|---------------------------|-------------------------|--------------------------|-----------------------------|--------------------------|
| Normal | 2938 | 1.46 | 5.6 | 40.0 | 52.8 |
| Preventative | 2866 | 1.52 | 3.8 | 28.8 | 40.7 |

1 Feed conversion ratio corrected for mortality

2 Litter capping scored visually at 39 days

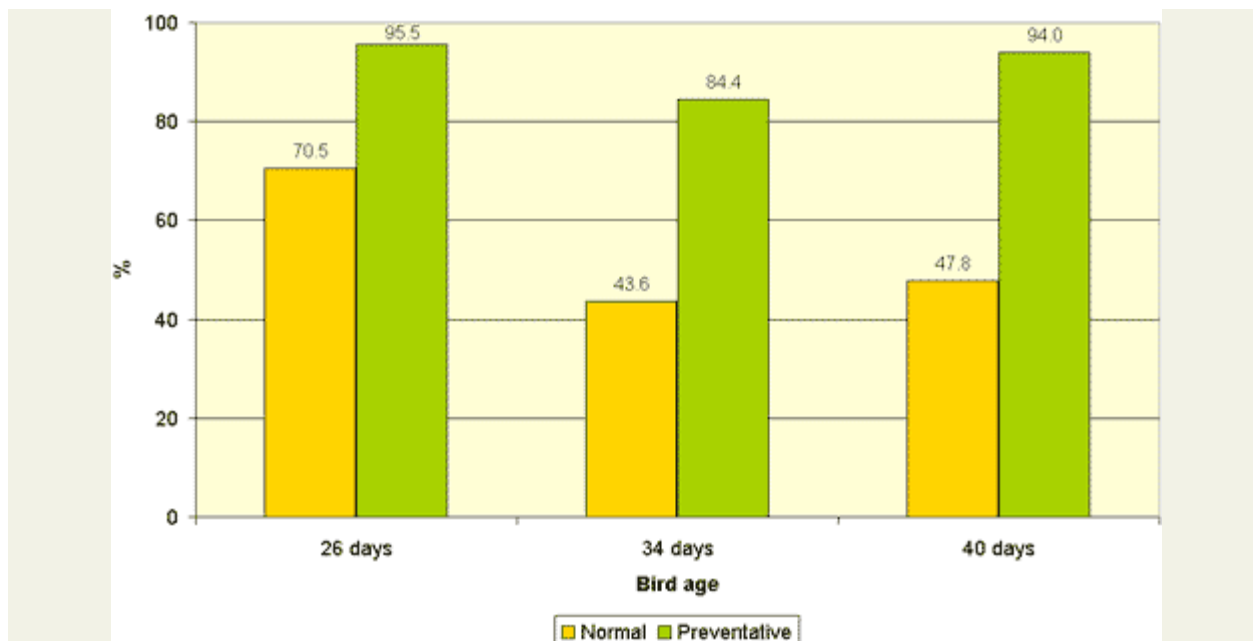


Figure 1. Proportion of male broilers fed two different feeds with zero pododermatitis scores (based on three-point score where 0 = no lesions)

Conclusions

The results show that manipulation of the feed and nutrient levels can play a significant part in a strategy to avoid reduced welfare and economic loss as a result of pododermatitis lesions, said Kenny and colleagues, and they suggested that other contact lesions, such as hock burn and breast damage, would be controlled to some extent in the same way.

Reference

Kenny M., C. Kemp and C. Fisher 2010. Nutrition and pododermatitis in broilers. Proceedings of the XIII European Poultry Conference in Tours, France, August 2010.

Nutritional Effects of Foot Pad Condition Studied

The Poultry Site

March 10, 2011

Litter moisture had a substantial effect on the development of paw burns but neither feed enzymes nor additional dietary biotin improved foot pad condition in broiler chickens, reports Drs Joseph B. Hess and S.F. Bilgili of the Poultry Science Department at Auburn University.

Research was conducted to determine if feed grade enzymes and dietary biotin reduce foot pad problems in broilers, according to Drs Hess and Bilgili. The enzyme trials were undertaken to determine if feed-grade enzymes improve foot pad quality by reducing undigested complex carbohydrates passed into the litter. Six enzymes were fed in a three-feed program in two separate trials. Improvements in intestinal viscosity were observed with feeding of most enzymes. However, there were no measureable improvements in foot pad quality score in either trial.

Biotin has been reported to improve foot pad quality in turkeys and the commercial price of biotin has recently decreased to the point that enhanced supplementation may be economically

viable. Two broiler trials involving four levels of biotin were fed during grow out to determine if higher than normal levels would help protect broiler footpads from paw burns. There were no observed improvements in foot pad lesions following the feeding of higher than normal levels of biotin.

Litter moisture was found to have a substantial effect on the development of footpad burns. Although, addition of moisture either early or late increased paw burns, broilers appeared to have the ability to reduce paw problems from early moisture exposure.

In general, feed grade enzymes and additional dietary biotin did not improve footpad quality measurably under conditions that enhance footpad lesion development (high protein feeds), concluded Drs Hess and Bilgili. Litter moisture did have a marked effect on paw lesion development, indicating that in-house environmental management can go a long way toward managing paw problems in the field.

This research was sponsored by the US Poultry & Egg Association.

McDonald's backing Iowa research on hen housing

DesMoinesRegister.com (blog)

Mar 2, 2011

by Philip Brasher

Laying hens are about to become the subject of a study backed by the food and restaurant industries. The study will be conducted at an undisclosed location in Iowa where hens will be studied in three different types of housing systems.

Egg producers are being pushed to move away from the conventional housing systems in which hens are kept in so-called battery cages.

The study is being funded by a industry group called the Coalition for a Sustainable Egg Supply, which includes such companies as McDonald's and food-service giant Sysco.

The goal is test alternative housing systems on an industrial scale, said Charlie Arnot, a public relations consultant whose Center for Food Integrity is coordinating the project. It is being directed by the American Humane Association, Cargill Kitchen Solutions (an egg processor), McDonald's USA, Michigan State University and the University of California-Davis. Researchers at the UC-Davis, Michigan State and Iowa State University will be involved in the study.

Hens will be housed in three separate barns: one with the conventional cage system; one that is cage-free with what is known as an aviary system where the hens eat and nest; and the third with large-style cages that many producers favor as an alternative to the conventional system. The barn with the conventional system already existed. The other two barns had to be built for the research.

Arnot said that the three housing types will be studied for their impact on food safety, animal health and welfare, worker safety, environmental impacts and cost to consumers. "Research like this has not been done on a commercial scale," Arnot said. The young hens, known as pullets, will be placed in the barns soon, he said.

Iowa is the largest producer of eggs.

OTHER

Animals speak through actions, College Royal hears

Guelph Mercury

Mon Mar 21 2011

Byline: Rob O'Flanagan, Mercury staff

You can ask a farm animal a question, and while it likely won't answer in the King's English, it will speak through its decision-making process.

Ian Duncan told a College Royal audience over the weekend that animals are quite capable of communicating their feelings and preferences, and what they say can guide farmers to engage in practices that are more considerate of animal welfare. Duncan is an animal welfare expert and professor emeritus in University of Guelph's department of animal and poultry science. In the 1970s, he was conducting research into battery cages (a form of factory farming) in egg production. It took 40 years, but such production methods are about to be banned in the European Union. The cages cause elevated levels of stress and aggression in hens, as well as various health problems.

As a scientist, Duncan pondered whether it is possible to learn about an animal's subjective state - its feelings - by, in a manner of speaking, asking them.

Over his four-decade research career, he conducted a number of studies in which he did just that.

And he received many intriguing answers.

Setting up simple preference tests and giving an animal a choice between two options is a good way of learning what the animal thinks of those options.

In one study, chickens were given a choice between living in a cage with a wire netting floor or one with a grid.

"You set up a simple preference test and watch where the birds spend their time," he explained. Chickens prefer the wire netting since it allows them to spread their feet out more over the surface, providing greater support and security, he said. The netting more closely approximates the jungle floor environment in which chickens originated.

Hens "will work very hard" to find a more comfortable, private nesting spot, he said. Confined spaces stress them out, and if given the choice of a larger space they will take it. Make that larger space less accessible by putting a weighty gate at its entrance, and the hen will work hard to open it.

Similar experiments work on fish. The animals, while slower to learn than chickens, will push open gates to get away from a stressful environment into a peaceful one.

Rollkur, the flexion of a show horse's neck using force, was popular in equestrian circles until recently. Many believe it is injurious to the animal's welfare.

"What about asking the horse?" Duncan asked. A simple Y maze was set up in a riding arena divided into two courses using several horses.

For the course to the right, a horse was placed in the rollkur posture, while to the left a normal posture was used. Each course was traversed several times without giving the horse a choice. When finally given the choice, all of the horses took the normal route.

"It was obvious that horses don't like rollkur," Duncan said. Rollkur was banned last year by the International Equestrian Federation.

Animals are sentient beings with a wide range of feelings, and people can understand those feelings better by carefully observing animal behaviour.

"Animals can be asked what they feel about the conditions under which they are kept and the procedures to which they are subjected," Duncan concluded. "This should enable us to improve the welfare of all animals that we have contact with."

Audience members expressed concern about factory farming methods and what they perceive as the alarming and cruel conditions farm animals live under. They wanted to know if producers are listening to people like Duncan. The scientist said they are starting to.

Large fast food chains, he added, have established animal welfare advisory committees to consider the well-being of animals, but their focus is more on the end stages of life.

Ariel Levitsky, a graduate student and president of Guelph Students for Ethical Treatment of Animals, said it is impossible for animals to be treated ethically in factory farm settings, which she called "horrific." She advocated vegetarianism or veganism as a way of ending such practices.

Duncan said cruelty toward farm animals is not only present in these corporate style farms, but also on smaller family farms. The ethical treatment of animals is becoming more widespread as consumers demand it, he said.

Scientific Opinion Concerning the Welfare of Animals during Transport

3 March 2011

EFSA Journal 2011; 9(1):1966

The Scientific Opinion on the welfare of animals during transport reviewed the most recent scientific information concerning the main farm species.

New scientific evidence and consequent conclusions and recommendations were arranged following the structure of Annex I of EC Regulation 1/2005. On fitness for transport, recommendations for cattle and poultry were focused on repeated humane handling and careful inspection prior to transport.

On the means of transport, use of partitions in horse transport, compulsory fasting of pigs with provision of water at stops, and temperature limits for poultry were major recommendations. Maintaining stability of animal groups was recommended as good practice, with special emphasis on the need to avoid mixing unfamiliar pigs or goats. On watering and feeding intervals, journey times and resting periods, journey duration should not exceed 12 hours for

horses and 29 hours for cattle. Horses should be supplied with water one hour before and one hour after transport, and for cattle there should be a 24 hour recovery period with access to food and water. For rabbits, time spent inside the containers during lairage should be considered journey time. Space allowance for horses should be given in terms of kg/m² instead of m²/animal. For cattle and sheep, it is recommended that space allowances should be calculated according to an allometric equation relating size to body weight. Limits for stocking densities of broilers in containers should be related to thermal conditions. On the navigation systems, temperature monitoring systems should be incorporated. Minimum standards should be established regarding data type to be recorded, the system and the on-board architecture. Recommendations for further research focused on the thermal limits and regulation for poultry and rabbits, the effects of ventilation on pigs, space allowance for rabbits, newly hatched chicks and pigs, optimal journey times for horses, pigs and calves.

Stress in Farm Animals and Food Safety: Is there a Connection?

U S D A - A R S - M W A Livestock Behavior Research Unit

Food Safety Fact Sheet

Fall 2010

By Dr. Marcos Rostagno

Stress in Farm Animals: Farm animals are challenged by different management-associated stressors, and consequently, develop varying degrees of stress responses during their lives. Each environment poses its unique set of stressors to which the animal responds. Factors that can cause stress when they act excessively within any animal production system include water and/or feed restriction, heat, cold, overcrowding, and handling (i.e., interaction with humans, or human manipulation of the animals). Additionally, most farm animals are transported at some stage in their lives. The handling, loading, transporting and unloading of animals can have substantial detrimental effects on their well-being by causing stress. Moreover, during this process, animals can be exposed to a range of challenging stimuli including, increased human contact, transport (vibration, movement, and jolting), novel/unfamiliar environments, food and water restriction, changes in social structure (through separation and mixing during transport and/or at the final destination), and changes in climatic conditions (i.e., heat, cold). These challenges perturb the homeostasis of the animals and an adaptive response is activated in an attempt to restore balance.

The Connection between Stress and Food Safety:

Stress reduces the fitness of an animal, which can be expressed through failure to achieve production performance standards or targets, or more drastically, through injury, disease and death. Stress in farm animals can also have detrimental effects on the quality of food products (meat, egg, and milk). The gastrointestinal tract is the primary habitat of a variety of bacteria, including foodborne pathogens. Colonization of farm animals by pathogens such as *E. coli* O157:H7, *Salmonella*, and *Campylobacter*, and their subsequent distribution along the human food chain are a major public health and economic concern for the food industries. The nervous system of the digestive tract is an integrative network located within the gastrointestinal wall that controls its microcirculation, motility, and secretions. It is bidirectionally linked to the central nervous system forming the brain-gut axis. Although we are only beginning to understand the complex physiology of brain-gut interactions involved in stress-related gastrointestinal alterations, there is increasing evidence that stress reactions via the brain-gut axis are not only responsible for functional disorders, but also contribute to inflammatory disorders and infections of the gastrointestinal tract. Additionally, the intimate connection (anatomical and functional) of immune and nervous systems provide another pathway for the stress effects on susceptibility to infections. This interaction has until recently

been the central pillar to support the hypothesis on the effects of stress on infections, however, it does not provide a complete explanation of what really occurs. The gastrointestinal tract is an environment in which, normally, there is a significant presence of catecholamine hormones (particularly, norepinephrine). During episodes of stress, catecholamines are released by the nervous system of the digestive tract, or spill over from the systemic circulation, causing significant local increases. These changes markedly affect the status and behavior of the intestinal microbial populations and colonizing pathogens, indirectly, through suppression of the immune system, and promoting physiological alterations in the gastrointestinal tract, and/or directly, on the intestinal tract microbial populations, including foodborne pathogens, by increasing their virulence and multiplication rate. Consequently, exposure of farm animals to stressors will lead to increased levels of foodborne pathogens in the gastrointestinal tract, and increased risk of contamination of their carcasses. What can be done? Understanding when pathogen frequency and levels are the highest or when farm animals are most susceptible to infections is critical to help identifying critical times when prevention or control measures are needed. For instance, changes in management practices to promote animal well-being and minimize stress can reduce the effects on foodborne pathogens in the gastrointestinal tract, and therefore, reduce the risk of carcass contamination. Also, other potential intervention measures to be strategically applied include the manipulation (or stabilization) of the gastrointestinal microbial populations through the use of feed or water additives (e.g., organic acids, probiotics, prebiotics, symbiotics, and other products), making it more resilient to the effects of stress. As briefly discussed, stress in farm animals has a significant deleterious effect on food safety through different potential mechanisms affecting the susceptibility of farm animals to infections as well as the carriage and shedding of foodborne pathogens. However, the precise mechanisms underlying this effect have not been fully elucidated. It is imperative that the issue receives more research attention in the interests of optimizing animal welfare and minimizing losses in product yield and quality, as well as food safety risks to consumers.

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