

RESEARCH WATCH April 2008

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BEEF CATTLE

Calf Nutrition: Got Milk?

CATTLE NETWORK

3/12/2008

Regardless of the endpoint at which calves are sold, pre-weaning calf nutrition can have a major impact on profitability. Quality and quantity of colostrum and milk are directly tied to both performance and health, and these effects can carry all the way to slaughter.

IT STARTS WITH THE FIRST MEAL

Research done with range beef cows at Clay Center, NE clearly shows the value of receiving adequate colostrum those first few hours after birth. Blood samples taken 24 hours after birth from more than 250 calves were analyzed to see how much passive immunity they had received via colostrum. Individual growth and health were then monitored all the way to slaughter. Calves that received inadequate colostrum had a:

- Ø 5.4 times greater risk of preweaning death;
- Ø 6.4 times greater risk of being sick the first 28 days of life -- which translated into an average 35 pound decrease in weaning weights;
- Ø 3.2 times greater risk of being sick pre-weaning;
- Ø 3 times greater risk of being sick in the feedlot -- which led to a .09 pound drop in ADG.

The key to managing colostrum quantity and quality is to provide adequate nutrition to the dam, especially during late pregnancy. In one trial, first-calf heifers were maintained on either adequate or inadequate levels of dietary protein prior to calving. Total colostrum production was 2586 ml and 1913 ml, respectively -- a 35% difference! Separate work done in Colorado further illustrates the tie between cowherd nutrition and calf immunity. Blood samples were taken from young calves, and levels of two key immunoglobulins were related back to cow body condition score (BCS).

NOTHING BEATS MOMMA'S MILK

Multiple research trials have shown that calves will take in all the nutrients they can from their mother's milk, and only use dry feed to make up any deficiencies. A good creep feed will substitute for grass or hay intake, but neither will take the place of available milk. One of the first papers to quantify this relationship (Boggs et al., 1980) showed that for every one pound increase in daily milk production, 205-day weaning weights in beef calves were increased 7.2 pounds. This point was reiterated in recent work at Cornell, where the impact of calfhoo milk intake level was also evaluated through to harvest. Groups of calves were hand fed to mimic different lactation curves, with peak milk ranging from 6 to 30 pounds per day. All animals had unlimited access to chopped alfalfa. After weaning, the steers were tracked through the feedlot, where ultrasound was used to ensure all cattle were harvested at a similar quality grade. As expected, when less milk was offered, more alfalfa was consumed. Other key differences reported by the authors include:

While the animals that received low levels of milk as calves made up these efficiency differences during the finishing phase, note that they were as much as 128 pounds lighter and 34 days older at a similar Choice endpoint than the calves that were able to get a larger portion of their early nutrition from milk. Collaborative work done over a nine-year time span in Oklahoma and Arkansas looked at both milk yield and quality (as measured by milk fat, milk protein and somatic cell count) in beef cattle of different breeds, grazing two types of pastures. Both quantity and quality of milk production consistently had a positive impact on pre-weaning calf gains. But they were also able to demonstrate that the scope of that response varied with both genetics and diet of the dams. Milk production level and nutritional content played a bigger role in calf growth responses:

- Ø in straightbred Brahman cows than in straightbred Angus;
- Ø in purebred than in crossbred cows; and
- Ø on endophyte-infested tall fescue than on Bermudagrass.

Regardless, though, the key point is that with all cattle, in all environments, and across all years, available milk supply was a key determinant of calf

performance.

While minimal specific research is available in this area, it is probably safe to assume that the diet a calf receives through to weaning will also impact animal health. And because cow nutrition is typically the first-limiting factor in milk production (assuming adequate genetic potential), the feed/ supplementation she receives becomes an important tool in preventing calf morbidity. For example, a summary of North Dakota ranch case studies, presented at an NCBA Cattlemen's College, implicated both protein and copper deficiencies in scours problems.

OPTIMIZE DOES NOT EQUAL MAXIMIZE

It is clear that improved colostrum and milk production can effectively improve calf performance. And we know that improved cowherd nutrition can support increases in milk quantity and quality. But bear in mind that our best net returns will come when there is a good fit, or balance, between animal genetics, forage resources, and calf performance. It may not make economic sense to feed a beef cow so well that she can reach her full genetic lactation potential; the additional feed costs could easily outweigh the value of increased calf production. What does pencil out is strategic supplementation of available forages to boost utilization of that grass or hay. That level of investment should consistently pay out in the form of healthier, heavier calves and feeders.

BeefTalk: Don't Overlook the Value of Cattle Hair

Healthy cattle will tend to not have frost on their backs, even when the weather gets very cold.

By Kris Ringwall, Beef Specialist

NDState University

ND Extension Service

North Dakota agricultural experiment station

Health never can be underestimated. Having been confined lately, that concept is even more appreciated. Comfort, the lack of stress and the need to allow time for recovery are important.

All three factors also are part of cattle management, so appropriate managerial reactions must be thought through. One concept often overlooked in good cow health is hair.

Cow comfort and stress are related to how a cow or calf is clothed. Many studies have been done on hair coat, but most are on how cattle survive in hot climates rather than cold. Regardless, hair in cold climates is important.

Notably, in northern climates, we all can appreciate those days when everything is covered with frost. What becomes obvious very quickly are those buildings that have adequate insulation and those that do not.

A heated building, with minimal or no insulation, will shed frost quickly because heat loss from the inside prevents frost from gathering on the roof. A quick look at rooftops and one can tell what homes are efficient to heat.

The same is true of the beef herd. Healthy cattle will tend to not have frost on their backs, even when the weather gets very cold. A well-fed cow produces a lot of heat, particularly when she is fed high-roughage feedstuffs.

However, as the weather gets colder, the frost eventually settles in. Well-insulated cows, just like well insulated homes, will look like walking frost balls. The hair protects the body from the devastating cold that confronts us all.

Inside, underneath that winter coat of hair, is a very warm, comfortable cow that really is not stressed at all by the cold outside. She doesn't need to depend on constant eating. Instead, she eats what she needs and returns to a protected, comfortable spot on the range where she quietly ruminates and waits for the warm days of spring.

That is in contrast to thin, poor-conditioned cattle that have not developed a good coat of hair. They are not comfortable, are stressed and forced to eat more feed to maintain body temperature.

We don't need fancy technology to understand if our cows are comfortable or stressed. The simple things in life often tell us the most and good managers know the signs.

How cattle respond to the cold is part of that equation. Cattle that don't respond need to be watched for and moved to the sale pen so they may be offered to someone who lives in a better- suited environment.

Sometime ago, one of our dogs, an Australian shepherd, caught an old antelope doe. Having caught up with the dog and reminding her that she should not be catching antelope, I prepared to release the doe.

What was interesting was the antelope's remarkable coat of hair. Not only did the hair protect her from the dog, it also became very obvious that there probably isn't a winter tough enough to freeze a well-fed antelope. Two layers thick, the outer and inner layers actually were interlocked and the fibers provided a solid, outside cover. The antelope depended on her

coat for survival.

Cows are domestic animals that rely on human caretakers. As caretakers, we need to remain aware of the natural traits livestock have.

We tend and keep those traits front and center for our profit and for the benefit, comfort and well-being of the cattle. Hair may not seem like a big deal, but when it comes to the environment, it means survival.

May you find all your ear tags.

Your comments are always welcome at <http://www.BeefTalk.com>.

For more information, contact the NDBCIA Office, 1041 State Ave., Dickinson, ND 58601, or go to <http://www.CHAPS2000.com> on the Internet.

Cattle Protein & Reproduction

Cattlenetwork

2/25/2008

While all aspects of nutrition impact reproductive performance in cows, protein (nitrogen) metabolism plays a unique role in these interactions. There is a wealth of research data outlining the problems caused by inadequate dietary protein, as well as a growing pool of information relating to the effects of excess protein on fertility.

Protein Deficiencies

Many of the forages fed to beef cows are unable to supply adequate protein to the cow, or to provide enough rumen-degradable protein to meet the needs of the fiber-digesting microbes. Dietary protein deficiencies lead to poor body condition, and cows that either do not breed back, or breed back later than desired. These cows are liable to have weaker calves, and produce limited, less effective colostrum. They may also produce less milk through lactation. This results in lighter calves weaned, both in the current and subsequent calf crops.

Additionally, a shortage of DIP (ruminally Degradable Intake Protein) limits microbial activity. And as rumen fermentation is decreased, so is total dry matter intake and digestion. So, with less forage consumed, and breakdown of that forage less complete, the supply of all nutrients is depressed.

What about an Excess?

In order to stimulate and maintain high levels of milk production in early lactation, many dairies balance rations at or above 20% crude protein. Recent research, primarily with highproducing Holsteins, has shown a link between excess dietary protein and some measures of reproductive efficiency. In a trial at Louisiana State University, 23% protein diets fed after calving resulted in reductions in first service breeding and overall pregnancy rates. Similarly, work at Cornell showed that when high dietary protein levels were reflected in elevated plasma urea nitrogen (PUN) levels, pregnancy rates were decreased.

However, in another Cornell experiment, researchers found that they were not able to significantly elevate PUN levels, even when feeding 150% of the degradable protein requirement, unless they also restricted energy intake to 70% of the cows' requirement. At that point, they were able to correlate high PUN with reduced first-service conception and a potentially harmful drop in uterine pH. But it appears from this work that properly matching energy and protein supplies may help offset the negative impacts of excess protein.

Because high levels of rumen-degradable protein or NPN would be expected to have a more direct impact on plasma urea levels than by-pass protein, researchers at Oregon State University compared the effects of 21% protein diets with different proportions of DIP. But they concluded that the excess dietary protein in their experimental diets had the same impact on reproductive performance, regardless of degradability.

Why Is Excess Protein a Problem?

First, it is important to remember that all this work has been done with cattle genetics, diets, and a level of milk production that bear minimal resemblance to a typical beef cow operation. But dietary protein fed well in excess of requirements for maintenance, pregnancy, or milk production does seem to have the ability to:

- Ø Have a direct effect (e.g., lowered pH) on the uterine environment;
- Ø Alter hormone secretion (possibly impacting insulin, progesterone, and/or prostoglandin);
- Ø Lead to a protein:energy imbalance, which would be worsened as some of the already limited energy would have to be wasted in the process of converting ammonia to urea prior to recycling and excretion.

Are There Particular Concerns With NPN (Urea)?

The short answer is no. A five-year, 85,000 cow summary based on Michigan DHIA records showed that dairy cows receiving urea in their diets exhibited

the same calving interval and % open cows as those that did not. And a review of research done by Dr. J.T. Huber of Michigan State showed that neither services per conception, nor first-service conception rate, were impacted by feeding urea. In fact, if we look all the way back to the 1950's, researchers showed that cows that received their entire dietary crude protein supply in the form of urea were able to reproduce normally.

Nevertheless, the belief that urea per se can harm reproductive performance is still encountered in the industry. Perhaps this is because a direct link between dietary urea and blood urea seems logical. In fact, all DIP sources-- both 'natural' proteins and non-protein nitrogen -- yield ammonia in the rumen. All the molecules in this ammonia pool are equally available for uptake by the rumen microbes, or movement into the bloodstream if this doesn't happen. Blood ammonia is converted to urea in the liver, and may be recycled or excreted. PUN levels rise when there is more ammonia released in the rumen than the microbial population can effectively utilize, regardless of source. We see this with excess total crude protein intake, pulse dosing of rapidly degraded crude protein sources, and/or inadequate energy (carbohydrate) available to the microbial population.

Management Solutions

For the cow/calf producer, this is an issue that resolves itself with a well-balanced nutrition program. Forages and supplements need to be selected that:

- Ø Supply adequate protein for maintenance, gestation, and lactation . . . in a cost-effective manner
- Ø Don't grossly overfeed protein in the diet . . . if your forages are of that high a quality, dilute them with a low-cost alternative
- Ø Supply adequate energy in a form that enhances activity of the fiber-digesting bacteria ideally in the form of sugar and/or soluble fiber, with minimal starch
- Ø Provide a relatively steady supply of nutrients to the rumen environment . . . don't pulse dose urea or other highly soluble protein sources.

Source: Dr. Cathy Bandyk, Quality Liquid Feeds

Limiting Nighttime Calving - Frequently Asked Questions

Prepared by Nanita Blomquist,

Ag-Info Centre, Alberta Agriculture & Food

This information published to the web on March 4, 2004.

Last Reviewed/Revised on February 14, 2007.

Calf mortality at calving time is reduced significantly with frequent checking of the herd. This supervision is becoming more important with the increasing number of calves with larger birth weights. Therefore it is important to try to calve during the daytime hours when supervision and assistance is most effective.

Can you change the time of day that cattle calve?

Merely changing the feeding time can change the time of calving. Feeding cows at night is the easiest and most practical method of reducing the number of night calvings.

How does feeding in the evenings reduce the occurrence of nighttime calving? Rumen motility studies indicate the frequency of rumen contractions is lower a few hours prior to calving. Pressure in the rumen begins to decrease in the last 2 weeks of gestation, with a more rapid decline during calving. It has been shown that night feeding causes pressure in the rumen to rise at night due to feed volume in the rumen from evening feeding and decline during the daytime.

What are the reasons to eliminating nighttime calving?

There are several benefits to eliminating nighttime calving;

Calving difficulties are easier to manage during daylight

Daylight births give calves time to dry off before the sun goes down

Predators are less likely to strike during the day

It is easier to find calving cows in larger areas and in those areas that have blizzards throughout the calving season reducing losses due to snow and freezing temperatures

Feeding in the evening helps maintain body temperature during cold winter nights

How much can feeding in the evening increase daytime calving?

A British study involving 162 cattle from 4 different farms compared the percentages of calves born from 5:00 a.m. to 10:00 p.m. with cows being fed in the morning versus feeding in the evening. 57% of the calves born during the day were from cattle fed at 9:00 am versus 79% born during the day when cows were fed at 10:00 p.m. A study done in Iowa with 1331 cows from 15 farms showed that 85% of the calves were born between 6:00 am and 6:00 p.m. when fed once daily at dusk.

What about large cattle operations?

For larger operations it may be physically impossible to feed all the cows after 5:00 p.m. With operations of this size it would be important to feed the first and second calf heifers in the evening, as they are the animals in need of the most attention during calving. The mature cows could then be fed earlier in the day. How much time should heifers and cows be allowed to be in labor before assistance?

This is another reason behind influencing the time of calving, as research has shown that once in Stage 2 of labor (Stage 2 is defined as the portion of the birthing process from the first appearance of the water bag until the calf is

delivered) time is limited. Studies have shown that Stage 2 is short, approximately 60 minutes for first calf heifers, and 30 minutes for mature cows. This is important, as the window is small before assistance may be needed, and it is easy to miss a cow or heifer calving during the dark. By getting more cows and heifers to calve during daylight hours, will allow assistance to be given early and result in fewer deaths and also result in healthier more productive cows.

DAIRY CATTLE AND VEAL CALVES

Guide to a healthy hoof

Leduc Representative

Fri 21 Mar 2008

Page: 24

Section: News

Byline: BY DAVID SCHMIDT, SPECIAL TO THE REP

Lameness is the most costly disease in the dairy industry according to Ontario dairy farmer and veterinarian Dr Gerard Cramer.

"Lame cows eat, rest, reproduce and milk less and end up at McDonald's sooner," he told dairy producers at the Pacific Agriculture Show, Abbotsford, B.C., Feb. 14, adding trained observers say 20-30 per cent of cows in freestall barns around the world suffer from some levels of lameness.

"If you really look, you'll see over half of your cows get lame at one point or another."

Since lameness is visible, it can trigger animal welfare concerns among consumers. In fact lameness is used as an animal welfare indicator in the European Union.

While many farmers blame nutritionists for lameness issues, Cramer does not. He says 90 per cent of lameness is due to foot lesions, adding 90 percent of lesions occur on rear feet and 90 per cent of them are on the outside hoof.

There are three types of infectious hoof lesions: foot rot, heel horn erosion and the most common, digital dermatitis. An Ontario study of 4,300 cows in 38 herds showed it in 92.3 per cent of the herds and 21.7 per cent of the cows. A B.C. study of 624 cows in 20 herds found digital dermatitis in 70 per cent of the herds and 15.1 per cent of cows.

Non-infectious hoof lesions include ulcers on the toe, heel or sole, white line disease and hemorrhages. The study showed almost 90 per cent of Ontario herds had at least one cow with a hoof ulcer.

The solution is to implement a hoof health program which focuses on keeping feet comfortable, clean and dry and includes regular disinfection and evaluation. Goals should be increase cow comfort and reduce standing time.

Cramer said producers, hoof trimmers, veterinarians, nutritionists and even dairy equipment companies and builders should all be involved in managing lameness.

"Some things being done in new barns are not very cow comfort-friendly," he stated.

He noted some floors in new barns are not flat, resulting in water pooling. Slatted barns should not be used unless they have scrapers and non-slatted barns should be scraped more than twice a day unless the alleys are very wide. Mats should be placed in holding areas and other areas cows are forced to stand for long periods.

Looking closer at legs

MEATPOULTRY.com,
January 01, 2008
by Dr. Temple Grandin

Swollen hocks and joint problems are both a welfare problem and a meat-quality issue in dairy cows. A recent survey by Dr. Wendy Fulwider at Colorado State Univ. showed that good management of the beds in a free-stall dairy barn will almost eliminate swelling and other injuries on a cow's legs. Freestall housing, where the cows live in a barn equipped with bedded stalls for the cows to lie in, is becoming more and more popular. Both good design of the stalls and maintenance of the bed surfaces are essential to prevent swollen leg joints. In a freestall barn, the dairy cows are free to walk in the alleys and they are not confined to the stalls.

Visiting dairies

Fulwider visited 113 dairies in five midwestern and eastern states. The size of the dairies ranged from 80 to 4,286 cows. Both the bedding type and its management were evaluated. The bed types surveyed were sand, rubber-filled mattresses and water beds. Sand and water beds had significantly fewer swollen joints compared to rubber-filled mattresses.

Careful maintenance of the bedding surface prevented a high percentage of hock injuries on all three bed types. Sand stalls have to be kept full to prevent injury on a rear concrete curb. To minimize hock injuries, the other two bed types must have wood shavings put on them either daily or every other day.

Table 1 shows the huge difference between the top 20 percent of the dairies compared to the worst 20 percent. In the best dairies, 0 percent of the cows had swollen or injured hocks. In the worst dairies, 12 percent to 47 percent of the cows had swollen hocks. Two to 10 percent of the cows had severe swellings where the swellings were larger than a baseball.

There was also a big difference between the best and the worst dairies on cow cleanliness. On the best dairies, 95 percent of the cows were clean with no soil on the udder or belly. On the worst 20 percent, only 71 percent of the cows were clean.

The difference between the worst and the best dairies was management attention to the details of bed cleaning and maintenance.

Dr. Temple Grandin operates Grandin Livestock Systems Inc., Fort Collins, Colo., and is a faculty member in the animal science department at Colorado State Univ.

Table 1 Well Being or Meat Quality Issue

	Small Hock Swelling	Sever Hock Swelling	Percentage of Clean Cows
Best 20% of Dairies	0%	0%	95% to 100%
Worst 20% of Dairies	12 to 47%	2% to 11%	71% to 83%

Heat Stress Model Keeps Cows Cool

By Laura McGinnis

<http://www.ars.usda.gov/is/pr/2008/080317.htm>

March 17, 2008

It's hard to relax if your cattle are stressed, so the ability to predict and avoid potential stressors is essential.

Fortunately, an online model developed by scientists with the Agricultural Research Service (ARS) provides information to help cattle—and producers—keep their cool when temperatures rise. ARS is the U.S. Department of Agriculture's chief scientific research agency.

For years, producers relied on the National Weather Service for livestock weather warnings. When that service was discontinued in the mid-1990s, many producers turned to university websites. The university warnings, like those they'd replaced, were based on temperature and humidity predictions, but did not account for other influential factors.

Elevated temperature is obviously the driving force behind dangerous heat levels, but other parameters—such as humidity, sun intensity and wind speed—are influential as well. The ARS model, developed by Tami M. Brown-Brandl and Roger Eigenberg at the agency's Roman L. Hruska U.S. Meat Animal Research Center in Clay Center, Neb., considers all four parameters in its calculations.

The model, which is updated twice daily, makes predictions for South Dakota, Nebraska, Iowa, Kansas, Missouri, Oklahoma, western Colorado and northern Texas. It analyzes weather forecast information, assesses the danger of incurring heat stress and displays that information as a color-coded map, which can be viewed at:

<http://www.ars.usda.gov/Main/docs.htm?docid=16750>

Ranchers and other cattle managers can consult the map to gauge the heat threat level in their region. More than 200 visitors used this site during the critical heat stress months of July and August in 2007.

Heat stress effects linger longer in dairy herds

North Queensland Register
Monday, 18 February 2008

New research has found that the effects of heat stress on dairy cattle last much longer than previously thought.

The impact on herd fertility lasts for up to five weeks after a hot spell, and tends to be greater in higher producing cows, according to new research from Dr Bill Tranter, from Tableland Veterinary Service, and Dr John Morton, from the University of Queensland.

"Because heat stress has an effect during the five weeks prior to servicing, there's little to be gained by not inseminating on very hot days, or by inseminating in the morning, instead of the evening," Dr Tranter said.

Running a bull with the herd during summer will increase submission rates but it won't improve conception rates, the pair found.

The effects can be severe during periods of continuous hot humid weather.

For example the average number of services to achieve one conception is usually about two, but this can increase to four or even six after prolonged periods of heat stress.

"In these situations, it's definitely worth using cheaper semen straws or possibly even running bulls at those times because it will take it will take more inseminations to achieve a pregnancy," Dr Tranter said.

The best option is to implement some simple ways to reduce the effects of heat stress throughout the hot months.

These include providing shade or sprinklers, lots of water and modifying the daily routine.

Make it a smooth transition

By Shannon Linderoth
(2/29/2008)
dairyherd.com

You've spent weeks nurturing calves from birth to weaning. The payoff is in hutches full of bright-eyed, active, healthy heifers.

Don't drop the ball when you move them to group housing. This can be a stressful time for heifers, and it's easy for problems to arise during this phase. Especially if their housing isn't up to snuff.

Review these six areas of your transition facilities and management to make sure the shift from individual housing to group pens is as smooth as possible.

1. Offer room to relax

Group pens should be designed so that animals have plenty of room to walk around and lie down without being frequently disturbed by pen-mates. That means you need to provide about 30 square feet of bedded resting space per animal.

If your pens include feed and scraping alley space, do not include those

areas in your calculation for resting space. It can be easy to forget, however, and could result in heifers receiving as little as 15 or less square feet of resting space. When that happens, heifers cannot rest without interruption, which is stressful and a precondition for illness and poor feed conversion efficiency, says Sam Leadley, calf care specialist with Attica Veterinary Associates in Attica, N.Y.

“If you give heifers 30 square feet of resting space, that is generally a low-stress environment and they’ll perform better,” Leadley says.

2. Ventilate

Good ventilation is not just for lactating cows; calves need plenty of fresh, dry air to breathe, too.

Natural ventilation is often preferred over mechanical ventilation, but some facilities will need both. And others will require fully mechanical-ventilation systems to meet air-exchange needs.

Regardless of the method, data from Cornell University show that the recommended air exchange rate per animal at this stage should be at least 20 cubic feet per minute in cold weather. That jumps to 60 cubic feet per minute per animal in mild weather and to 130 cubic feet per minute per animal in hot weather.

Properly ventilated facilities will have humidity levels near that of the outdoors and no ammonia odor. Keep in mind that animal respiration adds to humidity levels, as does water usage within the building. For instance, urine or water that is allowed to stand, as well as careless water hose or power washer use, can increase humidity levels significantly.

Check with an agricultural engineer for remediation recommendations if you suspect your heifer facilities suffer from poor ventilation.

3. Provide plenty of bunk space

According to researchers at Penn State University, post-weaned heifers should have at least 18 inches of feed bunk space. This space requirement stays in effect from two to four months of age.

Use stanchions or dividers to define the eating positions, if possible. This enables heifers to learn to eat from a community bunk.

And remember, do not overcrowd or skimp on bunk space. There should be a

slot for each animal, and enough slots so that all heifers can eat a once to ensure adequate intake. This reduces variation in growth rates within pens.

Watch heifers as they eat, recommends Neil Broadwater, regional dairy-extension educator at the University of Minnesota. “Are they all diving into the feed, or are some backing away from it?” Also note any competition at the feed bunk. Grouping animals by size should reduce this problem, but you may need to re-group heifers if competition gets out of hand.

4. Provide lots of fresh water

Heifers that have never experienced group housing need easy-to-find, visible and uncrowded access to water. Provide continuous access to water during all weather conditions, which may mean installing heated waterers in colder climates.

Consider separate waterers for each pen to reduce contagious diseases, especially if you struggle with them, suggests Leadley.

5. Find poor-doers

Not every heifer on your operation is going to flourish immediately in a group setting. So be prepared to intervene when necessary.

The easiest way to spot under-performing heifers is to limit the number of animals per pen. If possible, group no more than eight heifers together at first. It is much easier to find those who do not adapt to a group environment or are sick if you only have a few to observe at one time, says Leadley.

If that is not practical on your operation, assign one person to observe each heifer every day for signs of problems. Just be sure not to overcrowd pens. Develop a protocol of how to handle poorly performing animals. Then put it into practice.

6. Create handling facilities

Make sure your transition housing has the tools, like stanchions and scales, to routinely handle and manage heifers. Then you can accomplish needed tasks, like vaccinations and sorting, with a minimum of stress to animals and people.

Evaluate heifer housing

Author: Brian Lang - Veal Specialist/OMAFRA

Creation Date: 03 January 2008

Use this checklist to determine how well your facilities meet the criteria described on these pages. Answer “yes” or “no” in the blank next to each statement. If you answered “no” to three or more of these statements, it may be time to revamp your transition-heifer housing or management.

_____ Each heifer has 30 square feet of resting space.

_____ Pens are limited to eight heifers each or less. Or one person is assigned to check each calf daily.

_____ Housing provides adequate ventilation.

_____ Bunk space allows all heifers to eat at once; each heifer has 18-inches of bunk space.

_____ Heifers have easy access to fresh water at all times.

_____ Handling heifers is stress-free for animals and people.

Cow Waterbeds revisited

Author: Jack Rodenburg - Dairy Cattle Systems Lead/OMAFRA

Creation Date: October 2007

Last Reviewed: 09 January 2008

New dual-chamber model overcomes previous deficiencies to provide a comfortable option for free-stall operations.

During the search for the ideal free-stall base over the last 20 years, one option-waterbeds-has never gained much favour in Ontario. However, it's now attracting interest resulting from recently published research.

Cow waterbeds, first developed in Europe 15 years ago, never caught on in our market for several reasons. The original version had a single water chamber that provided little cushioning for a cow's knees. It resulted in poor drainage as it took on the shape of the cow's body and cost more than rubber-filled mattresses. Moreover, European trials showed cows preferred a rubber-filled mattress.

More than a decade of experience with rubber-filled mattresses has identified definite limitations for these bedding systems. The waterbed,

meanwhile, has markedly improved with a dual-chamber design that has helped overcome earlier deficiencies. Waterbeds are sold as a rubber roll of any length, and are filled with 13 US gallons of water per stall through a valve at the front.

Cow preference for rubber-filled mattresses over waterbeds requires some interpretation, as pointed out in a University of Wisconsin study published in the June 2003 Journal of Dairy Science by A.M. Wagner-Storch, R.W. Palmer and D.W. Kammel. Cows have to overcome the impression of instability when they step on wobbly waterbeds, and farmers report they spend less time in the stalls the first few weeks after waterbeds are installed. Since most research trials are fairly short, this affects their results.

The Wisconsin trial was the first to take a longer look. It followed stall use for nine months using video cameras. The first two columns of the table below show percentage of time cows occupied stalls of each type, either standing with two or four feet in, or lying down. The second two columns show how much of the time cows were lying down. In each case, the first column of the pair represents the entire nine months and the last column only the final two months.

These trial results show cows spent the most time lying down in sand, but occupied the best mattress stalls for a greater percentage of the time, often standing. It also shows not all mattresses offer equal comfort. There is a clear difference between the two commercial products included in the trial.

Waterbeds had a lower occupancy initially, but near the end of the trial, as cows overcame stability issues, lying times were comparable to those for Mattress 2, as shown in the table. Since rubber-filled mattresses pack down and tend to get harder with age, one might speculate waterbeds could come out ahead in a preference test after several years.

However, factors beyond cow preference should be considered when you evaluate a free-stall base. Cleanliness, injuries, health and production are important criteria. Cost, life expectancy, bedding requirements, and labour and management demands also affect a system's usefulness.

Waterbeds fared well in field study by W.K. Fulwider, T. Grandin, D.J. Garrick, W.D. Lamm, N.L. Dalsted and B.E. Rollin, published in the July 2007 Journal of Dairy Science. It compared 38 farms with rubber-filled mattresses, 27 with sand bedding and 29 with waterbeds. They scored cows for cleanliness, and lesions and swelling on their front and rear legs.

Among these herds, 72 per cent of cows in herds bedded on mattresses had hairless spots on their hocks, and 17 per cent had swollen lesions. Hock

damage was rare in sand-bedded herds-only 25 per cent had hairless spots and less than three per cent had swollen hocks. At 35 per cent, cows on waterbeds had less than half the lesions of those on mattresses, and three per cent had swollen hocks. Although knee injuries were uncommon, they occurred most frequently in sand-bedded herds using very course recycled sand. Herds on waterbeds had the second highest occurrence.

Cows in sand-bedded stalls were slightly dirtier than those on waterbeds or rubber-filled mattresses, the study found. There was no clear difference in somatic cell counts, and cull rates were lowest for herds with waterbeds and highest for those with mattresses.

Waterbed herds had a lower hock lesion incidence because water moves with cows, eliminating pressure points while they are lying down. Waterbed owners also report the surface of a dual-cell bed stays dry and clean. Moisture drains away, and flexing the surface dislodges dried-on manure. They suggest the beds require less bedding than rubber-filled mattresses, and they like the fact the cushioning effect doesn't deteriorate over time.

One common question is whether the beds freeze in cold weather. I have spoken to Ontario and Wisconsin producers who report no problems, even when barn air temperatures dip below freezing for several weeks at a time.

While these studies rank waterbeds as moderate for cow preference and comfort, and high for hock scores, research results never provide complete answers. The studies didn't consider newer rubber mat products and mattresses made with combinations of foam and rubber instead of rubber crumb. These models may perform equally well or better.

The final question is whether more comfort and freedom from injury makes a difference in cow health or production. A Norwegian study provides some answers. At the Sixth International Dairy Housing Conference last June in Minnesota, researchers L. E. Ruud and O. Osteras presented data from a field survey of 370 Norwegian herds that replaced concrete stalls with various types of softer base materials.

The researchers grouped stall bases according to softness by using a standardized test. It measured surface penetration depth by a standard weight dropped from a standard height.

Stall bases that offered a penetration of one to eight millimetres were associated with a 2.7 per cent production increase. Nine to 16 mm resulted in 4.8 per cent more milk, 17 to 24 mm led to a 7.3 per cent increase, and cows on the softest beds with greater than 24 mm penetration gave 7.7 per cent more milk than animals in concrete stalls. Although this study did not specifically mention how many, if any, waterbed herds were included,

waterbeds would rank in this highest category for softness with the testing method used.

These Norwegian cows gave more than 500 extra litres of milk per year when provided with a softer stall base, and most likely paid for the added investment in little more than one year.

This article first appeared in the Ruminations column of The Milk Producer Magazine, October, 2007.

Colder Temperatures Increase Feed Requirements for Calves

Calves have increased nutrients requirements when the air temperature drops below 10 oC (50oF). At colder air temperatures, calves must utilize energy to maintain body temperature that would otherwise go to growth. Calves that are under 3 weeks of age need additional feed to compensate when the air temperature is below 15oC-20oC.

A quick rule of thumb for calves over 3 weeks of age is that one additional litre of milk replacer is needed for each 10 oC decrease in air temperature below 10oC. For calves under 3 weeks, one additional litre is needed for each 10 oC air temperature decrease below 20oC.

For older calves, 0.5 kg of grain mix or calf starter for each 10 oC decrease in temperature below 10oC will provide the additional energy required by calves at the cooler temperatures.

The table below is for calves that are dry, well bedded and kept out of drafts. If not, the feed requirement will be even higher in cold temperatures.

Additional Feed Requirements Needed by Calves During Cold Weather

Temperature oC	20 oC	10 oC	0 oC	-10 oC
50 kg calf; under 3 weeks Additional	0	1	2	3

Milk Replacer (Litres)				
50 kg calf; over 3 weeks Additional Milk Replacer (Litres)	0	0	1	2
75 kg calf; Additional Milk Replacer (Litres)	0	0	1.5	3
Weaned calves; Calf Starter or Grain Mix (Kg)	0	0	0.5	1

*20% protein, 20% fat Milk Replacer mixed at 125g per litre, (Adapted from NRC 2001 Nutrient Requirements for Dairy Cattle and 1996 NRC Nutrient Requirements for Beef Cattle)

Calves need extra water

Author: Brian Lang - Veal Specialist/OMAFRA

Creation Date: 03 January 2008

Calves need to have water to drink over and above what they get in milk replacer. Fresh, clean water is essential to calf growth. Water helps with the development of the rumen and the digestion of calf starter and allows earlier weaning.

In the 1984, research by A.F. Kertz at Ralston Purina found that weight gain was reduced by 38% and starter intake by 31% for calves between birth and 4 weeks of age that did not receive supplemental water in addition to their milk replacer.

Table 1: Effect of Free Choice Water on Calf Performance

Water	Daily gain (grams)	Calf starter intake (kg)	Scour days per calf
Free Choice	309	11.8	4.5
None	180	8.18	5.4

Kertz, Ruettzel, & Mahoney, 1984, Ad Libitum Water Intake by Neonatal Calves and Its Relationship to Calf Starter Intake, Weight Gain, Feces Score, and Season

J. Dairy Science 67: 2964-2969

Dr. J. Quigley's research in 1999-2000, at the APC Calf Research Unit in Ames, Iowa found that water intake by calves was closely correlated to starter intake. The more starter calves ate, the more water they drank. He determined that daily starter intake explained 60% of the variation in daily water consumption. During cold temperatures, supply calves with warm water if possible.

J. Quigley, 2001, Calf Note #68- Predicting Water Intake in Young Calves, [http:// www.calfnotes.com](http://www.calfnotes.com)

PIGS

Tightening-Up Space - Does it Effect Growth?

ThePigSite News Desk

March 26, 2008

With the current shift in the industry toward housing pigs in groups of 100 to 1,000 per pen, questions have been raised as to whether pigs can perform as well in large groups as they do in small.

Canadian scientists B. R. Street and H. W. Gonyou (Prairie Swine Centre), have examined how housing finishing pigs in two group sizes and at two floor space allocations can effect production, health, behavior, and physiological variables.

The studies, which were recently published in the Journal of Animal Science, looked at the effects of small (18 pigs) vs. large (108 pigs) group sizes provided 0.52 m²/ pig (crowded) or 0.78 m²/pig (uncrowded) of space on production, health, behavior, and physiological variables.

Eight, 7-8 week-long blocks, each involving 288 pigs, were completed. The average liveweight at the beginning of the study was 37.4 ± 0.26 kg. Overall, average daily gain (ADG) was 1.032 kg/day and 1.077 (± 0.015) kg/day for crowded and uncrowded pigs, respectively ($P = 0.018$).

Differences between the space allowance treatments were most evident during the final week of study.

Pigs in the crowded groups spent less ($P = 0.003$) time eating over the eight-week study than did pigs in non-crowded groups. However, average daily feed intake (ADFI) did not differ ($P = 0.34$) between treatments. Overall, ADG of large-group pigs was 1.035 kg/d, whereas small group pigs gained 1.073 kg/d (± 0.015 ; $P = 0.039$). Average daily gain differences between the group sizes were most evident during the first two weeks of the study.

Minimal Changes

The investigation found that over the entire study, large groups were less efficient ($P = 0.005$) than small groups. Although large-group pigs had poorer scores for lameness ($P = 0.012$) and leg scores ($P = 0.02$) throughout the eight-week period, morbidity levels did not differ ($P = 0.32$) between the group sizes. Minimal changes in postural behavior and feeding patterns were noted in large groups.

An interaction ($P = 0.04$) of group size and space allowance for lameness indicated that pigs housed in large groups at restricted space allowances were more susceptible to lameness. Although some behavioral variables, such as lying postures, suggested that pigs in large groups were able to use space more efficiently, overall productivity and health variables indicate that pigs in large and small groups were similarly affected by the crowding imposed in this study.

Broken-line analysis of ADG indicated no difference in the response to crowding by pigs in large and small groups. Little support was found for reducing space allowances for pigs in large groups.

References

B. R. Street and H. W. Gonyou. Department of Animal and Poultry Science, University of Saskatchewan, Saskatoon, Saskatchewan, Canada S7N 5A8; and Prairie Swine Centre Inc., Saskatoon, Saskatchewan, Canada S7H 5N9. *J. Anim. Sci.* 2008. 86:982-991. doi:10.2527/jas.2007-0449

Back to the Basics

Author: Janet Alsop - Vet Disease Prevention - Swine - Veterinary Services
Creation Date: 06 February 2008

Paying greater attention to routine tasks in the farrowing barn can result in fewer cull pigs and fewer trims and condemnations at slaughter.

Sanitation is a key factor when processing piglets. All equipment should be clean and sharp. In addition, hands, clothing and boots should be clean. If one has been working with older pigs or treating piglet diarrhea, one should replace coveralls, and wash boots and hands (or wear gloves) before handling new litters.

In order to reduce umbilical infections, which may predispose the pigs to umbilical hernias, the crate floor needs to be clean and dry. Piglets should be farrowed into a clean environment. Any manure that has been produced by the pregnant sow since she was placed into the farrowing crate should be removed before she begins to farrow. Applying a drying powder to solid portions of the crate floor before farrowing begins or dipping the piglets into the powder at farrowing will help to dry the umbilical cords more quickly.

Teeth clipping should be performed with very sharp, clean tooth clippers. Dull tools shatter the teeth and this may result in gum infections. It is only necessary to remove the top 1/3-1/2 of each tooth. Cutting the teeth too close to the gum line often results in gum injuries, which may cause bacterial gum infections or even joint infections if bacteria from the mouth enter the bloodstream. Clippers should be dipped into disinfectant, or wiped with a clean paper towel, between piglets. Some producers do not clip teeth and most see no negative impact. In some cases, there are increased problems with greasy pig, but this generally subsides after herd immunity develops.

Tail docking is usually performed at 1-3 days of age with clippers or cauterizing pliers. The latter equipment is more expensive, but promotes faster healing with a reduced chance of infection. The best length for docking is 1/2-3/4 inch. If clipped too short, the wound takes longer to heal, if clipped too long, tail-biting may occur in the late nursery or finishing stages. The clipper used for tail docking should not be used for teeth clipping, in order to prevent transfer of fecal material to the piglets' mouths.

Splay-legged piglets are occasionally produced. Early identification is essential so that effective interventions can be applied. These can include taping the legs for one to two days and massaging of the hind limbs. Assisting the affected piglet with nursing or administering colostrum can improve the chances of survival.

If not performed carefully and cleanly, castration may result in

infected incisions. The tool used should be very sharp and there should not be any tissue tags protruding from the incisions. Pigs with inguinal hernias should be identified before castration so that they can be dealt with accordingly. The options are:

- 1.. do nothing and ship them as BBQ pigs or market hogs
- 2.. surgically repair the hernia, using local anaesthetic and sedation
- 3.. non-surgical repair, using tape

Both repair techniques can convert these animals into full value market hogs. The techniques need to be demonstrated by the herd veterinarian.

In summary, applying a little extra time at the beginning of the pig's life can translate into more full value market hogs.

Tips for Housing Gestating Sows in Group Pens

By Kathy Zurbrigg BSc. MSc. OMAFRA and Frank Kains, Waterloo, Ontario
November 2007

presented at the Shakespear Swine Conference in Ontario, Canada

In January 2007, Maple Leaf Foods made the decision to stop purchasing pigs in the future from farms using gestation crates.

There is also an increased interest from consumers in "humane-raised" pork. Together this means that Ontario producers may want to investigate the possibility of switching from crated gestation to group sow housing.

Sows naturally establish a hierarchy when kept in groups. Establishing this hierarchy involves a certain number of aggressive encounters for one to three days after sows are mixed together. Good pen design, feeding techniques, and management will decrease the frequency and intensity of these aggressive encounters.

The techniques listed below are used successfully by producers in Ontario who use pen gestation for their sows. Since group sow housing systems vary dramatically, producers may need to modify or use a combination of these suggestions to limit aggressive encounters between sows. The suggestions below are listed in order from least to greatest difficulty (based on labour and cost) to implement.

1. Wean sows into breeding crates

This is only difficult to achieve if your converted facility does not have enough crates for one week's weaned sows. Producers using group sow housing

hold weaned sows in breeding crates for various times, but very few wean directly into pens. During estrous, sows will ride each other and can injure themselves and others in the process. Weaning into breeding crates prevents this. Many producers wait until the 28 day pregnancy confirmation ultrasound before mixing a group of sows. Others have success mixing after seven days in the crates, i.e. directly after breeding. Since implantation occurs around 12-14 days post breeding, it is best to group the sows before or after this time.

2. Put extra feed on the floor of the pen before a group of sows enters. This is a distraction technique. A similar technique is to put a bag of shavings on the floor of the pen. The sows are too busy eating (or investigating in the case of shavings) to bother fighting with each other. Some producer s feed extra feed (1.5 times the normal ration) for two to three days after a new group is mixed.

3. Add a boar to the pen

The boar assumes the role of "leader" and keeps aggressive encounters between sows to a minimum. If the boar is too aggressive he may injure a sow. If he is not aggressive enough, a dominant sow may attack him, so you need a boar with the correct temperament for this work.

4. Mix the new group at the end of the day and turn out the lights

Many producers combine this technique with adding extra feed on the floor. The theory is that the sows are calmer when they are full and the barn is quiet and dark.

5. Mix groups of sows by size

Try to prevent groups from having one or two very small or very large sows as these "outlier" sows can often be quite dominant or submissive. This is notwithstanding that some small sows (particularly gilts) can be very aggressive sometimes.

6. Larger groups of sows (20 or more)

Larger groups of sows seem to reduce the number of aggressive encounters. Aggressive sows don't bother to pursue a sow through a larger group and the sow being chased can hide within the larger group. Smaller groups of sows (generally less than 10) are more prone to the establishment of strict dominant hierarchies than larger groups of sows. It appears that groups can be so large that sows "give up" trying to establish a hierarchy.

7. Add partition walls

The addition of partition walls (either cement or hanging rubber mats) provides sows with hiding places when being pursued by an aggressor. Often if the sow can get out of sight, the attacking sow stops the chase.

N.B. If you have converted partially slatted grower-finisher pens into

housing for gestating sows, it is possible to combine #5 and #6 by opening the partition at the back of the pen (over the slats) that separates two pens. In this manner sows are able to choose which side of the pen and which sows they prefer to congregate with. The solid pen divider over the solid area now serves as a visual barrier. By thus combining two pens one also gets the benefit of increased sow numbers. This may increase the work load for staff pre-farrowing, if they need to sort sows that need to go to the farrowing room. Batch farrowing can sometimes overcome this problem.

8. Spread out the feed

Aggressive encounters between sows occur most often during feeding. By spreading the feed over the entire solid floor surface, there will be more distance between the sows as they are eating. This decreases aggressive sow encounters. The addition of an inverted "Y" PVC pipe or a cone underneath the drop feeder is an inexpensive way to spread out feed as it drops. A second but more costly method is to add a second row of drop feeders, set apart from the first.

N.B Having two or more separate solid surface areas for feeding (ie separated by partition walls or a centre dunging area) is the best way to reduce aggression when feed drops.

Submissive sows then have the ability to move away from dominant sows to a different area to eat.

9. Feed the sows multiple times a day

Sows are often fed once a day. This results in a large amount of anxiety just prior to and during feeding and causes more aggressive sows to hoard feed increasing fighting between sows. Feeding smaller amounts three to eight times throughout the day, results in calmer sows during feeding as they are not as frantically hungry prior to being fed.

Create one or two "ideal" sow mixing pens.

**This idea has not been tested in Ontario (that I have seen). If producers are renovating a conventional crated barn to group housing, they may not have the space or the extra money to invest in having all the group sow gestation pens being the "ideal" model (eg partition walls, separate feeding areas, multiple rows of feed drops). One idea would be to have a few "ideal" mixing pens. After their time in the breeding crates, a new group of sows would be mixed and held in these pens for one week. The same group would then be moved to a more traditional group pen for the rest of their gestation. However, since this idea has not been tested, it is possible that the intensity and frequency of aggressive encounters may again increase once the sows are moved into the second, more traditional pen.

The work that resulted in suggestions 1 through 9 was performed on Ontario

farms with group sow gestation housing. Swine producers tested these methods, through trial and error, and came up with solutions that resulted in limited aggression between sows, when mixed after breeding. These techniques were considered successful for several reasons: the sows have fewer scratches, injuries, and lamenesses and their body condition remains very even. The farrowing rates are greater than 80 per cent and producers rarely pull a sow out of a pen that is not doing well in the group situation. Finally, producers find working in group sow housing barns a quiet and pleasant alternative to crated gestation.

Housing During Early Pregnancy Affects Fertility And Behaviour Of Sows

Source: April 7, 2008 AASV by Munsterhjelm C, Valros A, Heinonen M, Hälli O, Peltoniemi OA, Housing During Early Pregnancy Affects Fertility and Behaviour of Sows, *Reprod Domest Anim.* 2008 Mar 31 [Epub ahead of print].

From 1.1.2013 EU legislation will permit stall-housing of dry sows for only 4 weeks post-service. Stalls are associated with compromised animal welfare, but group housing comes with risks from social confrontations. Studies on housing effects on fertility have produced contradictory results as systems are inconsistently defined. Effects of housing on pregnancy rate 28 days post-service (P28), early disruption of pregnancy (EDP) and behaviour were investigated in 12 replicates of 40 sows. Half of the animals were stalled (treatment S, mean parity 2.4) and half group-housed adjacent on 5.1 m² deep litter per sow (treatment G, mean parity 2.3). Pregnancy was detected using real-time ultrasound. An EDP-diagnosis required a drop of salivary progesterone concentration from >15.9 to <15.9 mmol/l in a series of samples taken on days 17, 20, 24 and 27 post-service. Behaviour was scan sampled on day 27 for 120 min with 10-min intervals. Data was analysed using mixed regression models in MLwiN. Treatment S increased the odds for P28 with 2.3 and the pregnancy rate of a treatment group with 0.1 compared with G. G increased the odds for EDP with 4.6. Treatment did not affect total exploratory or total passive behaviour. S sows explored floor and fixtures (not bedding) more and performed more passive sitting than G sows. Social stress may have caused the impaired reproductive performance in G sows. S sows showed behavioural signs of decreased welfare, but no corresponding reproductive effects. An interdisciplinary approach is needed when evaluating the appropriateness of housing systems.

Group housing called 'simple'

(1/25/2008)

Rod Smith, Feedstuffs Foodlink.com

The general manager of a company that has a group, or pen, sow housing

system explains how it works and what it achieves.

MAXWELL Foods Inc., a division of the Goldsboro Milling Co. in Goldsboro, N.C., is one of the 10 largest pork producers in the U.S., housing 90,000 sows and marketing nearly 2 million finished hogs per year.

Founded in 1989, Maxwell has used group, or pen, housing for its sows from the beginning. General manager and veterinarian Bob Ivey said he anticipated that the animal welfare trends in Europe would develop in the U.S., "and we built our system that way," i.e., group housing that was being established in Europe.

Explaining the Maxwell system to a session of the Minnesota Pork Congress earlier this month, Ivey emphasized that he does not advocate any one type of sow housing, saying "good animal husbandry gets good results in any system."

Veterinarian Bob Ivey, general manager of pork producer Maxwell Foods Inc., explained how he saw group housing starting to develop in Europe in the 1980s and anticipated that group systems would come to the U.S., which is why Maxwell built a group system from the beginning.

He also emphasized that a manager needs to worry about "disease and markets, not gestation in pens."

Ivey said Maxwell has a lot of marketing niches and has a marketing relationship with Smithfield Foods Inc., so when Smithfield's customers started asking for more animal welfare-friendly pork, Smithfield turned to Maxwell. He noted that a number of Smithfield's customers have visited Maxwell's farms.

Setting standard

Ivey said he brought in Temple Grandin, an animal scientist at Colorado State University and an authority on animal welfare, to evaluate Maxwell's sow system, which still involves stalls for the breeding and farrowing periods, but sows are moved to gestation pens for the majority of the time for socialization.

Grandin endorsed the system, he reported, quoting her as saying that Maxwell is "setting the standard for large-scale pork production, (and) the entire industry can use (the company) as a model."

Ivey said stalls are necessary in the breeding stage to allow for individual feeding so sows return to pre-farrowing condition, avoid injury to sows and stockpeople who do the artificial insemination and permit

pregnancy checks, and stalls are required in the farrowing period for the safety of the mother and her piglets as well as the stockpeople.

Maxwell mixes five sows or six gilts in pens during their gestation period. Ivey said they are not aggressive or frightened but are "friendly" and socialize well. Photo source: Maxwell Farms.

Grandin okayed stalls for those two periods, and "it's a very defensible position," he said.

Sows are moved to gestation pens at about 35 days, Ivey said, explaining that the pens are 80 sq. ft. in size and allow five sows or six gilts to be housed at 16 or 13 sq. ft. each. He said groups of five are more like the social systems "of pigs in the wild" and make mixing easier.

The sows "are friendly. ... You can go into the pens and touch them," he said, and they do not display aggressiveness or fear of humans. Furthermore, "you can 'see' sows in pens a lot better to identify problems" with their health or other matters, he said.

A key to their behavior is mixing, he said, making sure that gilts and sows are not put in the same pen and that the animals in each pen are of similar condition and size. He also said certain genetics will not mix, and in response to a question, he said "genetic suppliers need to select" for group housing.

Maxwell's system allows all animals in a pen to line up at the front to eat at the same time, and animals receive about 4 lb. of feed per day, an amount that's increased to 5-6 lb. in the last 30 days of gestation, he said. There is better water intake in pens than in stalls, he added.

Gilts and sows housed in pens are sociable, so stockpeople can go into the pens to check on their health and well-being. Photo source: Maxwell Farms.

As for performance, Ivey said Maxwell's sows are ahead of the industry, according to AgriStats data. He cited 2003 data in which Maxwell achieved 22.7 pigs per litter with a death loss of 5.7% versus AgriStats' group results of 19.56 pigs per litter and a death loss of 9.1%; he said Maxwell's farrowing rate was 84.1% versus group results of 81.0%.

He also suggested improved longevity with group systems, reporting that Maxwell "can get nine parities without an issue."

He said stockperson training is critical to the welfare of the animals in the pens and to performance results.

Re-emphasizing that he is not saying one housing system is better than another, Ivey said he does sense that sows "are happier (and) look more satisfied" in pens. Group housing "is really simple. It's not something to be afraid of," he said.

Modified Diet May Increase Swine Birthrate

Source: January 29, 2008 The PigSite.com

US - For more than 20 years, intensive genetic selection has led to an increase in both litter size and birth weight in swine. However, prenatal death and fetal growth restriction remain important factors that limit maximum reproductive performance in swine. New research, funded by USDA's Cooperative State Research, Education, and Extension Service (CSREES), shows this problem may be alleviated by dietary adjustments that can enhance placental growth, thereby promoting an optimal intrauterine environment throughout pregnancy.

Naturally occurring limitations in the placenta's ability to supply an adequate amount of nutrients to the fetus can result in prenatal death and fetal growth restriction. Increased death and reduced growth of fetuses are further exacerbated by the widespread practice of restricted feeding programs to prevent excessive weight gain of sows during pregnancy. Although this feeding regimen can ameliorate farrowing difficulties and appetite reduction during lactation, research from a team of scientists at Texas A&M University and Texas Tech University indicate that sows may not receive sufficient amounts of certain nutrients during mid- to late-gestation to support rapid absolute growth of their fetuses and mammary tissues. Specifically, these nutrients include arginine, one of the amino acids that are the building blocks for tissue proteins.

With grant support from the CSREES National Research Initiative (NRI), Guoyao Wu, Sung Woo Kim and colleagues discovered that prenatal death in swine could be greatly reduced by supplementing standard corn and soybean-based maternal diets with an additional 0.83 percent arginine between days 30 and 114 of gestation. Compared to the control sows that received no additional arginine, the additional supplementation increased the number and total litter weight of piglets born alive by two per litter and 24 percent, respectively. The study shows that a specific dietary intervention can enhance reproductive performance in pigs. This recent discovery may result in a significant economic return to pork producers. An increase in the

number of live-born pigs will markedly reduce the production costs associated with sow reproduction and lactation. An increase in the vitality of newborn pigs will increase their rate of survival to weaning. This use of dietary arginine supplementation was based on the findings of basic research on arginine biochemistry and nutrition that was supported by the USDA-NRI since 1992.

Arginine plays multiple roles in animal metabolism by serving as a substrate for the synthesis of various important molecules that enhance placental growth (including placental vascular growth). Ultimately, this can result in increased utero-placental blood flow and, therefore, improved transfer of nutrients from mother to fetus.

Shoulder Sores in Sows

By Mark White BVSc DPM MRCVS,
National Animal Disease Information Service
NADIS Health Bulletin
January 2008.

Ulceration of the skin over the point of the shoulder producing a “shoulder sore” is a common finding in indoor sows.

It is regularly reported by NADIS veterinary surgeons attending pig farms. It represents not only a welfare problem in the individual but can be the cause of premature culling or even euthanasia.

Causes

Shoulder sores occur almost exclusively in the farrowing area but, once started, can continue in dry sow accommodation and there are a number of factors that can precipitate ulceration:-

- 1.. Protrusion of the point of the shoulder, which is obviously related to the conformation of the animal. In sows which have suffered a previous deep ulcer, there may be a bony reaction, which itself produces a protruding lump which is then vulnerable to further damage.

- 2.. Loss of protective fat cushion. Sows are generally very lean nowadays and the thickness of subcutaneous fat over the shoulder is low. As the sow lactates, this limited fat reserve can be burnt up, allowing the underlying bone to become more prominent and prone to damage. Nutrition of sow from the earliest stages as a maiden gilt – which will influence the starting point fat levels – through repeated pregnancy and lactation, is the key to maintaining fat cover and reducing the chances of ulceration.

3.. Physical abrasion due to floors. Whilst many cases of shoulder sores are directly the result of rough abrasive floors, such as poor concrete or some metal slats – particularly those deliberately made rough to assist grip – ulceration can be a major problem on some floor types that would not be expected at first glance to be involved. This applies particularly to fully slatted moulded plastic flooring. The problem here seems to be the difficulty that the sow has in moving from the lying position to standing in that the slippery nature of the floor leads to considerable thrashing about as the back legs struggle to gain a grip. This might be exacerbated by the fact that many plastic floors are not firmly fixed to their supports and tend to “bounce”.

Other parts of the body, particularly the lower legs may become abraded as well .

Remedial Action

Once a sow shows signs of ulceration of the shoulder, immediate remedial action must be taken. Ideally, she should be removed from the crate to a loose box on deep straw and her litter cross-fostered. Alternatively, a protective pad can be stuck to the shoulder – thick carpet stuck on with Evostick is very effective and plenty of bedding added to the pen if possible. Antibiotic treatment may be appropriate along with analgesic anti-inflammatory medicines.

Consequences of not acting quickly can be:-

- 1.. Deeper ulceration leading to infection in the bone.
- 2.. Cannibalism by piglets, particularly above 3 weeks of age.
- 3.. Fly maggot infestation.

In all of these cases, this represents unacceptable welfare for the sow and may lead to euthanasia. Chronically affected sows are unsuitable for submission to slaughter and thus contribute to overall on farm sow mortality.

Prevention

To avoid the risk of shoulder sores, it is vital that sows start with and maintain sufficient body condition to act as a cushion over the shoulder. Nutritional advisors and veterinary surgeons can provide advice on how best to feed the sow throughout her life.

Knee abrasion in piglets also points towards rough floors

The sow must be fed as much as possible in the farrowing house – factors affecting nutrient intake will include:-

- 1.. Specification of the diet
- 2.. Palatability of the diet and pellet size
- 3.. Frequency of feeding and levels offered
- 4.. Room temperature
- 5.. Water availability
- 6.. Feed trough design

All should be reviewed.

Where rough concrete is present at the front of the crate, it can be improved by a coating of self levelling compound or thin latex bonded screed. Concrete surfaces must be fully degreased and acid treated to remove lime before repairs are undertaken and therefore sufficient time between batches is necessary. Rough metal slats can be smoothed off with an angle grinder.

Fully slatted moulded plastic floors tend to improve with age but they must be fully secured to the base with strong cross supports to stop bowing and bouncing under the weight of a mature sow (250-300kg). To help the sow get up and down, safety matting – such as is used on floors in swimming pool changing rooms – laid across the back of the pen will help but will reduce the clearance of dung through the slats and risk hygiene related disease in the litter e.g. scour, joint ill. Conversely, failure to repair rough surfaces can additionally lead to abrasion of piglet feet and legs, again requiring treatment or euthanasia.

Costs

It is very difficult to put a cost of shoulder sores on a herd. Premature culling or on farm euthanasia leads to loss of the sow's value either as a breeding animal or for meat but in this case the costs to the animal in terms of its welfare are likely to exceed the economic costs.

Economic and welfare considerations for sow housing options

Town & Country

Mon 21 Jan 2008

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Source: Agri News

The practice of keeping pregnant sows in gestation crates has been regarded as the industry standard and currently the majority of sows in Alberta are housed in gestation crates. Dr. Nigel Cook and Kelly Lund with Alberta Agriculture and Food along with partners recently completed a comparative study on the economic and welfare implications of housing gestating sows in conventional stalls and in three different group housing situations. The study compared gestation stalls (GS) and free access stalls (FA) and the second study compared FA stalls with an electronic sow feeder (ESF) and open access stall system with two-tiered space provided by a mezzanine (2T).

The difficulty in comparing conventional housing with alternative group housing systems is the lack of consistent welfare standards. Each system has benefits and costs associated with it. This table attempts to rank the costs and benefits from different housing systems.

"The difficulty with comparing housing systems is trying to balance the lack of social contact in stalls with the risks of aggression seen in group housing, and comparing the injuries pigs receive from group housing with injuries pigs received in stall housing," says Adrienne Herron, livestock welfare specialist with Alberta Agriculture and Food, Red Deer.

"Sows in this study housed in GS receive fewer injuries when compared to sows in FA group housing; however, group housed sows received mostly minor injuries such as superficial skin scratches. These minor injuries are the consequence of allowing sows to have freedom of movement and social interaction. Most of the injuries and fights occurred shortly after mixing sows, demonstrating that sows required an adjustment period and that prolonged aggression was unlikely."

When comparing types of group housing systems in this study the ESF poses potential technical challenges to producers as well as significant costs to install or retro-fit barns. In terms of welfare, the sows in the ESF system experienced more aggressive encounters and received more minor injuries than any other housing system.

"It is possible that the levels of aggression seen in ESF would be reduced with more ESF stations and with the presence of straw bedding," says Herron. "The aggression seen in ESF was likely due to competition for access to the feed source."

The sows housed in FA stalls in this study avoided the competition for food resources, but the stall size and difficulties with gate mechanisms made this housing option challenging. Producers considering the FA or 2T systems need to consider the increased labour challenges that are posed by systems

that feed to the lowest weight sow.

"The open system with two tiered space provided by the mezzanine appears to be the best option for increasing common space while avoiding increased aggression and costs/problems of equipment," says Herron. "Retro fitting barns with gestation stalls would be easily accomplished by removing the back of the conventional gestation stall and installing the mezzanine to increase available space. The difficulty with increasing floor space is the temptation by producers to further increase stocking densities which negates the benefit of increased space."

It is likely that despite what science and economics indicate as most efficient, the final decision will be made by consumer pressures and meat suppliers. If consumers demand crate-free pork, suppliers will respond to this demand and, in turn, place pressure on producers. Societal concern over animal welfare is likely to increase in the future.

"Welfare-friendly housing systems are likely to become the standard in Canada if public interest remains high," says Herron. "However, the potential benefit of group housing systems is difficult to quantify as market trends towards 'welfare-friendly' foods remains unclear."

A more comprehensive study measuring chronic stress from social isolation in sow housing is planned between Alberta Agriculture and Food and the Prairie Swine Research Centre. For further information, contact Adrienne Herron at 403-755-2047.

Drinker Design Does Effect in Newly Weaned Piglet

Mar 10/08

The Pig Site

CANADA - During the first few days after weaning, pigs often experience body weight loss as they adapt to eating solid food. During this time period, they are also observed to drink excessively and develop abnormal oral behaviour such as belly nosing.

Some recently published research suggests that this excessive drinking may be from piglets' attempting to satiate hunger through gut fill from a familiar ingestive source.

Gut fill through water intake may affect establishment of feeding behavior. Using drinker devices other than the standard nipple drinker may ease piglets' transition at weaning by facilitating initiation of feeding and preventing development of behavior problems such as excessive drinking and

belly nosing. This experiment examined the effect of drinker type on water and food intake, growth rates, and belly nosing in newly-weaned piglets.

Investigation

Eighteen pens of 15 piglets each (270 piglets) were weaned at 18.1 +/- 0.1 days of age. They were housed in pens containing one of three drinker devices (standard nipple, push-lever bowl, float bowl).

Piglets' water and feed intake, water usage, body weight and behavior were examined on a pen-basis for two weeks post weaning.

Observations

a.. Piglets with nipple drinkers wasted more water than those using other types of drinker.

b.. Those piglets with float bowls consumed less water than other piglets. Piglets with push-lever bowls spent less time at the feeder than other piglets, although no difference was detected in feed intake ($P = 0.64$) or overall ADG ($P = 0.16$).

c.. Piglets with push-lever bowls also tended to perform less piglet-directed nosing behavior than piglets with the float bowl ($P = 0.04$).

d.. Piglets appear to use more water during the first two days after weaning with certain drinker devices. However, piglets do not appear to attain satiety through water consumption because most of the water used during the first few days after weaning is wasted.

This excessive drinking and water wastage can be abated through use of push-lever drinkers without negative implications on feed intake and growth rates.

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Torrey S, Toth Tamminga EL, Widowski TM. Agriculture and Agri-Food Canada, Dairy and Swine Research and Development Centre, Sherbrooke, Quebec, J1M 1Z3, Canada. J Anim Sci. 2008 Feb 13

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Effect of drinker type on water intake and waste in newly-weaned piglets
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A population-based on-farm evaluation protocol for comparing the welfare of pigs between farms

Authors: Goossens, X.; Sobry, L.; Ödberg, F.; Tuytens, F.; Maes, D.; De Smet, S.; Nevens, F.; Opsomer, G.; Lommelen, F.; Geers, R.

Source: Animal Welfare, Volume 17, Number 1, February 2008 , pp. 35-41(7)

Publisher: Universities Federation for Animal Welfare

Abstract:

The variability of animal-based parameters was studied within a population of 41 farrow-to-finish farms. Data were collected during three visits, each corresponding to a different season within a two-year period. The largest between-farm variability was observed for stereotypic behaviour by pregnant sows, and for skin, ear and tail lesions, dirtiness and respiratory problems in growing pigs. Relationships with housing and management parameters were established to formulate advice on how to improve pigs' welfare.

Group-housed sows performed less oral stereotypic behaviour than individual housed sows (18.7 versus 44.1%), but a higher proportion of skin lesions was observed in group-housed sows (15.4 versus 2.0%). Prevalence of tail-biting behaviour varied between 0 and 21%. The risk for tail biting was higher in cases of reduced levels of floor space per pig, and ear-biting behaviour occurred more often when tails were docked short. Coughing was not correlated directly with the occurrence of lung lesions, but the risk was higher in instances of reduced space availability per pig. Farms could be ranked according to these welfare parameters, ie either according to the score of each individual parameter or based on the summation of all scores. Hence, welfare status was defined in relation to farm-specific information, allowing formulation of advice on housing and management to ultimately improve pig welfare through the matching of a predefined benchmark.

Keywords: ANIMAL-BASED PARAMETERS; ANIMAL WELFARE; ENVIRONMENT; HOUSING; MANAGEMENT; PIG HUSBANDRY

Scientists go whole hog on pig-stress study

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Even the mental picture of a truckload of hogs on its way to market is enough to draw frowns from empathetic animal lovers, but researchers are taking a scientific approach to relieving the stress suffered by the pigs on those journeys.

Ensuring the welfare of the hog is one goal of Agriculture Canada scientists and members of the pork industry. But the bottom line is still the bottom line.

"There's a huge economic impact. There is no one in the business that would intentionally try to harm animals, because there's simply a huge economic loss associated with that," explained Al Schaeffer, a research scientist for Agriculture and Agri-Food Canada in Lacombe, Alta.

Mr. Schaeffer and his colleague Clover Bench have been co-ordinating a review of the existing recommendations, standards, laws and regulations on pig welfare during transport for the past three years to compare them with current scientific literature. It will be used to ensure that coming changes to Canada's Livestock Transport Code of Practice are based on scientific data.

The pork industry is big business for Canadian producers who export seven million live hogs each year.

Mr. Schaeffer acknowledges most people don't understand what the transport and handling of hogs can do to an animal - or the meat it eventually produces.

"If you go for a good plane ride yourself and go through security and all that, it's a stressful day. It's the same with animals," he said. "Even though one would think walking up a ramp into a truck wouldn't be that stressful, it's novel to the animals because they don't do it very much." Stress causes a number of physical changes that can affect food flavour and quality.

The changes to the meat can lead to what the industry calls pale-soft-exudative meat or dark-firm-dry meat.

"What we found more than that - it tends to affect flavour nodes.

If an animal is transported too long, you can well imagine, flavour nodes are changed, which affects tenderness and sweetness," Mr. Schaeffer said.

A change in the body chemistry can also increase the bacteria in the animal.

"It will change the texture," acknowledges Jodi Hesse, the director of policy and communications for Alberta Pork.

"The meat becomes more watery and more pale-looking. It's not something you would see commonly in Canada. It's not a good product that sells," she said.

Sow Herd Management

By Ed Barrie - Swine Sow-Nursery Specialist/OMAFRA

January 2008

Individual sow nutrition is one of the aspects of maximizing sow herd performance in terms of pigs produced per litter, and in the quality of the pigs produced.

The requirements of gilts in getting them developed to mating and on to delivery of their first litter is a whole and complete topic in itself and will be discussed later.

In a rather extensive paper by Dana R. Cooper and John F. Patience at the Prairie Swine Centre titled "Sow Body Weight - Changes in Gestation", it was determined that predicting digestible energy allowances that will maximize sow and litter performance is possible with sows between parity 3 and 5. There is too much variation in younger parity sows and older parity sows to predict sow performance with any accuracy.

Furthermore, the size and weight of the litter at farrowing is important in determining the body weight gain of the sow in gestation. Therefore, using the actual litter size and weight within a sow herd is desirable when calculating daily feed allowances.

What this paper has also pointed out is that, from the time a gilt is selected for a sow herd until after she has weaned her second litter, we do know a lot about her nutritional requirements, but her overall body condition score and development is very much in the abilities of the stock person who sees her daily.

Similarly, sows after the fifth litter also require the guidance and experience of a capable stock person in maintaining them in a state of reasonable body condition while delivering a well-sized litter of vigorous, healthy piglets. During pregnancy, requirements are a good quality gestation diet that will develop the litter, maintaining body condition and adding some body fat to support the sow during lactation.

The requirements to do this will change with the parity as was presented in the paper. It is also clearly understood that as the pregnancy progresses,

so does the nutritional needs of the sow and these demands typically peak in the last five weeks of the gestation cycle.

At parturition, the whole chemistry of the process changes. The nutritional requirements become focused on the need to get enough nutrients in to meet the milk producing requirements of the sow. Typical milk production in sows starts around 3-4 litres per day at birth and works up to 10+ litres per day at full lactation. We would normally start off increasing the feed by .5 kg per day from date of birth, and continue this for several days, hoping to reach 5 kg/day, at which point the sow is put on full feed, or fed to appetite. It must be kept in mind that maximum feed levels will be affected by parity and litter size.

Feeds used should well balance for nutrient content and be made available to the sow frequently, in a fresh form in a clean container. Sanitation is important because of the heightened sense of smell which pigs have. Any rancid, sour or unusual odours will deter them from eating.

Some people find benefits in using wet feed for the first few days to improve palatability and encourage consumption. It is also reasonable to increase the amount of fibre in the diet in the last two weeks of gestation, to expand the volume of the stomach, to enable it to hold the increased volumes of feed required for successful lactation over the restricted yet adequate volumes fed during gestation.

Water should be available easily and quickly, typically from a bowl type drinker, and often is provided to sows both lying down through a drinker and while standing from a bowl.

Following weaning, the sow should be kept on full feed of lactation ration to encourage quick and rapid return to estrus and to assist in the recovery of lost fat and body weight during lactation.

Sows should be weighed in the week following weaning to get a good understanding of their weight gain or loss during the reproductive cycle, and this information can be used quite successful in preparing the nutrition plan for the next gestation cycle.

Depending on the location of the facility, it is often necessary to allow seasonal adjustments to the ration as well to make up for colder air temperatures. While the nutritional balances can all be calculated, it is still critical to use the eye of the stock- man, especially for the first two or three litters, and again in the post five litter portion of the sow herd.

Elastrator Rings For Umbilical Hernia Repair

Pollicino, P., Gandini, M., Perona, G., Mattoni, M., Farca, A. Use of Elastrator® rings to repair umbilical hernias in young swine. *J Swine Health Prod.* 2007;15(2):92–95/ SVC Staff, Feb. 27, 2008.

Source: February 28, 2008 Pig Progress.net

The objective of this study was to evaluate the use of Elastrator rings to repair umbilical hernias in swine. Ten 2- to 3-month-old gilts with umbilical hernias were heavily sedated and placed on their back. The umbilical hernias were manually reduced in each animal and two Elastrator rings were applied on the hernial sac, close to the abdominal wall. The mean time required to reduce hernias and place Elastrator rings was 2 to 3 minutes per animal. At the end of the procedure, in order to allow treated animals to fully recover from sedation, all gilts were housed in individual pens for 12 hours before returning to their original pens. Animals showed no signs of post-treatment pain. No behavioral differences were noted between treated animals and normal penmates. No signs of pain or discomfort or systemic signs were observed (eg, depression, inappetence, prolonged recumbency, self-isolation, self-mutilation, or cannibalism of hernial sacs) Animals were examined daily until the hernial sac separated from the abdomen. Four to 5 days post treatment, the hernial sacs became noticeably discolored. Necrosis became evident 5 to 6 days post treatment and hernial sacs were completely necrotic by day 7. Average daily gain of these eight animals was 1.73 lbs and was comparable to that of the non-herniated pen mates (1.76 lbs). Mean slaughter weights of treated and healthy animals were 377lbs and 390 lbs, respectively, at an average age of 220 days. In two animals, treatment was unsuccessful. At day 7, edema developed between the Elastrator rings and the abdominal wall, pushing the Elastrator rings towards the tip of the hernial sac. These animals were sedated and underwent a second placement of Elastrator rings; however, hernias recurred a few days later in both animals. This study indicates that reduction of recently diagnosed umbilical hernias with Elastrator rings may be an effective therapeutic method in commercial swine. SVC Interpretation

- Elastrator rings may be useful for nonsurgical repair of umbilical hernias in commercial swine 2 to 3 months of age. It is important to diagnose these early, when they can still be reduced.
- An overall cost of approximately \$18.90, with an average cost of approximately \$2.36 for each successfully treated animal was incurred.
- The overall working time required to treat 10 animals was about 50 minutes, including the lag time between sedation injection, hernia reduction and Elastrator application.
- Repair of umbilical hernias using a low-cost, nonsurgical method allows recovery of the economic value of successfully treated animals.

- Many methods of repair including this one have been tried in the past such as surgical, wood clamps and scarification, but no one method has “stuck”.
- Most concur that the majority of umbilical hernias are caused by navel infections. Sanitation, colostrum uptake, powdering pigs and preventative antibiotic at birth all help to reduce the incidence.
- The success rate of this study was better, but required procedures that are difficult for most farms to practice (anesthesia and removal from the pen to an individual empty pen).

Castration of Pigs

By Dr. Allen Harper, Virginia Tech University

Extension Animal Scientist – Swine, Tidewater AREC

and published by Virginia Cooperative Extension, Livestock Update.

January 2008

Castration of male livestock intended for meat production is a long standing management practice.

Background

In North American swine production, castration is essentially universal and only a select few male pigs are left intact as potential breeder boars.

There are two primary reasons for feeding out barrows rather than boars in pork production. The first is behavioral. As the age and body size of sexual maturity is reached, boars tend to be more aggressive with pen mates and more difficult to handle than barrows of similar age and weight. The second and perhaps most important reason is that meat from boars that are nearing sexual maturity (about 200 lbs. body weight) has high potential for an odor and flavor problem commonly called “boar taint.” Boar taint refers to objectionable odor and flavor characteristics that many consumers detect in cooked pork from intact males.

Boar taint in pork is associated with two compounds produced in the live animal: androstenone and skatole. Androstenone is a steroid produced by the testes and concentrated in the salivary glands where it is converted to a pheromone involved in eliciting sexual behavior in gilts and sows during the mating process. Androstenone is also deposited in the fat tissue and can be released in response to heat during cooking thus contributing to boar taint. Skatole is a compound produced by bacteria in the hindgut of the boar. It is absorbed across the intestinal wall into the blood stream, is metabolized by the liver and may be excreted or absorbed into fat tissue where it may cause boar taint (Squires, 1999).

Castration: Another Swine Welfare Controversy?

Some interesting developments are taking place in several European countries with regard to castration of pigs (Arnot and Gauldin, 2007). For example, legislation has passed in Norway and Switzerland that will ban castration of pigs starting in 2009. Certain major supermarkets in the Netherlands have announced that they will no longer sell meat from castrated pigs unless the animals received anesthesia prior to the procedure. The fast food chain McDonald's of the Netherlands has announced that it will no longer sell products containing pork from castrated pigs. A similar announcement has been made by Burger King in the Netherlands.

Here in the U.S. the predominant swine welfare issue has been the use of individual gestation stalls for housing sows during the breeding period and throughout pregnancy. Indeed in Florida, Arizona and Oregon, legislation has recently been passed banning the use of gestation stalls and requiring group housing of breeder sows; and some swine production integrators have announced conversion of production systems to include group housing of sows during extended periods of the production cycle. But castration as a swine welfare issue has not received a lot of attention in the United States. The reports of legislative and food service company mandates on castration in Europe have North American pork producers concerned. Will efforts to eliminate this important management practice that helps control aggressive pig behavior and assures a desirable pork product be imposed here?

Alternatives to castration have been proposed. However, such alternatives are much easier to talk or write about than to actually put into practice. For example in the United Kingdom and Ireland castration of pigs is not standard practice, but pig slaughter weight and age is lighter and younger in those countries. Typical slaughter weight in the U.K. may be 230 lbs. or less while the average slaughter weight in the United States is 269 lbs. Packing plants in the U.S. are designed to be most efficient by processing heavier hogs and to reduce typical slaughter weights by 50 lbs. would have major logistical and economic impacts. It has also been said that European pork consumers are willing to accept a certain amount of boar taint, but U.S. pork processors are understandably reluctant to expect this from their consumers. Other proposed alternatives include modification of castration procedures such as the use of anesthesia when castrating or the use of chemical or immuno-castration in place of surgical castration. Again these are easy to talk or write about, but in general practice have significant technical and economic limitations.

The Most Important Factor: Proper Castration Procedures

The American Veterinary Medical Association's (AVMA) current policy on pig castration can be viewed as striking a balance between animal welfare and the need to efficiently produce quality pork. This group acknowledges that castration helps control aggressive behavior in pigs and recommends that the

procedure be performed at least 5 days prior to weaning to allow for sufficient healing before pigs are removed from the sow. The group's policy also indicates that if castration is delayed beyond 28 days of age, anesthesia or analgesia should be used and the procedure should be performed by a veterinarian on such older, larger pigs.

The AVMA policy on restricting producer performed castration to young pigs that are still suckling the sow has some scientific basis. For example one study indicated that pigs castrated at 2 weeks of age displayed fewer indicators of pain than pigs castrated at 7 weeks of age (McGlone and Hellman, 1988). Another study conducted during the suckling period indicated that pigs castrated at 1 day of age grew at a slower rate up to weaning than when castration was performed at 14 days of age (McGlone and co-workers, 1993). This suggests some disruption in piglet suckling when castration is performed very early during lactation. In a similar study Douet and co-workers (1994) found no growth differences when pigs were castrated at 1 or 10 days of age. These limited trials coupled with the vast experience of swine farm managers and technicians indicate that castration of male pigs within a suckling litter is best performed during mid lactation or at a pig age of 4 to 14 days. Castrating after day 3 allows piglets to receive colostrum rich first milk and establish teat order with minimal disruption during the first days of life. It also allows ample time for testicles to descend into the scrotum and for pigs that may be at risk for scrotal hernia to be identified for special treatment. The advantages of castrating pigs at less than 14 days of age are just as profound. Such pigs are still relatively small and are less difficult to restrain. The testicles are more easily separated from testicular cords and bleeding tends to be reduced. Indeed if properly trained, one person can perform castration without assistance if pigs are within the 4 to 14 day age range. Pigs castrated at this age have the advantage of continuing to receive antibodies through the sow's milk which helps prevent infection and promotes fast healing prior to weaning.

Perhaps the most important aspect of pig castration is proper training and skill development of the individuals that perform the procedure. Veterinarians, animal science educators and skilled swine managers can and should provide this training to anyone who is taking on the responsibility of piglet processing on a swine farm. A current reference on the procedure can be found in the new Pork Industry Handbook Fact Sheet PIH 01-01-07, Baby Pig Management – Birth to Weaning (Reese and co-workers, 2007). Several method variations are described in this publication but the most common method employed on commercial swine farms is for one person using a surgical knife. Typically the knife is a disinfected number 12 hooked or straight blade scalpel available from veterinary supply sources. This procedure as described in the Pork Industry Handbook is reprinted in outline form as follows.

Castration Method for One Person Using a Surgical Knife (adapted from PIH 01-01-07)

1. Hold the piglet by both hind legs with its head down.
2. Using the thumb, push up on both testicles.
3. Make an incision through the skin of the scrotum over each testicle in the direction of the tail.
4. Be sure the incisions are made low on the scrotal sac to allow for fluid drainage.
5. It does not matter if you cut through the white membrane of each testicle or not.
6. Pop the testicles through each incision and pull on them slightly.
7. Pull each testicle out while pressing your thumb against the piglet's pelvis.
8. Thumb pressure on the pelvis is important to ensure that the testicular cords break off at the point of your thumb rather than deep inside the body, which may promote development of a hernia.
9. If necessary the testicle may be cut free of the cord using a scraping motion.
10. Cut away any cord or connective tissue protruding from the incision and spray the wound with antiseptic.

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Castration Of Piglets On EU Agenda

Source: March 25, 2008 Pig Progress.net

The discussion about castration of piglets with anaesthetics is not confined to the Netherlands. In Switzerland, Norway and Belgium the topic is gaining ground again. The Dutch intend on lobbying the EU to completely ban the practice of castration altogether. European researchers are working together on the EU- project PIGCAS, which has as its overall objective to provide information on pig castration that will support EU policy, Costs: 2007, research was carried out into the welfare aspects of anaesthetic procedures. Researchers calculated that castration with anaesthetics costs €1 per piglet carried out by a vet and €13m for the total sector per year. CO₂: castration using CO₂ appears to be a better choice. A visit to Switzerland is planned, where this practice is in a more advanced stage of development. Development of prototypes: 1st year, researchers from the Dutch Animal Sciences Group, carried out a study into castration using a gas anaesthetic containing a mixture 70% CO₂ and 30% O₂. Tests are being carried out since the beginning of this year into instruments developed abroad. Spread of costs: In February this year, the Dutch Agricultural Economics Research Institute (LEI) has begun to create a cost calculation tool. The results of which will be available as of June this year.

Effects of housing finishing pigs in two group sizes and at two floor space allocation on production, health, behavior, and physiological variables

Source: March 21, 2008 AASV by B. R. Street and H. W. Gonyou.
J. Anim Sci. 2008. 86:982-991

Effects of housing finishing pigs in two group sizes and at two floor space allocations on production, health, behavior, and physiological variables
With the current shift in the industry toward housing pigs in groups of 100 to 1,000 per pen have come questions as to whether pigs can perform as well in large groups as they do in small and whether large groups of pigs can use the space provided more efficiently. This study examined effects of small (18 pigs) vs. large (108 pigs) group sizes provided 0.52 m²/ pig (crowded) or 0.78 m²/pig (uncrowded) of space on production, health, behavior, and physiological variables. Eight 7-to 8-wk-long blocks, each involving 288 pigs, were completed. The average BW at the beginning of the study was 37.4 ± 0.26 kg. Overall, ADG was 1.032 kg/d and 1.077 (±0.015) kg/d for crowded

and uncrowded pigs, respectively ($P = 0.018$). Differences between the space allowance treatments were most evident during the final week of study. Overall G:F was also reduced ($P = 0.002$) in the crowded treatment. Pigs in the crowded groups spent less ($P = 0.003$) time eating over the 8-wk study than did pigs in noncrowded groups, but ADFI did not differ ($P = 0.34$) between treatments. Overall, ADG of large-group pigs was 1.035 kg/d, whereas small group pigs gained 1.073 kg/d (± 0.015 ; $P = 0.039$). Average daily gain differences between the group sizes were most evident during the first 2 wk of the study. Over the entire study, G:F also differed, with large groups being less efficient ($P = 0.005$) than small groups. Although large-group pigs had poorer scores for lameness ($P = 0.012$) and leg scores ($P = 0.02$) throughout the 8-wk period, morbidity levels did not differ ($P = 0.32$) between the group sizes. Minimal changes in postural behavior and feeding patterns were noted in large groups. An interaction ($P = 0.04$) of group size and space allowance for lameness indicated that pigs housed in large groups at restricted space allowances were more susceptible to lameness. Although some behavioral variables, such as lying postures, suggest that pigs in large groups were able to use space more efficiently, overall productivity and health variables indicate that pigs in large and small groups were similarly affected by the crowding imposed in this study. Broken-line analysis of ADG indicated no difference in the response to crowding by pigs in large and small groups. Little support was found for reducing space allowances for pigs in large groups.

Better Pig Growth With Correct Chemistry

Source: April 1, 2008 Pig Progress.net

Pigs grow quicker when they are placed in a group where the chemistry is optimal. Such is the result of a study by the Dutch Institute for Pig Genetics (IPG) and the Genomics Centre of Wageningen University. The institutes discovered that it is possible to select pigs and to breed them with a particular social behaviour. As to how much profit such a selection process delivers in terms of quicker growth, both organisations are unsure at present. Potential profit increases are certainly possible for pig producers. With the same feed, average growth is quicker and the path to slaughter can be shortened. Pig interaction: The study shows that the interaction between one pig and another has a big effect on growth.

According to Wageningen researcher, Piter Hijma, "by mixing socially-interactive pigs with a group of other pigs, the latter group tends to grow quicker". Pigs that "get on" better in a group, tend to invest less energy in fighting among each other. Further study into this phenomenon is planned. Hijma hopes that further research will show that there is a connection with animal welfare. "If pigs are bred better on a social behaviour level, then not only are the producers happy, but also the public at large and animal welfare organisations.

POULTRY

CPRC Research Initiative on Poultry Behavior and Welfare

Read about the CPRC ongoing research projects and the poultry welfare cluster in their first official annual report: 2007 CPRC Annual Report.

CPEPC is a founding member of the Canadian Poultry Research Council (CPRC) formed in 2001. With a focused membership of the four national feather agencies and CPEPC, the CPRC continues to gain strength and recognition as the central poultry research funding organization in the country. By sourcing government funding matches of 3.8:1 the CPRC is able to offer significant financial grants to Canadian poultry scientists with research initiatives in important areas identified by the CPRC Board of Directors such as avian gut microbiology, novel feedstuffs, welfare and behaviour, food safety and quality.

In addition to research projects, the CPRC has just announced the approved funding for the development of a cluster of poultry welfare and behaviour expertise in Canada. When fully implemented, the initiative will result in an Agriculture and Agri-Food Canada research scientist being permanently co-located at the University of Guelph. This scientist will work alongside the many welfare and behaviour experts already at Guelph and will also play a coordination role to raise mutual awareness among researchers working in welfare, behaviour and related fields across Canada and beyond. This approach will improve the efficiency of the poultry welfare research effort in Canada.

Testing Gait Scoring Systems

ThePoultrySite. March 2008

As it becomes increasingly important for welfare conditions on farms to meet

consumer and legislative demands, new systems are being devised to ensure that animal health is recognised as a priority, writes Chris Harris, Senior Editor, The new systems are not only measures of the conditions but also used as benchmarks for quality assurance.

One problem found among commercial broilers that is becoming of increasing concern is difficulties with walking and leg disorders.

A study of a new gait scoring system that has been introduced in the US was recently carried out by the University of Georgia, Athens, Mississippi State University in Starkville together with Sanderson Farms.

The study - Validation of a Gait Scoring System for Field Assessment of Walking Ability of Commercial Broilers - was recently presented to the International Poultry Scientific Forum in Atlanta, Georgia.

Prof. Bruce Webster from the University of Georgia told the forum: "Animal Welfare on farms is becoming more and more important. Large problems have been established on walking difficulties among birds, which have welfare, discomfort and mortality repercussions. "A need to establish the depth of the problem has to be established."

He said that one method of establishing the seriousness of the problem was to use gait scoring - a non-invasive method of assessing a large number of birds.

"The Kestin system for gait scoring uses six categories and was used originally for breeder flocks," he said.

"The US system for gait scoring uses a three category system, which has been developed with Sanderson Farms using direct observation of broiler flocks.

"Increasingly gait scoring is being used as a measure of welfare assurance."

In the study the three category US gait scoring system used to evaluate broiler walking ability in welfare audits of commercial flocks was compared with the six category Kestin system.

In two university trials, six week old broilers were gait scored by two observers for each scoring system - a total of 681 broilers. A sub-sample of birds was rescored and used in latency-to-lie (LTL) tests.

"The experiment conducted two trials on Cobb birds. The test went to two different farms to carry out observations and we observed 20 birds in each Kestin group," said Prof Webster.

"We needed heavy birds to be able to observe the problem."

The study showed that too few birds had significant walking difficulties to allow for comprehensive statistical comparison of the two scoring systems, but Prof Webster added that the data were encouraging despite sampling limitations.

He added that there was a significant association between the two systems and both had substantial inter-observer agreement. Both scoring systems had significant correlations with latency-to-lie but the variation of latency-to-lie was too high to give gait score or latency-to-lie much predictive value for each other.

US Gait Scoring System Marking from 0-2

- 0 No obvious signs of problems Balance
- 1 Obvious signs Clear limp, awkward but can walk 5ft
- 2 Severe signs Will not walk 5ft

"The Kestin six category system requires a lot more work to assess the capability of the birds," Prof Webster said.

For the field observations, two teams of observers scored broilers 47 to 61 days of age on five commercial farms each (in total 1381 broilers). Two pairs of observers scored the same birds, each pair using the US system or the Kestin system. The tests used a handler to move the birds through an open space towards other birds.

Broilers with evident walking problems were oversampled to generate adequate numbers in each gait score category.

Weighted Kappa statistics showed substantial inter-observer agreement in each system, but more so in the US system ($K=0.65$ vs 0.78 , Kestin vs. US, respectively), suggesting that the application of the US system was more consistent between observers, Prof Webster told the forum.

He said that Spearman correlations between US and Kestin scores for individual birds had high statistical significance ($P<0.001$) and indicated strong correspondence between the two systems.

The simplicity of the US gait scoring system aids inter-observer agreement, making it preferable to more complex systems for use in commercial welfare audits. The strong correspondence between the US and Kestin systems validates the three category system in light of the well-known six category system.

"There are time criteria that have to be considered in the commercial

field," Prof Webster said.

"The study found good observer agreement between observers in the on-farm trial both in the Kestin system and the US Gait Scoring system and this validates the US system for Gait Scoring."

Footnote

The study was conducted by A. B. Webster and D. Fairchild, University of Georgia, Athens, B., T. S. Cummings, Mississippi State University, Starkville, P. A. Stayer, Sanderson Farms, Laurel, MS.

Bristol Chicken Leg Study Findings Already in Practice

The Poultrysite.com

Wednesday, February 13, 2008

UK - The findings of a Bristol University paper on Leg Disorders in Broiler Chickens published this month is already being put into practice by the British poultry industry, according to the British Poultry Council.

The study was started in March 2002 and completed in 2005 and the full Project Report was published on the Defra website in February 2006. This is the first time it is published in a scientific journal.

The study was conducted by Bristol University with the full involvement of the main chicken producing companies in the UK, demonstrating their commitment to good bird welfare.

The study was intended to identify risk factors associated with leg health problems and to provide recommendations that may be used to improve leg health under commercial conditions.

Following on from the study, chicken producers have continued to work with Bristol and have changed flock management practices in line with the study's findings, according to the BPC.

These changes, such as longer dark periods to give the birds more rest, meal-time feeding in the earlier weeks, and the addition of whole wheat to chickens' feed have significantly improved overall leg health. Since the study was undertaken, new genetic stock has been introduced into the UK chicken sector which has improved the leg health of the breed highlighted in the study.

Some of the results of the Bristol study are at odds with the major Defra-funded project carried out by Professor Marian Dawkins of Oxford University at around the same time.

This study examined the effects of different stocking densities on chicken welfare. It used a different gait scoring system from Bristol and found little difference in leg health between 30kg/m² and the Assured Chicken Production maximum stocking density of 38kg/m². In the Oxford University study chickens whose walk was scored at a level considered to be a welfare problem were on average less than 1% of examined birds, and the score was not affected by stocking density.

All gait scoring techniques currently used to indicate chicken leg health are subjective which reduces their accuracy in scientific comparisons. The poultry sector is keen that objective gait measuring equipment be developed that will remove these subjective aspects and allow meaningful measurements between flocks and across years. Work is progressing on such a device, the BPC said.

"British chicken producers take welfare very seriously as the companies' full participation in these welfare studies demonstrates," a statement from the BPC said.

"Chicken producers heed the practical findings of these studies and implement them to improve the overall health and welfare of their flocks."

Leg Disorders in Broiler Chickens: Prevalence, Risk Factors and Prevention

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Abstract

Broiler (meat) chickens have been subjected to intense genetic selection. In the past 50 years, broiler growth rates have increased by over 300% (from 25 g per day to 100 g per day). There is growing societal concern that many broiler chickens have impaired locomotion or are even unable to walk. Here we present the results of a comprehensive survey of commercial flocks which quantifies the risk factors for poor locomotion in broiler chickens. We assessed the walking ability of 51,000 birds, representing 4.8 million birds within 176 flocks. We also obtained information on approximately 150 different management factors associated with each flock. At a mean age of 40

days, over 27.6% of birds in our study showed poor locomotion and 3.3% were almost unable to walk. The high prevalence of poor locomotion occurred despite culling policies designed to remove severely lame birds from flocks. We show that the primary risk factors associated with impaired locomotion and poor leg health are those specifically associated with rate of growth. Factors significantly associated with high gait score included the age of the bird (older birds), visit (second visit to same flock), bird genotype, not feeding whole wheat, a shorter dark period during the day, higher stocking density at the time of assessment, no use of antibiotic, and the use of intact feed pellets. The welfare implications are profound. Worldwide approximately 2×10^{10} broilers are reared within similar husbandry systems. We identify a range of management factors that could be altered to reduce leg health problems, but implementation of these changes would be likely to reduce growth rate and production. A debate on the sustainability of current practice in the production of this important food source is required.

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Introduction

Due to their short reproductive cycle and their worldwide popularity as a food, poultry represent the most highly selected livestock. Selection of broiler chickens (chickens grown for their meat) has been primarily directed at economic traits which have reduced costs of production [1]–[3].

Throughout the world the majority of broilers are reared using very similar, modern, intensive systems of production where birds are confined for their lifetime within high density housing [4] and reared from hatch to slaughter weight within approximately 40 days. However, there is evidence that in optimising traits for production the resulting birds, whilst producing meat at a low cost, have a reduced viability and reduced welfare [5]–[7], with poor walking ability, or locomotion, a primary concern.

Previous research has highlighted associations between management practices

and levels of leg disorders. Most attention has focussed on the partially effective practices of reducing feed quantity or the nutrient density of feed [e.g. 8], [9], on providing more than 1-hour of darkness each 24-hour period [10], and on attempts to increase bird activity [11], [12]. There are also known genetic effects, with genotype influences on many traits associated with leg health [7], [13]–[15]. Despite a large body of work investigating the effects of specific risk factors [reviewed in 16], there has been little previous work to examine how these practices interact on real commercial farms to determine the overall level of leg disorders in particular flocks. There are also many management practices, with potential influences on leg disorders, which have not been looked at quantitatively. This study was therefore commissioned by the UK Department for Environment, Food and Rural Affairs to investigate the extent of variation of leg disorders within UK flocks and to identify methods by which these disorders could possibly be controlled.

Materials and Methods

We studied broiler flocks belonging to five major UK producers who together accounted for over 50 per cent of UK production. Two other relatively large companies were invited to participate but declined. We obtained data from each producer in proportion to their respective annual broiler production. Visits were randomised to farm and flock and were made by veterinarians who had completed a five-day training course to evaluate broiler walking ability with a standardised gait scoring method [7]. Eighteen veterinarians with postgraduate qualifications in poultry medicine and production, or in welfare science, acted as flock assessors and were trained to categorise gait scores within a range from 0 (completely normal) to 5 (unable to stand). The scoring system primarily assesses walking ability rather than exhaustion, with assessors trained to identify rolling gaits, limping, jerky and unsteady movements and problems with manoeuvrability. The scoring system is also known to correlate well with other methods of assessing leg disorders that do not involve active movement, such as the latency-to-lie test [17]. Throughout the study the uniformity of the assessors' scoring was monitored and by the end of the course, average scores for each category were all within half a score. During the subsequent 18 month study, assessors were sent at approximately six and 12 months, a tape containing new video sequences covering a range of gait scores. The scoring of these tapes was monitored to ensure that the assessors remained in agreement. Reference movies of birds' walking ability for each of the six categories are given in the supplementary information [Movie S1, Movie S2, Movie S3, Movie S4, Movie S5, Movie S6]. Each of 176 flocks was visited approximately three days before the flock was depopulated for slaughter and at least 250 birds from each flock were gait-scored from ten, pre-selected, randomised sites within a house.

Fifty seven of the 176 flocks in our study were not 'depopulated' for

slaughter simultaneously. Instead, one of more groups of birds were removed sequentially over a period of days or weeks in a process known as 'thinning'. This process involved the removal of a portion of the flock, usually the female birds, to allow the remaining birds more room to grow on to a greater weight. To account for the effects of 'thinning' practices, an additional 30 visits were made as second visits approximately three days prior to a later depopulation of one of the original 176 flocks. The flocks visited a second time were also chosen at random from the initial set of flocks.

A primary aim of the study was to investigate possible risk factors associated with the wide inter-flock variation in leg disorders. Of particular interest were risk factors associated with bird husbandry which could possibly be altered when rearing future flocks. Information on these aspects was obtained for each flock by a direct interview with a farm representative. The same questionnaire was used for each visit and comprised 134 questions initially about the breeding flock that had supplied the farm, the facilities where the eggs had been hatched, the distance and time the chicks had been transported, and hatchery vaccination policies. Information was then obtained about the number, weight, sex and time of chicks placed, and their date of arrival. The largest section of the questionnaire sought information on husbandry practices including stocking density and thinning practices, nutritional information, layout and construction of the house, and background information on health, growth rates, mortality and culling policies. Finally, information about the personnel working with the flock, the farm, biosecurity measures and company policies was obtained. After conducting the direct interview, each veterinary assessor collected direct information relating to air quality, temperature, general cleanliness and feed quality.

Statistical Analysis

Statistical models were built to identify between-flock variables that were associated with the differences in average flock walking ability. The multilevel modelling software package MLwiN v2.01 (<http://www.cmm.bristol.ac.uk/MLwiN/index.shtml>) was used as it allowed us to create linear models within the hierarchical structure of the data of repeated measurements on flocks and flocks within companies.

Results

The overall results of the survey, showing the distribution of gait scores prior to slaughter, are given in Table 1. The figures in Table 1 were calculated using the gait scores of a flock, weighted by the size of the flock as given by the number of birds placed as chicks. The minimum and maximum values in Table 1 show that there was considerable variation in walking ability between flocks, but overall, 27.6 per cent of birds represented by this survey had a gait score of 3 or above.

Table 1. The estimated percentage of birds in the survey population within each gait score category.

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Table 2 shows the percentage of birds within each gait score category broken down by the five companies and by the first and second visits. There was a large amount of variation in the distribution of gait score in flocks between the different companies. Company 4 notably produced only 8.5 per cent of birds with gait scores of 3 and above at the first visit compared with 22.7 to 29.7 per cent for the other companies, and only 0.6 per cent of birds with gait scores of 4 and above compared with 1.3 to 4.2 per cent for the other companies. Table 2 also shows the deterioration of gait over time for companies 1, 4 and 5 where a minimum of four second visits were made, the figures for the second visit to company 3 representing only one flock.

Table 2. The percentage of birds in each gait score category by producer and by first and second visit.

doi:10.1371/journal.pone.0001545.t002

The average gait score for a flock was modelled in terms of the levels of the risk factors recorded by the veterinary assessors. In addition to the assessment of husbandry variables as linear predictors of average flock gait score, the age at which the birds were assessed, and a seasonal effect, were included in the model. It was necessary to correct for both age and season at the time of assessment, before the effects of different husbandry practices could be properly investigated. The seasonal effect was expected to be cyclical, so was modelled as a sinusoidal curve to identify any cyclical variation in average gait score over a 12 month cycle. Both Sine and Cosine terms for month (January = 1, February = 2, etc) were used in the modelling process allowing us to look for an annual maximum and a minimum effect of season on gait score. A number of variables in the model were centred [Text S1] by subtracting the mean of the variable from each of its measurements.

The most parsimonious multilevel model we obtained of the relationship between the average gait score of a flock, and the risk factors that were recorded within the survey, is shown in Table 3. When company was included as a fixed effect, rather than a random effect, in the model the parameter estimates shown in Table 3 were not meaningfully altered and there were no significant variable/company interactions. Similarly, when the veterinary assessors were included in the model as fixed effects the parameter estimates were not substantively altered. The parameter estimates in the final model are shown and also details of which of the variables are centred. The mean, minimum and maximum of the predictor variables are shown in Table 4, including all those variables which were centred.

Table 3. The parameter estimates, their standard error and significance for the model of average flock gait score.

doi:10.1371/journal.pone.0001545.t003

Table 4. Mean, minimum and maximum values of the continuous predictor variables in the model of average flock gait score.

doi:10.1371/journal.pone.0001545.t004

When all other variables were held constant, there was a seasonal pattern to the average gait score of the flocks (Table 3 and Figure 1) with the lowest (best) gait scores occurring in March and the highest (worst) in September. The age at which the birds were assessed was important in determining gait score, with every extra day, across the range of 28 to 56 days, leading to an average daily deterioration in score of 0.048. Although each flock was visited close to slaughter when gait is known to be poorest, within the survey as a whole we were able to evaluate the effect of age on locomotion problems throughout the growth period because of the wide range of age at slaughter. A post-thinning visit was associated with an increased average gait score of 0.25 over and above that due to the age at which the birds were assessed, probably due to the effect of the stress of the first thin, and/or the preponderance of larger, faster-growing male birds remaining in the flock after thinning.

Figure 1. The modelled seasonal change in average flock gait score.

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We found that a number of fundamental husbandry practices were significantly associated with average flock gait score and these are detailed below.

A major influence was bird genotype. Broilers worldwide are predominantly of two types, from either one of two major international breeder companies, labelled here A and B. Birds from both genotypes are sometimes reared together within one flock. For every percentage increase in Breed A birds in a flock, from between 0 to 100 per cent, there was a 0.0024 improvement in flock gait score.

Whole wheat is sometimes fed to broilers as part of their diet, predominantly to improve digestive function. For every percentage increase in dietary wheat fed, from 0 to 30 per cent, as measured during their third week of life, there was a 0.017 per cent improvement in flock gait score.

Broilers are reared under a wide variety of artificial lighting regimes. For every 1 hour increase in the daily period of darkness, across the range of 0 to 8.5 hours, there was a 0.079 improvement in flock gait score.

There has been debate about the importance of stocking density as an

influence on bird welfare and locomotion [18]. Within limits, putting as many birds in a house as possible for each rearing cycle will improve profitability. For every 1 kg/m² increase in stocking density as measured at the time of the flock assessment, across a range from 15.9 to 44.8 kg/m², there was a 0.013 deterioration in flock gait score.

Antibiotics are routinely used during different stages of broiler rearing and their use can be quite difficult to quantify accurately. In our study farmers were simply asked if a flock had received antibiotic. A reply of 'yes' in this context meant that a flock had received an extra antibiotic treatment in addition to that which would be part of normal rearing practice. For the flocks for which the farmer had answered 'yes' flock gait score was reduced by 0.17.

Broiler feed is pelleted to minimise wastage and to increase the amount of feed that a bird can consume within a given time. In our study, veterinary assessors made a subjective judgement of whether the quality of the pelleting was good or poor (dusty/broken). For flocks with poor pelleting, gait score was on average 0.15 improved.

The magnitude of a parameter estimate given in Table 3 is not an indicator of the importance of the association of a variable with an increase or a reduction in gait score. This is because the magnitude of the parameter estimate is dependent upon the measurement scale used (e.g. kg or g, hour or day). Further, it is not possible to rank objectively the variables in terms of importance as subjective considerations such as practicality and the perceived cost of altering the husbandry practice have to be considered. For example, the results show that using 100% Breed A birds compared with 100% Breed B birds would reduce average flock gait score by 0.24. To achieve a similar reduction in average gait score by manipulating stocking density alone would require a reduction in stocking density of 18.5 kg/m². Despite these considerations there is value in using our model in a predictive capacity to show the improvement in average flock gait score that might be achieved on a hypothetical farm if each relevant variable attained the 'best' value actually recorded within the survey. Figure 2 shows the potential improvement from a baseline flock average gait score of 2.5, the middle of the range of possible scores. The Figure shows that no, one variable was associated with a large shift in average flock gait towards the score of 0, a perfect gait, but that the age at which birds are slaughtered appears to be of primary importance, followed by the hours of darkness that the birds are allowed.

Figure 2. A modelling exercise reveals the extent to which average flock gait score might be improved (i.e. lowered from a notional average score of 2.5) by adoption of the 'best' management practice for each variable that we

recorded within our study.

doi:10.1371/journal.pone.0001545.g002

Discussion

For comparison with previous surveys we draw attention to the prevalence of birds in our survey that had gait scores of 3 or above. This cut-off point is important because there is evidence from studies of the effects of analgesic drugs that birds in these categories can be in pain [19]–[22]. Other surveys have reported between 14.1% and 30.1% of birds with gait scores of 3 or above in different European countries, although it is not always clear whether weighted or unweighted estimates have been used [7], [23], [24]. Our survey presents a conservative estimate of UK prevalence of leg disorders in meat chickens because the national proportion of birds slaughtered at second, and subsequent thinnings, when gait score tends to deteriorate, is higher than in our sample, and because we present results only from companies that volunteered to participate.

All companies had a policy of culling broilers and some farms separately identified “leg culls” conducted because of leg disorders. If a flock within the survey were to be heavily culled because of leg disorders it would be expected that the overall flock gait score would be improved. However, we found no association between the flock average gait score and the percentage of birds culled as “leg culls”. However, the lack of a relationship may reflect the difficulties farmers have in recording these data in a standardised manner across the survey as a whole. Companies themselves report that these records are inconsistent between farms.

Despite examining a fuller range of husbandry and management practices than previous surveys, we did not identify many novel or previously unreported risks. An effect of season has been noted before in the US, where a higher percentage of leg abnormalities was reported in the summer [25]. The strong genotype effect that we found, confirms the important genetic component to leg disorders, and many of the husbandry effects detected most likely alter levels of leg disorder through direct or indirect effects on growth rate. Thus, we consider the effect of feeding whole wheat is probably due to the slower rate of digestion for whole wheat resulting in reduced growth rate, whilst providing broken or dusty pellets, rather than whole pellets, probably reduced overall consumption rates.

Birds reduce or cease their feed intake during periods of darkness, with associated reductions in growth rate. This is the most likely explanation for the beneficial effect of longer dark periods on the prevalence of leg disorders. The detrimental effect of higher stocking densities may be more complex, reflecting not only a lack of room available for birds to move and exercise, but also the extra environmental loading from increased biomass (e.g. additional ammonia and litter moisture) [18]. Finally, the improvement in leg health observed when antibiotics were used, was probably due to a

reduction in the infectious disorders which can cause some types of leg problem.

The study indicates that modern husbandry and genotypes, biased towards economics of production, have been detrimental to poultry welfare in compromising the ability of chickens to walk. However, we demonstrate that within the current framework there is variation in the magnitude of the problem between different flocks, and so some scope to improve walking ability through alterations in husbandry practice. Work needs to be carried out on the predictability of these risks, and the economics of improved welfare practices, for them to gain industry acceptance. An informed balance could then be drawn between profitability and our moral obligation to maintain good standards of animal welfare. The agreement, in May 2007, within the EU of new regulations governing the conditions under which broilers may be reared [26] is a recognition of the problems associated with modern broiler production and is an attempt at a first step towards remedying the situation. The new measures will include the introduction of a maximum stocking density limit, data collection and scientific monitoring of impacts on chicken welfare. The new Directive will not come into force until 2010 but it will prevent farms from stocking birds at densities over 39 kg/m² in subsequent flocks where mortality levels in the past seven flocks have exceeded a set level. The animal welfare implications of monitoring mortality and culling rates are potentially complex. In the short-term, the new Directive could lead to less rigorous culling of birds with leg problems and thereby increase suffering. However, in the longer term, the Directive could act as a stimulus to breeding companies to produce more robust genotypes, with a reduced susceptibility to leg disorders.

Research shows that consumers currently know little about how broiler chickens are reared but can be shocked when presented with information about current commercial practices [27]. Since the sustainability of intensive broiler production depends on continued consumer acceptance of the farming practices involved, the broiler industry will need to work with the scientific community to develop more robust and healthier genotypes and to ensure that optimal husbandry and management practices are fully implemented.

Supporting Information

Text S1.

Further explanation of the linear model of mean-flock-gait-score.

(0.03 MB DOC)

Movie S1.

Example of a gait score of 0. Movies S1 to S6 Examples of the gait scores taken from the veterinary assessors' training videos.

(2.19 MB MOV)

Movie S2.

Example of a gait score of 1.

(4.23 MB MOV)

Movie S3.

Example of a gait score of 2.

(2.67 MB MOV)

Movie S4.

Example of a gait score of 3.

(3.02 MB MOV)

Movie S5.

Example of a gait score of 4.

(4.25 MB MOV)

Movie S6.

Example of a gait score of 5.

(5.71 MB MOV)

Acknowledgments

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Author Contributions

Conceived and designed the experiments: DP CN TK SK SB AB LG. Performed the experiments: TK SK SH SB AB SP. Analyzed the data: DP CN TK SK SH SB LG. Wrote the paper: DP CN TK SK SH LG.

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Feather Loss in Chickens

Poultrysite.com

Feb 218/08

By Dan Cunningham Extension Poultry Coordinator,

The University of Georgia,
Cooperative Extension Service.
February 2008

A common complaint received from owners of backyard flocks relates to feather loss with their birds.

Feathers on chickens serve very important roles in providing protection and insulation for the body. Too much feather loss makes it more likely that injuries will occur to the exposed flesh resulting in infections or bruising of the tissues. In addition, excessive feather loss can result in higher energy utilization requirements to maintain body temperature. As a result, birds with excessive feather loss often require more feed to produce the energy necessary to compensate for the heat lost from the exposed areas.

This condition can also adversely affect feed conversion and result in greater feed costs. Preventing excessive feather loss can, therefore, have an important impact on flock health and profitability. The primary reasons for excessive feather loss in small flocks are:

Inadequate Nutrition

Good feather growth and maintenance requires adequate amounts of proteins, amino acids, vitamins and minerals. It is not unusual to trace a feathering problem in a backyard flock to inadequate feeding. A well balanced poultry feed formulated for appropriate age and type of bird will assure that the flock is receiving the necessary nutrients to maintain feather growth and maintenance. Diets formulated specifically for egg production or meat production and for the appropriate age of the bird offer the best feeding programs for your flocks. Birds require different levels of protein and energy at different ages. For example, meat birds require higher levels of protein early when their growth is most rapid. Once they reach maturity, their protein needs are less to maintain body weight and feather growth. In addition, birds kept for egg production will require different levels of protein, energy and minerals compared to meat producing birds. Thus, to be sure that your birds are properly fed, it is best to purchase a poultry feed formulated for the type and age of bird kept (ie broiler starter, grower and finishing rations for meat birds and Pullet/layer diets for egg producers).

Feather Pecking and Pulling

Loss of feathers from birds can sometimes be associated with feather pecking and pulling by other members of the flock. This can also be the result of poor nutrition as inadequate intake of nutrients can trigger this type of behavior. If, however, the appropriate feed is being provided and feather loss is occurring, it may be a result of aggressive behavior by some members of the flock. Feather picking and pulling can be a learned behavior and is usually the result of one, or a few members of the flock, exhibiting this

behavior. Birds are curious animals by nature and will pick at objects that attract their attention. Should their attention focus on the feathers of their flock mates and picking/pulling begin, it can become a habit that spreads to other members of the flock. Birds are also somewhat territorial and pecking/pulling of feathers can be a manifestation of this behavior. If feather loss is observed with only a few members of the flock rather than all the birds, it is likely the result of these types of behavior. Ways of determining if feather loss is a result of this type of activity is to observe the birds for a period of time and determine if certain birds in the flock are being overly aggressive with their flock mates or have developed feather pulling behavior. If so, the best remedy is to remove the bird(s) instigating the problem from the rest of the flock. A few weeks in isolation may reduce the expression of this behavior. If not, the remedy for this problem may require permanent removal from the flock. For flocks of birds where picking and pulling are chronic problems, beak trimming at an early age may be necessary. Beak trimming may be done at about six weeks of age by removing about 3/16 in. from the tip of the upper beak. This can be done using a toe nail clipper, but care must be taken not to injure the tongue of the bird.

Molting

Molting is a natural process whereby laying birds will cease egg production and lose feathers from their neck, breast and back areas for a few weeks to a few months. Molting occurs most often in natural environments where the birds are exposed to natural day lengths. Decreasing length of day light in the fall will trigger the onset of molt. It is nature's way of providing laying birds a rest period prior to the stimulus for maximum reproductive performance in the spring. Molting is eliminated in commercial flocks by providing long day lengths using artificial lights for approximately 14 hours every day. Many backyard flocks are kept under natural day light fluctuations and thus molting can be a common cause of feather loss.

If the feather loss occurs in the fall or winter and only lasts for a few months before new feathers are observed, it is likely your birds have gone through a natural molt. Molting is not something to be concerned about unless you want your birds to continue laying in the fall and winter.

Disease and Stress

Unhealthy birds or birds that are under stressful conditions may also exhibit feather loss. Using best management practices and observing your birds for possible disease conditions can be important for your flock. Stressful conditions such as heat, cold, disease, and lack of adequate amounts of feed and water can result in feather loss and poor feather quality with your birds. Good management is always important, and feather loss maybe an indicator needed improvements in management. It is important for your birds to have good quality feathering. Providing good management

programs, adequate feed and water and minimizing stressful conditions in your flocks will help assure strong feathers and a healthy flock.

To Cage or Not to Cage: Research Coalition Seeks Answers

February 13, 2008

UC Davis, CA

Animal welfare and poultry science experts from UC Davis, Michigan State University and other universities across the country are teaming up to study what are the most humane and commercially viable methods for housing egg-laying chickens.

Leading the team of researchers in tackling this controversial issue are internationally recognized animal welfare scientist Joy Mench of UC Davis, and animal welfare researcher Janice Swanson and philosophy professor Paul Thompson, both of Michigan State University.

The research team has recently received \$400,000 from the American Egg Board, an egg-marketing organization, to fund the planning stage of the research program.

The issue of whether it is better for egg-laying hens to be housed in cages or to roam freely in large barns is particularly contentious in California, where an effort is under way to place an initiative on the November 2008 ballot that would ban the use of cages in raising laying hens.

"The primary drawback of a conventional cage system is that it restricts the hen's movement and some of her natural behaviors," said Mench, an animal science professor and director of UC Davis' Center for Animal Welfare.

However, Mench says that hens that roam free of cages, in barns or outside, are more likely to fall victim to cannibalism or to health problems associated with increased exposure to their manure.

Furthermore, most laying hens suffer from osteoporosis, and cage-free hens are more likely than caged hens to break bones while moving through the barn or on the range. Mench also notes that the cage-free systems are expensive and would likely result in higher egg prices for consumers.

While there are no simple answers, Mench suggests that one of the most promising alternatives appears to be "furnished cages," which European producers have begun to use in recent years. These larger cages provide areas where hens can nest, perch and dust-bathe -- all important natural

behaviors. The cost of producing eggs in furnished cages is comparable to conventional cages, according to Mench.

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Hot and Bothered Hens at Their Best

ThePoultrySite News Desk Thursday, January 10, 2008

DENMARK - Startling new research from the Faculty of Agricultural Sciences, Aarhus University has concluded that the immune system of hens is affected by heat. Knowing this means that a slight change of temperature can dramatically improve hen health to the benefit of producers and consumers.

A bit of heat is a good thing. And if hens are just a teensy bit stressed due to heat, then that is a good thing too. Scientists from the Faculty of Agricultural Sciences at the University of Aarhus have shown that mild heat stress can actually improve the health of laying hens. Healthier hens improve both production and food safety – to the benefit of producers and consumers.

The immune system and body weight of laying hens can be affected by a slight excess of heat in the growing period. A bit too much heat can be regarded as a mild form of stress. In the growing period, chickens develop their natural immune system and stimulation of the immune system can therefore be used to improve the health of laying hens, explains senior scientist Birthe M. Damgaard from the Department of Animal Health, Welfare and Nutrition at the Faculty of Agricultural Sciences (DJF).

Under production conditions this could be used to stimulate the hens' natural immunological mechanisms to improve health and food safety, she says.

Chicken heat waves

The chickens were given a hot start: Their room temperature was increased by eight degrees above the normal temperature within half an hour and kept up there for one and a half hours. This was repeated four times with breaks of four weeks in between until the chickens were 14 weeks old. When they reached the age of 17 weeks, they were housed together with the control chickens that had not tried the "heat waves".

All chickens were vaccinated against Gumboro when they were four weeks old in order to simulate a reaction against a viral infection.

When you are vaccinated with foreign material, such as bacteria or vira, you develop an immune response that helps combat the foreign material in your body. Some of the white blood cells that help fight disease are B-cells that produce antibodies as well as specialised killer cells. Bacterial infections are typically fought by antibodies while viral infections are typically fought by killer cells.

It was shown that heat-stressed hens had fewer antibodies in their blood than the non-heat-stressed hens. However, they had more specialised killer cells that constantly circulate in the body on the lookout for foreign material. The heat stress led to an increased production of killer cells that fight vira.

The heat-stressed hens also weighed more than the control hens when they were weighed at the age of 66 weeks.

The scientists from DJF carried out the study in collaboration with two organic poultry farmers and a breeder of organic layers. The results are from a project under the Innovation Law.

TRANSPORT AND SLAUGHTER

More than animal welfare at risk during improper transport practices

Medboadcast

Mar. 01, 2008

Provided by: The Canadian Press

Written by: Bill Graveland

CALGARY - Even the mental picture of a truckload of hogs on its way to market is enough to draw frowns from empathetic animal lovers, but researchers are taking a scientific approach to relieving the stress suffered by the pigs on those journeys.

Ensuring the welfare of the hog is one goal of Agriculture Canada scientists and members of the pork industry. But the bottom line is still the bottom line.

"There's a huge economic impact. There is no one in the business that would

intentionally try to harm animals, because there's simply a huge economic loss associated with that," explained Al Schaeffer, a research scientist for Agriculture and Agri-Food Canada in Lacombe, Alta.

Schaeffer and his colleague Clover Bench have been co-ordinating a review of the existing recommendations, standards, laws and regulations on pig welfare during transport for the past three years to compare them with current scientific literature.

It will be used to ensure that upcoming changes to Canada's Livestock Transport Code of Practice are based on scientific data.

The pork industry is big business for Canadian producers, who export about half of their annual production, or about seven million live hogs each year.

Schaeffer acknowledges most people don't understand what the transport and handling of hogs can do to an animal - or the meat it eventually produces.

"If you go for a good plane ride yourself and go through security and all that, it's a stressful day. It's the same with animals," he said. "Even though one would think walking up a ramp into a truck wouldn't be that stressful, it's novel to the animals because they don't do it very much."

Stress causes a number of physical changes that can affect food flavour and quality.

The changes to the meat can lead to what the industry calls pale-soft-exudative (PSE) meat or dark-firm-dry (DFD) meat.

"What we found more than that - it tends to affect flavour nodes. If an animal is transported too long, you can well imagine, flavour nodes are changed, which affects tenderness and sweetness," said Schaeffer.

A change in the body chemistry can also increase the growth of bacteria in the animal, which can indirectly pose a health threat to humans once the hog is butchered.

"It will change the texture," acknowledges Jodi Hesse, the director of policy and communications for Alberta Pork.

"The meat becomes more watery and more pale-looking. It's not something you would see commonly in Canada. It's not a good product that sells," she said.

The pork industry is eager to see changes that reduces the stress on hogs, she said.

"As long as the animal is reaching the end point in good health and free of injury, that's our bottom line. That's telling you how the animal is cared for," said Hesse.

It's taking a while to come up with a consensus on how hogs should be transported. Trucks that carry more animals have higher temperatures, decreased ventilation and poor air quality, which leads to a higher mortality rate.

At the other end of the spectrum, too much space can lead to an increase in fighting and aggression.

There are also questions about whether the animals should be unloaded during a lengthy journey. The loading and unloading of animals is the most stressful component of livestock transport, so taking them off the truck for rest periods isn't necessarily a good idea.

"Research on loading and unloading during long-distance travel and the methods used to load and unload animals is urgently needed from the point of view of animal welfare and meat quality," says Bench.

"Further studies need to determine if it would be better to allow animals to remain on the transport truck and continue their journey, with access to food and water on a higher standard vehicle, or if it would be better to transport them shorter distances on a basic vehicle."

Two year program studies cattle haul

Leduc Representative

Fri 29 Feb 2008

Page: 36

Section: News

CFIA

Agriculture and Agri-Food Canada (AAFC), the Alberta Beef Producers, the Alberta Livestock Industry Development Fund and the Alberta Farm Animal Care Association have embarked on a two-year transport benchmark project to study industry practices for transporting cattle within Alberta. The study results from a recent proposal from the Canadian Food Inspection Agency (CFIA) to amend a 30-year-old section of the Health of Animals Act that deals with transporting livestock.

Responding to concerns voiced by cattle producers, AAFC scientist Dr. Karen

Schwartzkopf-Genswein in Lethbridge, is engaging the industry to study how current transport practices in the largest beef producing province in Canada support the need to review the Act.

The survey was launched in July 2007 and documents distinct practices for short-haul (less than 400km) and long-haul (greater than 400km) transport in Alberta. Among the questions, operators are being asked to document things such as feed, water and rest intervals. To date 24 trucking companies in Alberta have participated and over 5,000 surveys have been collected. The goal is to collect a minimum of 15,000 surveys to get an accurate summary of current transport practices.

Data from the survey will be valuable to the cattle transport industry and address concerns put forth by CFIA. The information will help develop a thorough understanding of the norms and non-standard practices within the industry, a necessary first step to help define current practices and identify areas where research may be required.

"Documenting current industry practice is important because the day-to-day management may vary somewhat from the recommendations outlined in the Codes of Practice as adherence to the codes is voluntary, says Dr. Schwartzkopf-Genswein. "The outcome of this study will help maintain and build an industry that has the highest standards in animal health and well-being."

The proposed changes from CFIA also coincide with the first ever global standards for the transport of live animals from the World Organization for Animal Health. Consumers worldwide are demanding higher standards for animal welfare, including their rearing and transport. Canada must maintain the highest standards of animal welfare or risk losing share to countries that have implemented rigorous regulations.

The events that affect animals, like transport stress, are linked directly to actual outcomes in meat quality, food safety and animal welfare. Stress causes a number of physical changes that can affect food flavour and quality.

This project has also collected video footage of proper animal loading and unloading procedures, handling procedures within the truck, and proper safety precautions for handlers. This information will become part of a training video for new trucking personnel through the Certified Livestock Transporter (CLT) training program.

Upcoming changes in transporting pigs

The World Organization for Animal Health will soon adopt the first ever global standards for the transport of live animals, including pigs.

Ensuring that transport industry standards meet international norms is critical for a country like Canada which exports about half its annual production including seven million live hogs a year.

As consumers worldwide demand higher standards for the welfare of animals both in their rearing and transport, Canada must maintain the highest standards of animal welfare or we risk losing share to countries that have implemented increasingly rigorous regulations.

Drs. Al Schaefer and Clover Bench, Agriculture and Agri-Food Canada scientists in Lacombe, Alberta have been coordinators of a review of the existing recommendations, standards, laws and regulations on pig welfare during transport to compare them with current scientific literature, a project that started in 2005.

This review will help ensure the upcoming changes to Canada's Livestock Transport Code of Practice are based on scientific data to improve the welfare of animals and subsequently, maintain or improve meat quality.

The events that affect animals, like transport stress, are linked directly to actual outcomes in meat quality, food safety and animal welfare. Stress causes a number of physical changes in that can affect food flavour and quality.

The team of scientists specifically examined loading density and journey duration standards (including rest periods and the supply of food and water) in The Recommended Code of Practice for the Care and Handling of Farm Animals in Transportation and the Canadian Health of Animals Act.

Loading density standards

At lower space allowances, pigs encounter higher ambient temperatures, decreased ventilation and air quality, as well as insufficient space to lie down in transit.

At the other end of the spectrum, increased space allowance reduces vehicle temperature and increases ventilation, but it can also increase the incidence of fighting and aggression in transit.

Overcrowding can result in increased mortality rates, food safety concerns, and reduced meat quality (primarily the incidence of pale-soft-exudative (PSE) meat). Space allowances above 0.45-0.5 m²/100 kg pig can increase skin damage and the incidence of dark-firm-dry (DFD) meat.

Proper pig density can offset the effects of high temperatures by providing adequate ventilation through vehicle vents, regulating heat production within the vehicle, and providing animals with adequate space to accommodate their size, behaviour and positions during transport.

"The effect of extremely hot and extremely cold conditions during transport and its effect on loading density also needs to be studied in greater detail," says Dr. Schaefer. "This is of particular importance in Canada due to the extremes in temperature which are experienced throughout the country and over the course of a year."

Travel Rests and Duration

The loading and unloading of animals is the most stressful component of livestock transport. Unloading animals for rest periods mid-transport may increase the stress experienced by transported animals.

The duration of transporting animals is also an important factor in animal health and meat quality.

The scientific literature has yet to reach a consensus on precise impact of rest periods during transport and maximum transport times, both of which can affect meat.

"Research on loading and unloading during long distance travel and the methods used to load and unload animals is urgently needed from the point of view of animal welfare and meat quality," says Dr. Bench.

HSA highlights best practice in group stunning

meatinfo.co.uk

Published: (29-02-2008)

Best practices in group stunning are highlighted in a new study by the Humane Slaughter Association.

It follows a two-year Defra-funded project to determine optimal design and operational parameters for group stunning systems in abattoirs, which was completed by ADAS UK in collaboration with the Humane Slaughter Association (HSA) and Industrial and Agricultural Engineers (IAE).

Group stunning, in which a group of animals are brought to a stun pen and stunned individually before being bled, is relatively common, particularly in small to medium-sized, multi-species abattoirs. However, prior to this study, there were no guidelines covering the operation of group stunning systems – as was highlighted by the Farm

Animal Welfare Council in its 2003 'Report on the Welfare of Farmed Animals at Slaughter or Killing: Part 1 Red Meat Animals'.

The study involved gathering information through visits to 40 abattoirs using group stunning, industry consultation and commercial testing of an optimum pen design, based on the information and built by IAE. The results were presented at a meeting of the Association of Independent Meat Suppliers (AIMS) in Leeds in November 2007. Best practice guidelines have also been published and these were launched at the meeting.

The guidelines highlight potential advantages and disadvantages of group stunning systems and how to improve these systems for optimum animal welfare and operating efficiency, with best practice recommendations. They are being distributed to all the abattoirs that participated in the study, with further copies available either as a free download from the HSA website (www.hsa.org.uk) or at £1.00 each to cover postage and handling from the HSA. Contact the Humane Slaughter Association, The Old School, Brewhouse Hill, Wheathampstead, Herts AL4 8AN. Telephone 01582 831919, email info@hsa.org.uk.

GENERAL

Government of Canada Invests Over \$5 Million for Livestock Research in Manitoba

Agriculture and Agri-Food Canada
Government of Canada Newsroom (press release)

BRANDON, Manitoba, February 22, 2008 - The Government of Canada, the Government of Manitoba and the Manitoba Cattle Producers Association (MCPA) today announced a five-year research agreement to develop improved production strategies for beef producers in Western Canada that will reduce their dependence on grain-based systems of production.

Merv Tweed, Member of Parliament for Brandon-Souris, on behalf of the Honourable Gerry Ritz, Minister of Agriculture and Agri-Food and Minister for the Canadian Wheat Board, was joined by James Bezan, Member of Parliament for Selkirk-Interlake, the Honourable Rosann Wowchuk, Minister of Manitoba Agriculture, Food and Rural Initiatives and Martin Unrau, MCPA President to announce details of the agreement at Agriculture and Agri-Food Canada's (AAFC) Research Centre in Brandon.

The three-party agreement includes Government of Canada in-kind support through the AAFC Brandon Research Centre estimated at \$4 million over five years.

"The Government of Canada is committed to putting farmers first. Investing

in science and innovation is one of the keys to a vibrant agriculture and agri-food sector that benefits everyone - our farmers, industry and all Canadians," said Mr. Tweed. "Today, we're proud to be here to announce an agreement that will help to improve the bottom lines of our beef producers. Developing new feeding technology will ensure the long-term competitiveness of the cattle sector."

The Government of Manitoba will also provide in-kind support through allocation of staff specifically for business and economic analysis and technology transfer of the research originating from the federal research program estimated at \$900,000 over five years.

"Changes in feed costs have had a major impact on the competitiveness of the Manitoba beef industry," said Minister Wowchuk. "This agreement will help develop improved production strategies for beef producers and help maintain the solid reputation our beef producers have achieved for sound management and quality beef production."

The MCPA is providing a financial contribution of \$250,000 as well as in-kind support costs of \$50,000 over five years.

"These investments in research by both industry and government are essential in ensuring the long-term health of the cattle industry in Manitoba and Canada," said Joe Bouchard, MCPA Vice President and chairperson of the association's Research Committee. "Cattle producers are always looking to improve their production methods to stay ahead of the competition in a tough global market. This research project continues that tradition of innovation."

This three-party research collaboration will help to develop new production strategies for grass and forage feeding systems for beef cattle as well as the use of grain processing by-products.

Schoolboy explodes goldfish memory myth

Australia AP

<http://www.theage.com.au/articles/2008/02/18/1203190696599.html>

February 18, 2008

A 15-year-old South Australian school student has busted the myth that goldfish have a three second memory.

Rory Stokes, from the Australian Science and Mathematics School in Adelaide, conducted an experiment to test the commonly held theory that goldfish have short memory spans.

He was also keen to open people's minds to the cruelty of keeping fish in small tanks.

"We are told that a goldfish has a memory span of less than three seconds and that no matter how small its tank is, it will always discover new places and objects," Rory said.

"I wanted to challenge this theory as I believe it is a myth intended to make us feel less guilty about keeping fish in small tanks."

Rory's experiment involved teaching a small group of fish to swim to a beacon by establishing a memory connection between the beacon and food.

Over a period of three weeks, he placed a beacon in the water at feeding time each day, waited 30 seconds and then sprinkled fish food around the beacon.

The time taken for the fish to swim to the beacon reduced dramatically, from more than one minute for the first few feeds to less than five seconds by the end of the three weeks.

Following the initial three-week period, Rory removed the beacon from the feeding process.

Six days later, he once again placed the beacon in the water and despite not seeing it for almost a week, the fish swam to the beacon in 4.4 seconds, showing they had remembered the association between food and the beacon for at least six days.

"My results strongly showed that goldfish can retain knowledge for at least six days," Rory said.

"They can retain that knowledge indefinitely if they use it regularly."

Rory also conducted a number of sub-experiments which showed that goldfish were capable of negotiating a simple maze, having them move onto a second beacon if they found no food at the previous one.

"My experiments showed that goldfish have the mental capabilities to learn and remember fairly complex concepts and they can retain that knowledge for at least a number of days," he said.

Australian Science and Mathematics School principal Jim Davies said the series of experiments were an excellent example of science investigation made fun.

FISH CHEWS UP BAD MEMORY THEORY

BBC News, February 5, 2008

http://news.bbc.co.uk/go/pr/fr/-/2/hi/uk_news/england/devon/7228978.stm

Researchers at the National Marine Aquarium in Devon think they have disproved the age-old theory that fish have got bad memories.

Whether it is good memory or a good appetite, humphead wrasse Bentley has been obediently coming to food when a dinner gong is sounded.

He even remembered the sound after a four-month break and raced to his favourite meal of squid and prawns.

Now the aquarium is going to test its experiment further with sharks.

Kelvin Boot from the aquarium said: "There is a popular misconception that fish are not very bright and that they do not have long memories.

"But we are finding that this is just not true at all."

The project could be useful in the future to separate fish who need treatment without the use of divers which can cause stress.

New Technology Heals Horses Faster, Stronger

January 31, 2008

From a Press Release

Canadian horse-owners will have access to an innovative technology that enhances the healing of equine tendon and ligament injuries, thanks to a new partnership between UK-based VetCell Bioscience Ltd and the Atlantic Veterinary College at the University of Prince Edward Island.

The two organizations have entered into a partnership establishing the Atlantic Veterinary College as the Canadian centre for the introduction of VetCell's equine stem cell therapy technology. VetCell's technology involves extracting stem cells from an injured horse's healthy tissue, multiplying those cells in the laboratory, and re-injecting the cells into the soft tissue wound of that horse to improve healing rates and reduce re-injury.

VetCell's Chief Operating Officer, Dr. David Mountford, says that the company's technology is currently in use in some of the world's leading equestrian countries, including the UK, Australia, France, Germany, Holland, the United States and Japan. "We've been very particular about the expertise of the partners we've chosen in each country where we are currently active," says Mountford. "The technical expertise and the equine focus that the Atlantic Veterinary College has demonstrated make them our obvious choice in Canada."

Dr. Laurie McDuffee, an equine surgeon, associate professor and researcher at the Atlantic Veterinary College, will lead the Atlantic Veterinary

College laboratory in delivering this new leading-edge equine health service. Dr. McDuffee has ten years experience in regenerative medicine and cell therapies for horses.

“The Atlantic Veterinary College is very excited to be the Canadian leader in the introduction of this technology,” says Dr. McDuffee.

“We are eager to provide a new tool to treat horses’ injuries right now. Our laboratory also has an ongoing research program in cell-based therapies and is exploring further collaborations with VetCell in the research and development of cell-based therapies for bone fracture healing and treatments for companion animals.”

VetCell and the Atlantic Veterinary College are currently offering this equine health service to selected veterinary clinics in Canada. To-date, ten horses have been treated and it is expected that the service will be widely available to veterinarians and horse owners from across Canada by May 2008.

VetCell’s stem cell technology will be made available to veterinary clinics across Canada through training sessions delivered by Drs.

McDuffee and Mountford. The first session is scheduled to take place at the Atlantic Veterinary College in Charlottetown, Prince Edward Island on March 5, 2008. A second session will be delivered in Ontario on March

7, 2008. Additional sessions are being planned across Canada.

The Atlantic Veterinary College at UPEI is committed to excellence and innovation in education, research, and professional services. The college is known around the world for its outstanding educational programs, aggressive research agenda, and being home to more than a dozen centres of expertise that range from veterinary epidemiological research to aquatic health. The Atlantic Veterinary College’s Veterinary Teaching Hospital is the only full service referral hospital in Atlantic Canada.

VetCell BioScience Limited is a leading provider of stem cell technology to the world of animal health. VetCell was founded to investigate and develop the veterinary use of stem cell technologies.

The company was formed in London, UK in partnership with the Royal Veterinary College and the Institute for Orthopaedics and Musculoskeletal Science. VetCell is committed to working with top veterinary research establishments across the world to improve and expand the range of species and conditions treated using regenerative medicine.

Strange Creature Immune to Pain

http://news.yahoo.com/s/livescience/20080129/sc_livescience/strangecreatureimmunetopain

Charles Q. Choi

Special to LiveScience

LiveScience.com

Mon Jan 28, 8:31 PM ET

As vulnerable as naked mole rats seem, researchers now find the hairless, bucktoothed rodents are invulnerable to the pain of acid and the sting of chili peppers.

A better understanding of pain resistance in these sausage-like creatures could lead to new drugs for people with chronic pain, scientists added.

Naked mole rats live in cramped, oxygen-starved burrows some six feet underground in central East Africa. Unusually, they are cold-blooded — which, as far as anyone knows, is unique among mammals.

"They're the nicest, sweetest animals I've ever worked with — they look frightening, but they're very gentle," said neurobiologist Thomas Park at the University of Illinois at Chicago

Scientists knew the mole rats were quite sensitive to touch — perhaps to help replace their almost useless eyes. After probing their skin, Park and his colleagues unexpectedly discovered the rodents lacked the chemical Substance P, which causes the feeling of burning pain in mammals.

Acid test

The researchers discovered that when unconscious mole rats had their paws injected with a slight dose of acid, "about what you'd experience with lemon juice," Park said, as well as some capsaicin — the active ingredient of chili peppers — the rodents showed no pain.

"Their insensitivity to acid was very surprising," Park told LiveScience. "Every animal tested — from fish, frogs, reptiles, birds and all other mammals — every animal is sensitive to acid."

To explore their pain resistance further, the researchers used a modified cold sore virus to carry genes for Substance P to just one rear foot of each tested rodent. Park and his colleagues found the DNA restored the naked mole rats' ability to feel the burning sensation other mammals experience from capsaicin.

"They'd pull their foot back and lick it," Park said. Other feet remained impervious to the sting of capsaicin.

"Capsaicin is very specific for exciting the fibers that normally have Substance P," Park added. "They're not the fibers that respond to a pinprick or pinch, but the ones that respond after an injury or burn and produce longer-lasting pain."

Curiously, the researchers found that mole rats remained completely insensitive to acids, even with the Substance P genes. This suggests there is a fundamental difference in how their nerves respond to such pain.

"Acid acts on the capsaicin receptor and on another family of receptors called acid-sensitive ion channels," Park said. "Acid is not as specific as capsaicin. The mole rat is the only animal that shows completely no response to acid."

Why so insensitive?

Scientists theorize naked mole rats evolved this insensitivity to acid due to underground living. The rodents exhale high levels of carbon dioxide, and in such tight, poorly ventilated spaces it builds up in tissues, making them more acidic. In response, the mole rats became desensitized to acid.

"To give you an idea of what they experience, we normally all breathe in carbon dioxide levels of less than 0.1 percent. If people are exposed to an air mixture with as low as 5 percent carbon dioxide, we'll feel a sharp, burning, stinging sensation in our eyes and nose," Park said. "We hypothesize that naked mole rats live in up to 10 percent carbon dioxide."

Researcher Gary Lewin, a neuroscientist at the Max Delbrück Institute for Molecular Medicine in Germany, noted, "People may say, 'So what — it's weird, but what has it to do with human pain?' I think that is wrong, unimaginative and short sighted."

Lewin noted that all vertebrate pain-receptor systems "are built in a highly similar way, so the mole rat may tell us how you can unbuild the system."

Help for people

Specifically, Park noted this research adds to existing knowledge about Substance P. "This is important specifically to the long-term, secondary-order inflammatory pain. It's the pain that can last for hours or days when you pull a muscle or have a surgical procedure," he explained.

As such, these findings might shed new light on chronic pain. Park said,

"We're learning which nerve fibers are important for which kinds of pain, so we'll

be able to develop new strategies and targets."

Lewin added, "We really do not understand the molecular mechanism of acid sensing in humans, although it is thought to be pretty important in inflammatory pain. An animal that naturally lacks such a mechanism may help us identify what the mechanism actually is."

Park next plans to study distantly related animals that dwell in similar circumstances, such as the Mexican free-tailed bat and the Alaskan marmot, which both spend large amounts of time in high carbon dioxide caves or burrows. "How are they surviving down there? It'd be interesting if we saw some parallels there with the naked mole rats," Park said.

The scientists detailed their findings online Jan. 28 in the journal PLoS Biology.