Time for Technology

Using Technology to Measure Dairy Cattle Welfare

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Although there were few producers at the Dairy Cattle Welfare Symposium, held last October in Guelph, it has certainly created a new buzz around the issue of animal welfare in the dairy industry. While I suspect that there is a wide range of opinion on this issue among producers, it is much better to see the buzz resulting from scientific discussion at a symposium, rather than from some viral video showing animal abuse on the internet. The latter is often the case with other livestock sectors, and it certainly can happen to dairy as well. Fortunately, our dependence on healthy productive adults of the species usually puts welfare and profit on the same page, making modern dairy production practices quite "animal friendly". But no doubt this emerging issue will get more attention in the next few years.

One of the things that stood out for me at the conference is the wide gap between how producers and consumers see this issue. Producers tend to look at welfare for the cow as "freedom from pain and suffering". They think about reducing the incidence of lameness and perhaps clinical mastitis as well. But consumers know very little about specific dairy cattle health problems. To them livestock farming interferes with the animal's freedom to do what it wants, and "welfare" is more likely to mean "freedom" in general, and things like access to pasture, opportunity to bond with their young, and freedom from restraint.

The other thing that stood out for me at the symposium was the important role of sensor based precision technology in advancing our knowledge of dairy cattle comfort and welfare. Out of about 50 conference reports that involved actual collection of data on dairy cows and calves, more than 50% used some form of technology to collect the information. In a few case this involved very specialized research equipment measuring grazing bites, rectal temperatures, skin temperatures and "thermography" which is a form of photographic imaging of the temperature of various parts of the body. But for the most part these studies used a variety of pedometer type products that measure time spent walking, standing and lying down.

When it comes to animal welfare standards, I am hopeful that this sensor data can play a role in encouraging standards based on "outcomes" rather than "inputs". For example, the "Code of Practice for the Care and Handling of Dairy Cattle, developed by Dairy Farmers of Canada in 2009 has a requirement that lactating cows not be overstocked more than 20% in freestalls, and a recommended best practice that there be 1 stall per cow. Although such an "input" standard might be well documented and based on research, it tends to leave little room for good management and good judgement to get the job done. As a case in point, many European countries require one freestall per cow but have no standards for alley space, and space around water troughs. It follows that farmers, looking to house more cows, fill in much need crossovers with not so necessary stalls, resulting in less resting time as cows stand in line waiting for safe access to water. The Code of Practice also has an "outcome" based recommendation that resting

areas be designed so that cows to lay down for 12 hours per day. It is this kind of approach that I hope wins out over fixed stall sizes, since it reflects the cows ability to express normal behaviour rather than a single fix. But 12 hours is clearly a "gold standard" and not a minimum.

With more than 20 studies reporting on resting behaviour of cows and calves, the conference provided an opportunity to look at how both farms and research stations are doing and what factors contribute to resting times. At 10.8 hours per day, the average freestall herd in a Danish study did not meet the 12 hour standard, but it did show that fresh cows and high producing cows spend less time laying down. High producers likely require more time to eat leaving less time for rest. Canadian free stall barns did not fare a whole lot better with only 9 out of 71 pens exceeding the 12 hour gold standard. Canadian tiestall barns did meet the standard with cows laying down an average of 12.4 hours, but perhaps having less opportunity to socialize and not greater comfort explains the difference from freestalls. A study with a mixed herd in Kentucky showed milking Holsteins rested nearly 1 hour per day more than crossbreds and 1.6 hours more than Jersey cows. Similar breed differences were reported in a dry cow study where Holsteins spent 15.8 hrs laying down vs 13.3 hours for Jerseys. Hence, breed, and stage of lactation factors have to be accounted for before we determine whether lying times reflect adequate welfare.

In these studies, many of the traditional "input" standards did not show much sensitivity. In a Canadian study looking at stocking densities, herds with 80 cows in 100 stalls were not statistically better at 11.4 hours lying than herds with 113 cows in100 stalls, at 10.7 hours. The authors concluded that stocking density up to 120% does not reduce resting time in typical barns. A major renovation at University of Kentucky with longer stalls, higher neck rails, rounded brisket locators replacing boards and new mattresses replacing old, increased resting times by just 12 minutes and this was not statistically significant. In another trial, close up cows in packs rested only slightly more than herd mates in freestalls. The only really big difference in lying times came from the Canadian tiestall study, which showed that, when bedding was more than 2 cm deep cows rested 1.2 hours longer than with less bedding. Clearly many things that have been promoted as input standards are not strongly reflected in outcomes.

Pedometers that count steps are great heat detection tool and are a practical and cost effective option for commercial farms. But if the added feature of recording time spent lying down is going to be worthwhile on commercial farms, it has to provide information that is useful in management decision making. Several studies looked at lying times and length of lying events in the context of predicting health problems. They found that lame cows lay down slightly more total hours, in fewer longer lying "bouts". Others reported cows about to develop milk fever spent more time lying down, and quite obviously cows with milk fever spent more time lying. Video work showed cows with clinical mastitis lay less, and also lay with the infected quarter up, and a study with rumination tags suggested cows in the early stages of a clinical flare up were less active and had reduced rumination. But in all cases differences were subtle and too small to have predictive value as standalone diagnostic tools for disease. Perhaps it will prove useful in future when combined with other data, but for now it appears that monitoring lying down time on commercial dairy farms is of limited value.

But if these tools used in research herds can help the industry define outcome based welfare standards, they will still serve a very useful purpose.