Estrus Cycle Management in Feedlots

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In Southern Alberta, the beef cattle sector is the backbone of our economy and is a major export. Canada is the fifth largest Beef exporter in the world (1). Not only does the cattle industry provide employment and business opportunities but it also strengthens the agriculture sector. The Lethbridge county and surrounding area has the largest population in Canada and is known as “feedlot alley”. There are 62 feedlots containing 814 700 head of cattle, (1) almost half of the total population of beef animals in Canada.

Typically, heifers are discounted 2 to 7 dollars per 100 pounds compared to steers. The difference is due to feedlot performance and the liability of pregnancy (2). There are some important issues that need to be addressed when feeding female cattle in feedlots. First of all heifers in the meat processing industry are targeted for weight gain not reproduction. However, heifers in the feedlot still display all signs of estrus and can become an economical issue. When heifers are in heat they will display homosexual behaviour and ride each other, this behaviour causes stress, injury and erratic feed intake. The goal of feedlot producers is to enhance the weight gain of animals at the lowest price possible but heifers cycling at different times can make this extremely difficult. Also, when heifers are pregnant the outcome of the situation is never favourable and is a recipe for disaster.

Approximately 16.5% (3) of beef heifers are pregnant upon entering feedlots annually. This represents a significant problem to the beef industry because pregnant

heifers have decreased feedlot performance, increased mortality, lower carcass quality and dressing percentage, and as a result are worth less to the beef industry (4)

Pregnant heifesr in feedlots pose a serious economic liability for producers. They can cost an upward of US$114 per head more than an open heifer in a feedlot due to an increased cost of gain because the mother will allocate more of her energy to the fetus instead of weight gain and a reduced feed efficiently (3). Heifers on a high protein ration will have a higher fat to muscle ratio and will pose serious calving implications. Another issue is that most pens are only checked once a day, and it is not uncommon for a mother to be in labor for many hours and if she needs assistance, the situation can be very stressful and may detriment her health later on. Morality is round 25% (5) in pregnant heifers due to dytosica, infection, and death.

If a live calf is born, the fate of this animal is usually unfavorable. The calf is born into contaminated, pathogen rich environment and will be susceptible to many infections. Generally calves do not receive the mother's colostrums which poses a risk on its survival rate. Often employees of feedlots are time pressed and cannot be bothered to invest time and money on a calf when chances of survival are so low.

All females should be rectally palpated for pregnancies and if pregnant abortion should be induced. These animals should be in good health and well adjusted to the feedlot. Abortion is a stressful situation and combined with any other stress such as shipping fever or pneumonia can cause extreme losses in gain efficiently or even death. Also growth implants and feed additives containing progesterone or analogues to progesterone may interfere with induction of abortion and should be withheld after abortion occurs (6).

To prevent economic loss when feeding heifers it is essential to suppress the estrus cycle, ensure heifers are open on arrival and if they are pregnant that it be terminated. Some of the protocols that are used in feedlots are the chemical suppression of esterous activity by a feed additive melengestrol acetate (MGA), immunization against Gonadotrophin Releasing Hormone and spaying.

Melangestrol acetate or MGA as it is more commonly known is a synthetic drug used to regulate estrous cycles in heifers. Estrous cycle regulation is important in breeding programs and in feedlots. This paper will focus predominantly on the feedlot aspect of MGA use. When heifers enter the feedlot setting they all go through estrus at different times. This has very negative effects as cycle heifers will start to exhibit homosexual behaviours. Heifers will essentially 'pick on' one heifer and ride her. She can become seriously injured from this as it rubs off hair, causes bruising and can cause spinal injuries. Not only is this dangerous to the heifer being ridden but also to the heifers doing the riding. They may fall off and break bones. An injured or dead cow is worth no money in the feedlot industry. This behaviour is made even more dangerous by the extremely adverse conditions within the feedlot such as uneven footing and wet, slippery grounds. Ultimately it becomes very stressful for heifers in the feedlots making estrous control a valuable asset to feedlot management.

MGA is a powder added to daily rations and can be used in conjunction with other supplements and antibiotics (7). The dose is usually 0.25 to 0.50mg per head of cattle (7).

LH surges are inhibited by MGA, however the basal concentrations of LH increase (7). This increase in basal concentrations causes multiple follicles to grow as

well as an increase in estrogen production (7). Some of these follicles can form persistent follicles which have increased life spans, are larger in diameter and produce increased concentrations of estradiol (8, 9). The follicles regress but are replaced by new ones, therefore the level of endogenous estrogen remains quite constant (7). The constant levels of endogenous estrogen are responsible for the improved feed conversion and rate of gain (7).

The benefits of MGA are incredibly valuable to the feedlot industry. MGA is simple, inexpensive and gives consistent results. Since estrous cycles are suppressed, there is a decrease in homosexual behaviour related injuries (7). This implies that money is not being wasted on repairing injuries or infections. Also the improved rate of gain means that heifers are gaining more weight and can therefore be sold for more money. Heifers also have a faster turn around which means that less feed is required, decreasing costs. As cows are sold by weight, the heavier cows make more money and MGA improves rate of gain (7). Inconsistent feeding may imply that food is being wasted on heifers that will not eat. While on MGA, heifers have more consistent eating habits, so feed can be planned and budgeted for, again reducing the costs. There has been some evidence that MGA can be used to improve rate of gain in lightweight and pasture heifers. A study on heifers weighing 451lbs showed a 12.8% improvement in average daily gain and an 8% improvement in feed conversion when compared to heifers not fed MGA (7). However, dose control is harder to control in free-range cattle.

Some limitations to MGA is that if cows are taken off MGA utter chaos breaks out. Heifers will be cycling at all different times and injuries will again become prevalent. MGA does work better in mature heifers as it requires mature ovaries for full effects.

Also, for use in breeding programs MGA decreased fertility because persistent dominant follicles are formed if fed (with MGA) longer than 7 days (8).

Ultimately MGA is a valuable tool in the management of feedlots, reducing costs and loss of heifers to unsynchronized cycling.

Gonadatrophin Releasing Hormone (GnRH) plays a central role in the reproductive function of animals. Vaccinating against GnRH will inactivate LH and FSH and suppress reproductive cycles of both male and females (10). In females, down regulation of GnRH receptors on gonadatroph cells acts as a fertility control which prevents the pre-ovulatory surge of LH and blocks ovulation. Unfortunately, this method has not had success with producers in Australia as Vaxstrate was taken off the market in 1995 due to heifers continually cycling (11). Continued research in endocrinology will lead to a safe commercial product that is effective in the suppression of unwanted reproductive behavior.

An alternative technique to eliminate estrous and therefore unwanted estrus behavior is spaying heifers. Spaying, or ovarioectomy, is the removal of the ovaries to discontinue the production of the gonadotropins and therefore permanently eliminate cycling. There are three main techniques of spaying heifers which include transvaginal and flank entry.

One type of the two transvaginal entries involves the utilization of a long tool, often called an ovary flute, that facilitates excision of the ovaries. The modern ovary flute has a hole in which the ovary is placed and rotation of an inner tube with sharp edges, cuts the tissue to detach the ovary. The instrument is guided into the vagina through rectal palpation. The tool possesses a sharp, pointed tip which is used to push

through the vaginal wall into the peritoneal cavity. Once the tool is in position, the ovary can then be manipulated, from the rectally inserted hand, into the hole of the flute. Excision of the ovary occurs with the rotation of the inner tube. The ovary can be stored in a small cavity in the tip of the instrument so that the remaining ovary can be removed without having to reinsert the instrument. Another type of transvaginal spaying does not include the use of an instrument, and relies on manual excision. The hole in the vaginal wall must be pierced so that it is large enough for the passage of the hand. Once this opening is large enough, the veterinarian manually excises the ovaries (12).

The third technique for spaying involves access to the ovaries through the flank. The heifer is shaved and scrubbed in the flank area, and a local anesthetic may be administered. An incision is made that is large enough for the veterinarians hand to pass through, and the oblique muscles are separated. The veterinarian can then remove the ovaries manually. This method is not commonly used as is has been found to induce more pain, there is a larger risk of infection, it is more time consuming and less efficient and results in a scar which can result in more trimming which can have a negative effect on marketability of spayed heifers.

Overall, spaying is not readily used because it can be expensive, may not be efficient when there are a large number of heifers, other options are available such as GnRH vaccine and MGA and is a rather abrasive technique. The pain and discomfort can be observed for up to four days during and after the procedure. Pain is monitored by behavior such as tailhead raising and stiff legged walking, stress hormone levels are also indicative of pain. It is estimated that up to four percent of healthy heifers will die from the procedure. Another reason for disuse is that intact heifers will perform better than

spayed heifers if steroidal implants are not given because endogenous estrogen is absent, decreasing rate of gain (13).

Autotransplantation experiments have been performed to study the effect of ovary presence on feed conversion. The ovaries were purposely dropped in the abdomen during spaying or partial ovaries were transplanted in the rumen wall to observe if they could rescue estrogen production. These techniques were not found to be useful, and did not cause an increase in feed conversion or weight gain (14). Experiments with steroidal hormones showed a significant increase in weight gain in heifers that were spayed or given GnRH vaccine(15). Heifers fed MGA were not found to be impacted by implants (16).

Heifer spaying, vaccination against GnRH and MGA all reduce the negative economical issues associated with heifers in a feedlot. Since estrus behaviour results in strongly economically unfavorable effects, it is not surprising to find that much research is being done to improve and develop new technologies to eliminate this problem. Although heifer spaying is not common anymore, further research is being done on the GnRH vaccines to test and improve its results. Furthermore, MGA may not be feasible for much longer as research suggests that it may induce acute interstitial pneumonia in heifers, which is an important cause of illness and death in feedlot animals (17). Nonetheless, MGA use is a prominent and important additive with respect to the southern Alberta cattle industry and economy.

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