Implant Strategies

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Abstract

Growth promoting implants has been a tool widely utilized by the beef cattle industry for many years. The first available implants came to market in the 1950s. Today, usage of implants is widespread in the confined cattle feeding industry. Comparatively speaking, less adoption of the technology has been applied in both the cow/calf and stocker phases. Research shows production benefits in all phases of the beef industry. Concerns have been raised regarding whether implants should be used for growth promotion in the beef industry. With these concerns in mind, safety and the impacts of quality on beef show little if any negative consequences to the use of implants on beef available for consumption.

Recent adjustments to implant labeling have created some challenges and confusion in how we are able to utilize the technology. As veterinarians, it is important to understand label requirements in each phase of the beef industry. Additionally, it is important to understand how implants are placed in the ear to assist producers in obtaining the best return on their investments when they decide to utilize this technology.

Key Words: beef cattle, growth promotion, implants

History and Mechanisms of Action

In 1958 Synovex S and Synovex C were the first implants approved for use in beef cattle. Following that launch, Ralgro became available in 1969, Compudose in 1982, Synovex C obtained a calf label in 1984, and finally the Revalor line of implants was first introduced in the early 1990s. The very basic mode of action was to increase protein anabolism thereby increasing skeletal muscle production. Estradiol implants increased growth hormone from the pituitary gland. This increase has multiple positive interactions to have positive direct effects on skeletal muscle. The interactions of increased growth hormone increase somatomedin in the liver to increase protein production, increases insulin production in the pancreas, and reduces catabolic effects of cortisol by the adrenal gland. Trenbalone Acetate (TBA) has a direct effect on the nuclei of skeletal muscle cells by increasing ribosomal protein production.[13]

Industry Usage

NAHMS surveys of the cattle feeding industry showed 92% of confined cattle feeding organizations utilizing implants.[2] In 2013 another survey showed 94% of both steers and heifers received at least one implant while the cattle were on feed. Usage in the stocker phase drops off as compared to the feedlot sector but is still used on a larger scale than the cow/calf industry. A 2015 survey of ranchers in KS, OK, and TX showed 77% of these operations implanted cattle going out to grass. A similar survey of Oklahoma ranchers in 2008 showed similar numbers. One finding of the Oklahoma survey showed a large drop in usage of implants if the stocker operation had a cow/calf component to their operation.[3] This data of cow/calf usage of implants is consistent with NAHMS data last collected in 2007-2008. At that time, only 9.8% of all cow/calf operations used implants. The same data showed a tendency for larger operations to implant. 24% of cow/calf operations with over 100 head routinely implanted calves suckling cows.[1]

Reasons not to Use Implants

With the data showing a disparity of usage in implants used by production phase, it is reasonable to ask the question of why an operation would not want to implant cattle. One possible reason is a perception of decreased meat quality in beef that comes from an implanted animal versus beef from a non implanted animal. This perception has led to niche marketing programs such as "All Natural" and Non Hormone Treated Cattle (NHTC). Preston and Others in 1997 looked at the amount of estrogens in various foods available to consumers. While the amount of estrogen in nanograms was more in implanted beef (2.5 ng/4 oz) as compared to nonimplanted beef (1.8 ng/4 oz), the amount of estrogens in beef was negligible compared to food products like soybean oil, cabbage, and peas.[9] Decreased tenderness of implanted beef has been shown using the Warner-Bratzler Shear Force Test, but blinded sensory panel tests could not tell the difference in implanted versus non implanted beef when comparing juiciness, flavor, and tenderness.[4,7] Longer aging of beef helped reduce the differences observed in shear force testing models.[6]

It has been shown there are quite a bit of production losses left on the table for producers who choose not to implant. Wileman and others in 2009 investigated potential production losses from not utilizing technologies and raising beef for these niche markets. They found there was a $77 per head loss in the feeding phase when cattle were not implanted and a $349 per head loss for cattle raised organically.[16] These same production losses can have a possible impact on the environment. Capper and others looked at the impacts of removing growth enhancing technologies from the US Beef Industry in 2012. They found we would need 385,000 more animals, 2,830,000 more tons of feed stuffs, and 20,139,000,000 more liters of drinking water to produce the same amount of beef if these technologies were taken away.[5]

Production uses: Suckling Calf Phase

There are currently 6 labeled products for use in beef suckling calves.[15] In a review of 50 studies comparing 1 implant given to suckling calves versus no implant, average daily gain was improved by 5.03%. 48 of these 50 studies showed a positive response in average daily gain. Performance after weaning has commonly been a concern of giving implants to suckling calves. There were some earlier studies in the 1970s that suggested this to be the case. However, looking at those studies, there were possible negative effects of stacking implants too close together. In subsequent studies when we follow these calves out to later stages in production, the effects of the implant can be considered additive as performance was not decreased following the suckling calf phase.[11]

Reproductive performance for replacement heifers is a concern when handling implants. It has been shown in three different studies that an implant given at birth to a heifer will reduce her ability to breed by 39%. Other studies showed no difference in the reproductive rates when implants were given between 1 and 3 months of age. The implanted heifers did have increased pelvic areas, but this did not help in reducing subsequent dystocia rates in future calvings. All in all, it is not advisable to implant heifers being retained for breeding as the opportunity for errors of implanting outside of the documented 1 to 3 months of age is a risk.[11]

Production uses: Stocker Cattle

This stage of the beef cattle production system has typically been defined as the period of time between weaning and cattle going on feed in a finished feeding situation. Historically, this has been a phase of production that either utilized a bunk feeding system called a starter yard or utilized a forage based biomass consistent with but not limited to native grasslands and wheat pasture type systems. Studies comparing one single implant with zeranol to no implant found a 14.5% increase in gain from one zeranol implant when evaluating 3,068 head in 43 studies averaging 125 days of grazing. Similar outcomes with steers having a 13.5% increase in gain and heifers showing 13.0% improvement regardless of product given. In each of the reviews of stocker production, gain was proportional to the amount of available nutrients. Gains realized in the stocker phase just like in the cow calf phase did not negatively impact the feedlot phase in terms of gain, feed conversion, and carcass weights and composition.[11]

Implant labeling has changed quite a bit for this phase of production which has created great confusion. The confusion lies mostly with how the phase of production is classified – dry lot, starter yard/feedlot, or pasture. There are distinct labels for each defined phase of production and the dry lot phase of production is the newest classified phase of production with its unique labeling. The FDA defines cattle managed in a dry lot as follows:

Growing Beef Steers and Heifers in a Dry Lot: Weaned growing beef steers and heifers (beef and dairy breeds) maintained in a dry lot. They received the majority of their diet from harvested forage (possibly with a supplement).

FDA considers dry lot management to mean beef cattle that receive harvested forages as the majority of their diet and are reared on dormant pastures with insufficient biomass to sustain typical growth and /or housed in dirt floor pens. Beef cattle in this production phase may receive minimal supplementation (generally a protein supplement) to achieve growth rates consistent with those typically observed in cattle on pasture. Cattle in this production phase may move nest to a pasture management setting or to feedlot management setting.

Cattle producers should note that there are currently no cattle ear implants approved for use in a reimplantation program for this production phase of beef cattle.[14]

Finishing Phase of Production

There are currently 20 labeled implants that can be used in the finished phase of production. 3 products are approved for use in a reimplantation program.[15] There is a large database of studies showing the benefits of growth promoting implants in the finished feedlot phase of production. The most common benefits observed includes but is not limited to improved average daily gain (ADG), dry matter intake (DMI), feed conversion (F:G), and hot carcass weight (HCW).[11] Much of the old studies have looked at timing of implants and how to stack them on top of each other in reimplant programs to fully maximize performance. With the limitations of labeling and increased days on feed (DOF) we are currently experiencing in the cattle industry, further research should be done with our current labeled products.

Above and beyond the concerns described for food safety, other concerns about implanting in the feedlot have been brought up over the years. Respiratory morbidity and mortality have been studied. Arrival processing implant, delayed implant, and no implant given were the study treatment groups. There was no differences in health outcomes in these treatment groups.[12] The buller syndrome has been a concern. While there are some studies comparing differences in old implant regimens that might suggest one implant protocol found more bullers than the next, it has been very difficult to show the use of implants as the key in causing bullers. When drawing blood on bullers and riders, Meyer and others found riders had higher levels of estradiol in their system as compared to the cattle being ridden. This suggests there might be an interaction inducing bullers as implants hit their terminal windows and begin to lose potency. The study suggested more work should be done looking into the rider animals.[8]

Veterinarian's responsibility

At the end of the day, growth promoting implants being placed in the ear should be considered a surgical event. Veterinarians should strive to make sure cattle producers that wish to utilize this technology is armed with the understanding of how to properly implant. Cleanliness and functionality of the applicator gun, cleanliness of the applicator needle, cleanliness of the ear, and cleanliness of the cartridges is of the utmost importance.

Applicators can jam if not used properly, so making sure there are backup applicators before you start processing is important. Implant needles should be dipped between animals or between ear skips. The needle should be dipped in a chlorhexidine solution that has bathed either a sponge or paint brush rollers. There is some old field trial work looking at Chlorhexidine solutions and the proper dilution rates. The level of dilution depends on the hardness of water. The current suggestion is to use distilled water at a rate of 1 part chlorhexidine and 4 parts distilled water. The solution should be changed every 200 head. Sooner if the sponge and/or tray is contaminated. The sponge should be flipped every 20-30 head to ensure disinfectant contact time on the sponge is maximized.

Ears to be implanted will be presented to the implanter in one of three ways: clean and dry, dry and dirty, and wet and dirty. The most common presentation is clean and dry. If the animal presents this way, the implanter needs to implant and go to the next animal. Dry and dirty ears need to have time spent scraping off the mud/manure caked on the ear. This can be accomplished with a knife or harsh brush. A hoof pick for a horse is a good tool for this. Once the debris is removed, implant. There is no need to get the ear wet and scrub it in this state. If the ear is presented in a way that is wet and dirty, the implanter needs to take time to clean off the ear with a brush that is sitting in chlorhexidine solution. Once the wet dirty material is cleaned, give a final rinse then implant. Implant cartridges waiting to be used need to be kept in a container away from the elements of the environment.

Preferred placement of the implant is in the middle 1/3 of the ear both horizontally and vertically. Implants need good blood flow to help maximize their effectiveness. Therefore, subcutaneous placement and not in the auricular cartilage is paramount. In a processing situation where ear tags are being placed in the same ear while implanting it is important to tag first then implant. This avoids the chances of ear taggers crushing the implants. Scar tissue from previous tagging sites and implant sites must be avoided. It is recommended to place implants 1 finger width away from any scar tissue and existing ear tags. If the middle of the ear has been damaged to the point to where there is no good location to implant, top of the ear placement is a viable secondary option but can be less advantageous due to vasculature of the ear.

Conclusion

Growth promoting implants continue to offer a large return on investment for beef cattle producers regardless of their stage of production. Large amounts of research has demonstrated their safety and effectiveness. Changes to implant labeling and definitions of production phases have shifted the approach to implant protocols and it is important for the veterinarian to understand these changes. Even with these changes, it is even more important for the veterinarian to be the educational avenue to make sure producers know how to properly apply and implement these technologies.

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