Injection Sites – a Look Under the Hide

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Abstract

Cattle are injected with a variety of animal health products including vaccines, bacterins, antibiotics, anthelmintics, analgesics, and vitamins. Giving proper injections improves animal welfare, product response, and beef quality. Current Beef Quality Assurance (BQA) recommendations are to give products in the neck. Injections should be four or more inches apart. No more than 10 mL of a product should be given at any one injection site when giving products labeled for intramuscular administration; label instructions should be carefully followed when administering products labeled for subcutaneous use. When given a choice, the subcutaneous route of administration should be used. Needles should be sharp and changed often. Damaged needles should be discarded. Veterinarians, technicians, and others giving injections should follow BQA recommendations.

Résumé

Les bovins sont injectés avec divers produits de santé animale incluant des vaccins, des bactérines, des antibiotiques, des anthelmintiques, des analgésiques et des vitamines. Lorsqu'appropriées, les injections améliorent le bien-être animal, la réponse au produit et la qualité du bœuf. Les recommandations actuelles du *Beef Quality Assurance* (BQA) insistent pour injecter les produits dans le cou. Les injections devraient être espacées d'au moins quatre pouces. On ne devrait pas injecter plus de 10 mL d'un produit par site d'injection lorsqu'on donne des produits homologués pour l'injection intramusculaire. Les instructions sur l'étiquette devraient être suivies scrupuleusement lorsqu'on administre des produits homologués pour l'injection sous-cutanée. Face à un choix, la voie d'administration sous-cutanée devrait primer. Les aiguilles doivent être pointues et changées souvent. Les aiguilles endommagées devraient être jetées. Les médecins vétérinaires, les techniciens et les autres personnes qui donnent des injections devraient suivre les recommandations du BQA.

Introduction

Nearly 20 years ago, USDA-FSIS, the National Cattlemen's Association and others began efforts to reduce lesions found at slaughter, often in the more expensive cuts of beef. Beef Quality Assurance (BQA) meetings and other educational efforts were undertaken to inform producers and veterinarians of problems being found at harvest, at the retail level, and by consumers. Recommendations for giving proper injections were developed. Pharmaceutical and biological companies were encouraged to develop tissue friendly products and routes of administration. Many companies did the research necessary to add the subcutaneous (SQ or SC) route of administration to a product's label and to develop more tissue friendly products, such as clostridial bacterins/toxoids. Some of the more irritating products were removed from the market place. These educational efforts, along with improved products, have reduced, but not eliminated injection lesions being found at slaughter or meat cutting operations.

Injection Triangle

Injections should be given in the neck in the "injection triangle". The lower boundary of the injection triangle is above the cervical vertebrae, which lie in the middle of the neck. The upper boundary is below the nuchal ligament, which is two to three inches (5 to 7.5 cm) below the top line. The posterior boundary is in front of the slope of the shoulder. This leaves a fairly limited area for injections. Giving injections in the neck keeps them out of the more valuable areas of the carcass, such as the top butt and round. Both SQ and intramuscular (IM) injections are recommended to be given in the injection triangle.

The nuchal ligament lies at the top of the neck and helps support the animal's head. The ligament has limited blood supply, and should be avoided when giving injections because some products may not be absorbed properly. Any irritation caused by a vaccine or pharmaceutical could adversely affect how an animal moves its head and neck. The cervical vertebrae lie in the middle part of the neck. The vertebrae take up a significant part of the neck and are as wide as a fist. There is very little muscle on the lateral side of the vertebrae, so giving an IM injection into the vertebral muscles should be avoided.

The two main muscles for IM injections in the neck are triangular in shape. These muscles are wider toward the shoulder and thinner toward the animal's head. Besides being wider near the shoulder, the muscles are also thicker here. The small size of the neck muscles limits the area in which IM injections can be given.

In front of the point of the shoulder is the prescapular lymph node. Lymph nodes are found throughout the body and are important for developing an immune

response. The lymph node can get bruised by an animal coming into a chute rapidly and hitting the headgate too hard. Bruising the lymph node could compromise its ability to develop the expected immune response following vaccination.

Many working facilities don't make it easy to give injections in the neck. In some facilities, the headgate has been attached to an alley resulting in limited access to the neck. Older livestock chutes may not offer easy access to the neck because of bar placement; also some headgates may have had neck extenders added. Dairy cows and heifers are often given injections while in multiple head lockups. Out of habit and convenience, products are often administered by "tailing" the animal and injecting in the posterior hind leg or top butt.

Scarring of muscle tissue may occur following IM injections, but when given in the injection triangle, less-valuable cuts of beef are affected. Again, the lower boundary of the injection triangle is formed by the cervical vertebrae, the upper boundary is the nuchal ligament, and the posterior boundary is in front of the shoulder.

Multiple Injections Should be at Least Four Inches Apart

When administering multiple injections, they should be at least four inches (10 cm) apart. If two injections are to be given in the same side of the neck, one injection needs to be given in the front part of the injection triangle, and the second injection at least a hand's width behind the first injection. This reduces the chance of the products interfering with each other and not working properly. Spacing products apart also reduces the potential for both products causing an increased reaction in the tissues. I recall a situation where a rancher's son gave two oil-adjuvanted bacterins nearly on top of each other, resulting in softball-sized lesions. Follow-up investigation demonstrated that nether product caused significant lesions when given separately, but swelling occurred when given too close together.

Maximum Volume at each Injection Site

IM Injections

No more than 10 mL of any product should be given at any one injection site when an animal health product is administered IM. A smaller volume should be given to lighter calves. Injecting more than 10 mL at one site may decrease the product's efficacy because of the potential for reduced absorption. If a product is irritating, tissue damage may be minimized by using a smaller volume.

When treating heavier animals such as bulls or cows, some producers and veterinarians find it more convenient to give more than 10 mL at one site. For example, IM administration of 20 mL of long-acting tetracycline in a single site in the hind leg can cause a significant lesion. Two weeks post injection of oxytetracycline, a florescent green lesion can be found several inches above and below the injection site. Muscle lesions found at the packing plant will result in removal of the lesion and a large amount of surrounding muscle. Deep muscle lesions not discovered at the packing plant, may not be found until the retailer starts cutting steaks or roasts. Even after deep muscle lesions are removed, tenderness of the remaining muscle can be adversely affected.

SQ Injections

BQA guidelines do not restrict SQ injections to 10 mL per site. For example, the label for enrofloxacin allows up to 20 mL to be given in one location. If not specified on the label, restrict the dose volume to 10 mL. It is important for producers, veterinarians, and technicians to familiarize themselves with product labels.

SQ and IM Injections

If the product is labeled for both IM and SQ administration, the SQ route is preferred. This reduces the chance of causing lesions in the muscle. Should some scar tissue develop after a SC injection, it can be easily trimmed during hide removal.

When administering a SQ injection, a 16- or 18-gauge, 5/8-inch (16 mm) needle is a good choice. An 18-gauge needle should be used in a lighter-muscled animal, and a 16-gauge for heavier animals. How far the needle goes through the skin is important. The cutaneous muscle tightly adheres to the skin. Even with a 5/8-inch needle, it is easy to get into this muscle by accident when giving a SQ injection.

There are two methods to administer a SQ injection. One would be to go through the skin at an angle; pull the needle back out of the muscle and give the injection. The second method to give a SQ injection is the 'tent' method. The skin is pulled up by hand and the injection is placed in the space that is created. When using the tent method, the animal needs to be properly restrained so the person giving the injection doesn't risk injecting the hand forming the tent.

For intramuscular injections, a one-inch (2.54 cm) or longer needle is indicated. Use an 18-gauge needle in lighter animals and a 16-gauge in heavier-muscled animals. Intramuscular injections in the neck should go into the muscles which lie beneath the cutaneous muscle.

Other Injection Areas

Sometimes SQ injections are given behind the elbow over the ribs. Care must be taken not to be too close to the "armpit", where a product could cause inflammation or an infection that adversely affects nerves and blood

vessels located in this area. This could result in significant trim at the packing plant.

Sometimes the "top butt" has been used for giving IM injections. The top butt is not a good place to give an IM injection because it is in the middle of a more valuable cut of meat. Non-steroidal anti-inflammatory drugs (NSAID), prostaglandins, or vitamins ADE are drugs that are sometimes given in the top butt or round. These drugs have been associated with lesions in the muscle, and could adversely affect muscle tenderness surrounding the injection. Flunixin meglumine is a NSAID labeled for use in cattle, but only the intravenous route of administration is approved by the FDA. Label directions for administration should always be followed.

Change Needles Often

To reduce damage to the muscle, it is recommended that needles be changed often. Only sharp needles should be used for giving an injection. Dull or worn needles cause more tissue damage to the hide and muscle. Needles should be changed at least every time a syringe is refilled.

If a needle becomes bent, never straighten it and continue to use it because the needle has been weakened and could easily break off in the animal. A broken needle left in the muscle can cause a significant product defect. Also, burred needles should be replaced immediately.

Beef Quality Assurance is the responsibility of every cattle producer and veterinarian. The proper administration of animal health products is only one component of a complete BQA program. Other components of the National Cattlemen's Beef Association[1] BQA program include:

- Care and Husbandry Practices
- Feedstuffs and Sources
- Feed Additives and Medications
- Processing/Treatment Records
- Injectable Animal Health Products

Conclusions

In summary, injection guidelines are:

1. Give all injections in front of the shoulder where the lower-value meat cuts are located.
2. Multiple injections should be given at least four inches apart.
3. No more than 10 mL should be given when using the IM route. When using the SQ route, follow label instructions for the volume administered at each site. If not specified on the label, restrict the volume to 10 mL.
4. Use the most "carcass-friendly" route of administration. If the product has an option of IM or SQ, the SQ route should be chosen.
5. Change needles often – after every 10 or 15 injections; sooner if the needle becomes damaged or dull.

By utilizing BQA practices, animal welfare and consumer's satisfaction of beef is enhanced. Following these guidelines should help keep injection site defects out of the beef supply.

Reference

1. Ruppert R: Update on the National BQA Program. Used with permission.