

Vaccine and Drug Practices

Based on the 2000 National Beef Quality Audit, injection-site blemishes (lesions) cost the beef industry \$188 million annually. This means producers lost an average \$7.05 per head per year in the value of the steers and heifers marketed. Research sponsored by NCBA on behalf of the Beef Checkoff uncovered a negative relationship between meat tenderness and injection sites, including those injection sites that had no visible lesions. Findings concluded that all intramuscular (IM) injections, including sterile water, create permanent damage—regardless of the age of the animal at the time the product was given. At the very least, tenderness is reduced in a 3-inch area surrounding the injection site.

Contrary to popular belief, not all beef from market cows is sold as ground beef. For example, rib eye rolls and rounds from market cows and bulls are used as whole muscle cuts in popular consumer products such as Philly Steak and roast beef sandwiches, as well as marinated and tenderized steak products. Thus, BQA practices are just as important throughout the life of cows and bulls.

Injection Sites and Techniques

To lessen injection -site defects in economically important cuts of beef, the preferred site for all subcutaneous (SQ) or intramuscular (IM) injections is the neck region (See Figures 2-1 and 2-2.) It is particularly important to use the neck region with IM products, because even the shoulder chuck primal contains “value-added” cuts that should be protected.

Whenever possible, choose products formulated and labeled for SQ rather than IM injection. See Table 2-1 for proper needle sizes.

Subcutaneous Injections

SQ injections are made just under the skin but not into the muscle tissue. The side of the neck is the best area to make injections. To administer, lift the skin with your free hand and insert the needle into the raised fold of skin. This is known as the “tent technique” (Figure 2-2).

Figure 2-1. Proper injection sites.

SQ (subcutaneous) injections:

- Needle gauge: 16 to 18
Length: 3/4 to 1 inch; 3/4-inch if tent technique is not used.
- No more than 10 cc at a single injection site.
- Separate injection sites by at least 5 inches.

IM (intramuscular) injections:

- Needle gauge: 16 to 20
Length: 1- to 1½-inch long
- No more than 10 cc at an injection site. Too much drug in one area can cause muscle damage.

Source: Courtesy of The Ohio State University. Used with permission.



The lesions in this roast beef were not discovered until the fully cooked roast was sliced by a foodservice employee.

Certain antibiotics, vaccines, and implants are approved for the ear injection site. The exact location on the ear depends on the product. For example, liquid or pelleted growth implants are given in the middle third of the ear; whereas some antibiotics and vaccines may be administered in the base of the ear.

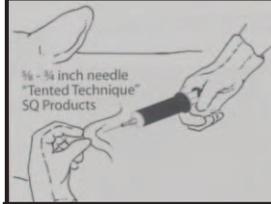


Figure 2-2. “Tent” technique for SQ injection.

Several animal health products are now approved to be injected into the ear of cattle. This location is excellent from a BQA perspective as ears are removed at harvest and do not enter the food chain. The ear must be clean to avoid infection, and producers should take care to avoid blood vessels. Read product labels carefully. An example of an ear injection technique can be found on the internet at <<http://www.excede.com/>>.

Injecting into a wet or muddy site increases the risk for spreading disease as well as increasing the number of injection-site lesions.

Intramuscular Injections

IM injections are made directly into muscle tissue of the neck. Absorption of the drug is more rapid in the muscle than under the skin because of the good blood supply to muscle tissue. After the injection site is chosen, distract the animal by slapping the injection site firmly. Immediately insert the needle with a quick thrust.

Needle Use and Handling

General Guidelines

- Select a clean injection site.
- Single-use needles are preferred.
- Keep the contents of the vaccine bottle sterile; do not store a syringe and needle in the top of a bottle.
- Do not put a needle back into the vaccine bottle once it has been used for anything else.
- Keep transfer needles in a closed container when at chute-side and after use, boil and place in a clean container (see Figure 2-3 for instructions).

Figure 2-3. Improper sterilization can reduce the effectiveness of future injections and result in infection at the injection site.

To sterilize:

1. Bring a container of water to a rolling boil.
2. Place equipment in the boiling water.
3. Cover the container.
4. Bring the water back up to a boil.
5. Continue boiling for three to five minutes.

Source: Center for Disease Control and Prevention



Selecting the Proper Needle Gauge

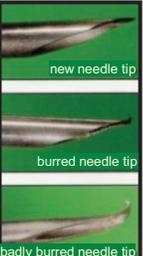
Primary considerations in needle selection include route of administration, size of the animal, and site of the injection. Secondary considerations include viscosity of the fluid and volume injected. The needle size used should never be larger than necessary to adequately perform the injection (Table 2-1).

Table 2-1. Determining proper needle gauge based on the route of administration, animal size, and viscosity ¹ of fluid.				
Injection Type	Fluid Viscosity ¹	Animal Size (lb)		
		<300	300-700	>700
Needle Gauge				
SQ Injection (³ / ₄ to 1 inch long needle)	Thin	18	18	
	Thick	18	18	18
IM Injection (1 to 1 ½ inch long needle)	Thin	20-18	18	18
	Thick	18	18	18
IV Injection (1 ½ inch long needle)	Thin	18	18	18
	Thick	18	18	18

Changing Needles

- Change needles every 10 to 15 head, or with every automatic dosing syringe refill.
- Change any needle that is bent, or becomes contaminated (manure, dirt, or chemicals), or if the needle point becomes burred.
- To prevent the spread of known blood-borne infectious diseases, use a new needle for each animal. Note: A broken needle is an emergency; it will migrate farther into the tissues. Under no circumstances should animals with broken needles be sold or sent to a packer.

Examples of needle tips. When needles become burred they should be replaced.



Do not straighten and reuse a bent needle.

Cleaning Needles

- Use disposable needles and syringes.
- Heat-sterilize reusable equipment by boiling.
- Do not contaminate modified live virus products with disinfectants (such as rubbing alcohol).

Disinfectants (like rubbing alcohol) can decrease or even eliminate the effectiveness of modified live virus products.

Proper Disposal of Sharps for Producers

- Place in a thick plastic container with a secure lid. A sharps container is best, but a liquid detergent bottle can also work.
- Place sharps container in a rigid container lined with plastic.
- Dispose of as solid waste.

Drug Management



Open and consistent communication between a dairy/livestock producer and a veterinarian is needed to assure quality control, animal welfare, and prevention of drug and chemical residues. Using animal health products exactly as they are labeled or prescribed by a veterinarian with whom the producer has a valid veterinarian-client-patient relationship (VCPR) is a requirement of a BQA program. Information about establishing a valid VCPR is contained later in this chapter.

Storage

Animal health products usually have specific storage requirements. Some require refrigeration. All should be stored in a clean place where they cannot become dirty or contaminated. Observe and obey the manufacturer's recommended storage instructions for each product.

Where refrigeration is needed, be sure the refrigerator is kept clean and located in a safe place that is not likely to be overheated or contaminated by dirt or manure. Do not keep refrigerated drugs in door shelves because of the temperature fluctuation.

Drugs for lactating dairy cows must be stored separately from those used for nonlactating cattle. This helps prevent lactating animals from receiving drugs intended for nonlactating animals, which could cause an illegal residue in milk and meat. This restriction applies to drugs stored both at room temperature and under refrigeration.



Using proper restraints when injecting cattle can help to avoid accidents.

Handling Precautions

- Always read and follow label instructions and supply them in Spanish or other languages if needed.
- Post the local poison control center number by all phones.
- Use proper restraints when injecting cattle.
- With medication known to be toxic to humans, use the one-handed SQ tent technique (Figure 2-4). Use extreme caution if using automatic syringes for these medications.

Figure 2-4. One-handed "tent" technique for SQ injection.



Ensuring Drug Effectiveness

Preparation

- Use only fresh products.
- Keep in a cooler from purchase until refrigerated or administered.
- Purchase appropriate dosage sizes for the task.
- Use transfer needles to reconstitute vaccines.

Mixing

- Rock bottle(s) back and forth, but do not shake.
- Do not mix too much at one time.
- After mixing, gently rock bottle(s) periodically.
- Use only approved combinations.

Administering

- Label syringes before processing.
- Use separate syringes for each product.

Storage

- Do not store partially used containers.
- Clearly label all products before storage.

Residue Avoidance

Drug residue in livestock products must be avoided. Consumers are concerned about the drugs used in dairy and livestock production and how they affect the food they eat. The industry can address these concerns by assuring consumers that the necessary steps are taken to prevent drug residues. Consumers expect zero tolerance.

Residue violations and condemnations can be avoided by implementing and following control systems that incorporate the following practices:

- Maintain proper individual animal identification.
- Maintain complete medical records on animals for at least two years (see sample records in Chapter 11).
- Properly store, label, and account for all medication.
- Use animal health products according to the label.
- Maintain a valid Veterinarian – Client – Patient Relationship (VCPR).
- Educate all employees and family members about your control systems, and emphasize the importance of keeping drug residues out of the human food chain.



To reconstitute a vaccine, place one end of the transfer needle into the sterile liquid and the other into the bottle containing the freeze-dried cake of vaccine. The vacuum should pull the liquid down.

Don't mix too much vaccine at one time. Modified live vaccines (MLV) begin to degrade after about an hour in the heat and sunlight.

Don't combine products unless their combined use is approved: Mixing unlike products can destroy effectiveness.

Use separate syringes for each product. Even a trace amount of killed product can harm the effectiveness of the modified live product.

Don't store partially used containers of vaccines. This can lead to infections at injection sites and result in ineffectiveness of the vaccine.

Drug Classifications

The Food and Drug Administration (FDA) has the responsibility for determining the market status of animal drugs, based in part upon whether it is possible to prepare “adequate directions for use” under which a lay person can use the drugs safely and effectively. The two basic classes of drugs available to livestock producers are discussed below:

Over-the-Counter Drugs

Over-the-counter (OTC) drugs can be purchased from multiple sources and must be used as directed on the label (Figure 2-5). For example, most procaine penicillin G products are labeled for use at 1 cc/cwt and are given IM. So, a 600-pound calf would get 6 cc IM. Producers are not allowed to change the dose or give the drug by any other route, such as SQ.

Prescription Drugs

A drug that has significant potential for toxicity (or other harmful effects) in humans or animals that may have a unique method of use or which requires other special considerations for its use is usually labeled as a prescription (Rx) drug. Such products can be used or dispensed only by or on the order of a licensed veterinarian, and the label must contain the legend: “Caution: Federal law restricts this drug to use by or on the order of a licensed veterinarian” (Figure 2-6).

Extra-Label Use of Drugs

Extra-label use is defined as the “actual or intended use of a drug in a manner that is not in accordance with the label.” Under the provisions of the Animal Medicinal Drug Use Clarification Act of 1994, the FDA recognizes the professional judgment of veterinarians and allows the extra-label use of drugs (either OTC or Rx) by veterinarians under certain conditions. Extra-label use is limited to situations where a failure to treat an animal would:

- Threaten the health or life of an animal
- Cause undue suffering

Veterinarians may only consider using drugs in an extra-label manner under the following conditions:

1. There is no approved drug that is labeled for such use and that contains the same active ingredient in the required dosage form and concentration.
2. A currently approved and labeled drug is clinically ineffective for its intended use (e.g., drug resistant bacterial infections).

Figure 2-5. Sample over-the-counter label.

Name of Drug	• COWBIOTIC
Active Ingredients	• (hydrocillin and streptozolidin in aqueous suspension)
Instructions for Use	• Directions for Use: See package insert.
Withdrawal Times	• Warning: The use of this drug must be discontinued for 30 days before treated animals are slaughtered for food. Exceeding the highest recommended dosage level may result in antibiotic residues in meat or milk beyond the withdrawal time.
Quantity of Contents	• Net contents: 100 ml
Name of Distributor	• Distributed by: Animal Health

Note: Over-the-counter drugs must be used as directed on the label.

Figure 2-6. Sample prescription label.

Name of Drug	• BULLMYCIN 300
Active Ingredients	• (Wondercine HCl)
Instructions for Use	• Directions for Use: See package insert.
Prescription Legend	• Caution: Federal law restricts this drug to be used by or on the order of a licensed veterinarian.
Withholding Times	• Warning: The use of this drug must be discontinued for 28 days before treated animals are slaughtered for food. Exceeding the recommended dose, or number of days treatment, or 10 ml per injection site may result in antibiotic residues beyond the withdrawal period.
Quantity of Contents	• Net contents: 100 ml
Name of Distributor	• Distributed by: Animal Health

Extra-label use: the actual or intended use of a drug in a manner that is not in accordance with the label.

Veterinarian-Client-Patient Relationship (VCPR)

Extra-label treatments may only be administered by a licensed veterinarian or under the supervision of a licensed veterinarian, and within the scope of a valid VCPR. A valid VCPR exists when:

- The veterinarian has assumed the responsibility for making clinical judgments regarding the health of the animal(s) and the need for medical treatment, and the client (owner or caretaker) has agreed to follow the veterinarian's instructions.
- The veterinarian has sufficient knowledge of the animal(s) to initiate at least a general or preliminary diagnosis of the medical condition of the animal(s). This means that the veterinarian has recently seen and is personally acquainted with the keeping and care of the animal(s) by virtue of an examination of the animal(s), or by medically appropriate and timely visits to the premises where the animal(s) are kept.
- The veterinarian is readily available or has arranged for emergency coverage for follow-up evaluation in the event of adverse reactions or failure of the treatment regimen.

Precautions

Prior to using or dispensing a drug in an extra-label manner, the veterinarian should take the following precautions:

- Make a careful diagnosis and evaluation of the conditions for which the drug is to be used.
- Establish a substantially extended withdrawal period prior to marketing of milk, meat, or other edible products.
- Institute procedures to assure that the identity of the treated animal(s) is carefully maintained.
- Take appropriate measures to assure that the assigned withdrawal times are met and that no illegal drug residues occur in any food-producing animal subjected to extra-label treatment.

Labeling

Drugs intended for extra-label use must have additional labeling (Figure 2-7), including at least the following information:

- The name and address of the prescribing veterinarian (not just the clinic)
- The name of the active ingredient(s)
- Directions for use, including identity of the animal being treated, dosage, frequency and duration of treatment, and route of administration
- Any cautionary statements specified by the veterinarian
- The veterinarian's specified withdrawal time for meat and/or milk

VCPR (veterinarian-client-patient relationship): Open and consistent communication between a producer and veterinarian helps to assure quality control, animal welfare, and prevention of drug and chemical residues.

Penicillin accounts for more than 20 percent of all antibiotic residue violations in beef. It is the most commonly used drug and is routinely purchased over the counter. Gentamicin and streptomycin run a close second in the number of residue violations attributed to these antibiotics.

Figure 2-7. Label provided by veterinarian for "extra-label"

<p><i>Name and Address of Veterinarian</i></p>	<p>• Veterinarian _____ Phone _____</p> <p>Address _____ Date _____</p> <p>Expiration of drug _____</p> <p>Owner/Farm _____</p> <p>Active Ingredients _____</p>
<p><i>Cautionary Statements</i></p>	<p>• Indications _____</p>
<p><i>Instructions for Use</i></p>	<p>• Directions:</p> <p>Give _____ cc's/bolus/oz _____ times each day for _____ days.</p>
<p><i>Prescribed Withholding Times</i></p>	<p>• Prescribed meat withholding time _____</p> <p>Hours of milk withhold _____</p> <p>Send samples: Y / N _____</p> <p>Days slaughter withhold _____</p> <p>Appropriate drug tag _____</p>

A common mistake: improperly administering a drug—e.g., a large dose is given all in one site instead of smaller doses in multiple sites.

Limitations

The extra-label use of drugs is not permitted in or on animal feeds. A veterinarian cannot use or prescribe drugs for use in feed in any manner except for the approved use and at the approved dosage. Extra-label use of drugs in treating food-producing animals for improving rate of weight gain, feed efficiency, or other production purposes is also prohibited. Some specific drugs are completely prohibited for extra-label use in food-producing animals, including:

- Chloramphenicol
- Clenbuterol
- Diethylstilbestrol
- Dimetridazole
- Iprnidazole
- Other nitroimidazoles
- Furazolidone (Furacin topical powder)
- Nitrofurazone
- Fluoroquinolones (except for approved use for beef cattle)
- Glycopeptides

Drug Withdrawal Times

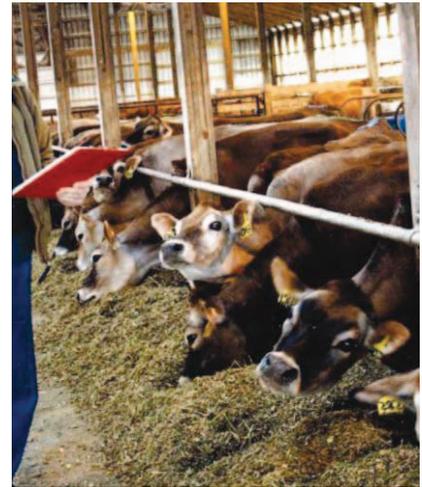
A withdrawal time should be indicated on the label of medications. This is the period of time that must pass between the last treatment and the time the animal will be harvested or milk can be sold. For example, if a medication with a 14-day meat withdrawal period was last given on August 1, the withdrawal would be completed on August 15, and that would be the earliest the animal could be harvested for human consumption. Often there are separate withdrawals for milk and meat, and meat withdrawals are always longer.

It is important that you follow withdrawal time directions on the label or as prescribed by your veterinarian. From the day you acquire your animals until the day they leave your care, you should maintain feed and treatment records. This is important for the day-to-day care of your animal and for whoever may later purchase your animal.

Observe label instructions and withdrawal times carefully. When using drugs by extra label work closely with the veterinarian on dosages and withdrawal times. Never use an approved veterinary drug in an extra-label manner without consulting the veterinarian. Treating animals in an extra-label manner without direction by a licensed veterinarian is illegal.

Unacceptable levels of drug residues detected in edible tissues collected at harvest will result in traceback, quarantine, and potential fines or jail time. Substantial economic losses may result for the individual producer as well as negative publicity for the entire beef industry. Producers are responsible for residue problems and should follow these rules:

- Do not market animals for food until the withdrawal time listed on the label or prescribed by the veterinarian has elapsed.
- Use only medications approved for cattle, and use them exactly as the label directs or as prescribed by your veterinarian.
- If ever in doubt, rely on the VCPR you have established with your veterinarian. Consult your veterinarian with all questions and concerns.
- Keep records that show drug and dosage used, animals treated, and withdrawal time.



All federally approved drugs will include the required withdrawal time for that drug on the product label or package insert. These withdrawal times can range from 0 to as many as 60 days or more. The Compendium of Veterinary Products, published by the North American Compendiums Inc., gives a comprehensive list of drugs approved for use in beef and dairy cattle as well as a description of each drug. In addition, the Compendium includes a chart of the withdrawal times for meat and also includes time of milk withholding. The drug label itself always supersedes the Compendium if there is a discrepancy. It is your responsibility to be aware of the withdrawal times of any drugs that you use on your cattle. More information is available at these Websites: <<http://www.fda.gov/>>

Managing Implants

Implants may provide an economic advantage in the production of safe and wholesome beef. Beef from implanted cattle has proven to be leaner than beef from non-implanted cattle, with minute differences in hormone levels (Figure 2-8). Nevertheless, consumer concern remains high with regard to implanted beef. Administer implants properly and follow label directions, including proper sanitation and the use of antiseptic on the needle between every use. Proper sanitation results in fewer abscesses in the ear and allows for higher utilization of the implant.



Figure 2-8. Hormone levels in beef.

Small Amounts Found in Beef	The difference in levels of estrogen found in beef from cattle raised with or without growth promotants is miniscule.
	Growth promotants vs. no growth promotants (in nanograms of estrogen)*
	3-ounce serving of beef from a steer treated with growth promotants 1.9 3-ounce serving of beef from a steer raised without growth promotants, such as certified organic beef 1.3
FDA-Approved Safe Levels	One serving of beef from a steer implanted with a growth promotant has nearly 20 times less estrogen than what the FDA permits, and thousands of times less than the amount our bodies naturally produce, not to mention a fraction of the phytoestrogen levels present in foods such as soybean oil, cabbage and grains.
Hormones in the Human Body	The human body naturally produces hormones in quantities much greater than could ever be consumed by eating any food. In fact, the average man or woman daily produces 35,000 times more hormones than could be present in beef or other food.
	Male vs. Female (in nanograms of estrogen)*
	Male child41,500 Female child54,000 Male adult136,000 Female adult480,000 Female adult (pregnant).....3,415,000
* A nanogram is one billionth of a gram, which is analogous to one blade of grass in an entire football field.	

Sources: Food and Drug Administration; Hoffman and Evers; Scanga et al.; FSIS-USDA; Dr. Harlan Ritchie, Michigan State University.

Regulations governing the use of implants are set by the FDA. Always read and follow the manufacturer's directions before implanting any cattle. The growth promotant implants approved for use in the United States are extremely safe for both production and consumption. There is no required withdrawal time for slaughter with FDA approved implants.

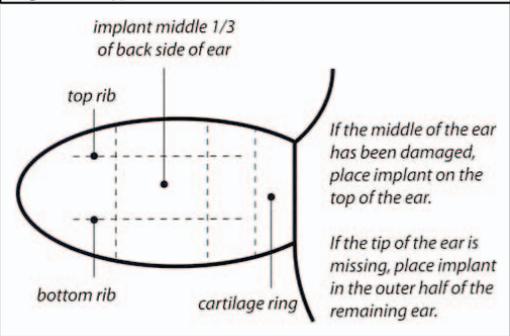
The only approved location for implant administration is the middle third of the backside of the ear. All implants must be located SQ within this area (Figure 2-9). Implants should never be placed in locations other than the ear.

Routine inspection of implant sites should be done every time animals are handled through a chute. Document the results of the inspection for future reference in implant management decisions. The objective is to know your options, then plan and keep records to evaluate your decisions.

Although there is no withdrawal period for implants, there are quality considerations in the timing. Aggressive implant strategies that maximize the response to the implant in growth and feed efficiency can compromise carcass grade. A conservative approach may not pay, however, when the Choice and Select price spread is too narrow to offset the lost value in feed efficiency and gain, which implants provide. It is as much an economic decision as it is a quality decision.

The objective is to know your options, then plan and keep records to evaluate your decisions.

Figure 2-9. Approved location for implant administration.



Using Implants Correctly—Implanting Mistakes and Solutions

Problem	Cause	Solution
Abscess at implant site	Lack of sanitation	Disinfect equipment, dry ears, improve restraint
Bunched pellets	Needle moved, poor restraint	Improve cattle restraint
Retrograde abscess	Infection after implanting	Pinch site after implanting; improve sanitation
In cartilage	Poor needle; too fast; improper placement	New needle; slow down; place properly
Crushed pellet	Needle not fully inserted	Fully insert needle
Missing implant	Not advancing cartridge; needle placed through ear; abscess occurred	Check implant position, pinch site shut
Separated pellet	Rapid withdraw of needle, processing too fast	Slow down, withdraw needle slowly
Partial implant	Needle too short, too fast, poor restraint	Use needle provided, slow down, improve restraint
Pellet too close to the head	Inexperience	Implant only in middle one-third of the ear
Walled-off implant	Abscess	Improve sanitation

Source: Compudose Technical Manual, 1982.

Producer's Guide for Judicious Use of Antimicrobials (Antibiotics) in Cattle

1. **Prevent problems.** Emphasize appropriate husbandry and hygiene, routine health examinations, and vaccinations.
2. **Select and use antibiotics carefully.** Consult with your veterinarian on the selection and use of antibiotics. Have a valid reason to use an antibiotic. Therapeutic alternatives should be considered prior to using antimicrobial therapy.
3. **Avoid using antibiotics important in human medicine as first-line therapy.** Avoid using as the first antibiotic those medications that are important for treating strategic human or animal infections.
4. **Use the laboratory to help you select antibiotics.** Cultures and susceptibility test results should be used to aid in the selection of antimicrobials, whenever possible.
5. **Avoid using broad spectrum. Use narrow spectrum antimicrobials whenever possible.** Combination antibiotic therapy is discouraged.
6. **Avoid inappropriate antibiotic use.** Confine therapeutic antimicrobial use to proven clinical indications, avoiding inappropriate uses such as for viral infections without bacterial complication.
7. **Treatment programs should reflect best use principles.** Regimens for therapeutic antimicrobial use should be optimized using current pharmacological information and principles.
8. **Treat the fewest number of animals possible.** Limit antibiotic use to sick or at-risk animals.
9. **Treat for the recommended time period.** This practice will minimize the potential for bacteria to become resistant to antimicrobials.
10. **Avoid environmental contamination with antibiotics.** Steps should be taken to minimize antimicrobials reaching the environment through spillage, contaminated ground run-off, or aerosolization.
11. **Keep records of antibiotic use.** Accurate records of treatment and outcome should be used to evaluate therapeutic regimens. Always follow proper withdrawal times.
12. **Follow label directions.** Never use antibiotics other than as labeled without a valid veterinary prescription.
13. **Extra-label antibiotic use must follow FDA regulations:** Prescriptions, including extra-label use of medications must meet the Animal Medicinal Drug Use Clarification Act (AMDUCA) amendments to the Food, Drug, and Cosmetic Act and its regulations. These regulations require a valid VCPR.
14. **Subtherapeutic antibiotic use is discouraged.** Antibiotic use should be limited to prevent or control disease and should not be used if the principle intent is to improve performance.



Source: Guidelines 1 through 13 adapted by NCBA, from AVMA, AABP, and AVC Appropriate Veterinary Antibiotic Use Guidelines.