

Producing Consumer Products From Sheep:

The Sheep Safety and Quality Assurance Program



Written For:

The American Sheep Industry Association

By:

Karissa Maneotis¹, Deborah L. Van Overbeke², Stephen B. LeValley¹, Dale R. Woerner¹,
Jennifer N. Martin¹, Joseph D. Tatum¹, and Keith E. Belk¹

1. Colorado State University – 2. Oklahoma State University



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Chapter 1: Introduction to the Sheep Safety & Quality Assurance Program

The American Sheep Industry Association (ASI) began development of an industry-wide quality assurance program in 1991. Since then, the ASI, through cooperative agreements with the United States Department of Agriculture (USDA), Colorado State University, University of Minnesota, and Texas A&M University, conducted a quality audit of meat, wool, and milk from U.S. sheep. In the final report of that audit, industry problem areas were identified, and preventative management strategies to assist in the reduction of quality challenges were developed.

This publication provides information about objectives and process control procedures for use by sheep producers that will help to generate safe, high-quality products.

The mission of the Sheep Safety & Quality Assurance (SSQA) program is to maximize consumer confidence in, and acceptance of, sheep products by using research and education to improve management during the production of safe and high-quality sheep products.

Consumers are concerned about the safety of the food they eat as well as about the quality of the products they buy. Consumer concerns have prompted those in every sector of the livestock industry to take a careful look at the products they market. The Sheep Safety & Quality Assurance (SSQA) program has been developed to ensure that consumer products generated by the U.S. sheep industry are safe and of the highest quality possible.

The SSQA manual contains introductory information, criteria to achieve through process control to ensure compliance with the SSQA program. Safety and Quality criteria of the SSQA Program are outlined in Chapters 2 and 3, along with supporting information relevant to the topic. To become SSQA verified, producers must implement process control strategies to address all criteria, via written Standard Operating Procedures (SOPs), as outlined in the guidelines, and contact a trained third party to verify compliance with the criteria in their operations. Full verification in the SSQA program will be awarded when all criteria have been addressed with written SOPs and have been implemented in a production unit

In 1992-1993, the American Sheep Industry Association, in conjunction with the United States Department of Agriculture (USDA), sponsored a quality assurance audit to examine all phases of the production of sheep and of the generation of lamb, mutton, wool, pelts, milk, and lanolin. The audit traced each product from its origin on the farm or ranch through processing (in animal-harvesting plants and mills) to the consumer. Factors of importance in quality assurance programs at the live-animal sector were farm, ranch, and feedlot management practices affecting the quality of sheep products.

There are many reasons for sheep producers to strive to supply safe, high-quality products:

- Producers have a responsibility to consumers to provide food that is safe for consumption. This is true for all commercial and purebred producers and those who manage a lamb feedlot or are involved in 4-H or FFA programs.
- Addressing the objectives in this manual will help ensure the well-being of sheep and alleviate concerns of consumers about animal welfare.
- Implementing management practices to address safety and quality issues will offer evidence that the industry is providing safe, high-quality products to consumers, and thus, will allow sheep producers to continue to control their own production systems and minimize regulatory intervention.
- Practices that result in safe, high-quality products also result in the highest potential profit to the producer.
- A reputation for high-quality products, such as clean wool and quality lamb, will result in more marketing opportunities for the producer.
- Production of high-quality meat, milk, and wool creates feelings of pride and satisfaction among producers.

The SSQA program was developed to provide education to producers pertaining to the concepts and background of total quality management; to outline the criteria for which production procedures will assist in meeting the objectives that should be addressed in a sheep production unit; and to assist in the writing, implementation, and verification of production procedures to meet the outlined criteria. The term “criteria,” as used in this manual, is analogous to the term “Good Management Practices” (GMPs), or “Best Production Practices” as used in describing Total Quality Management (TQM) systems, while the term “procedures,” as used in this

manual, is analogous to the term “Standard Operating Procedures,” or (SOPs), as used in describing TQM systems.

See Chapter 6 for further information on SSQA certification and verification programs.

This manual outlines three “levels” or stages of SSQA implementation that should be addressed sequentially by sheep producers.

Level 1: SSQA Participant-Education

Level 1 training is designed to educate producers regarding the basis of assuring sheep safety and quality, to describe and define the safety and quality criteria, and to assure that producers understand the concepts and reasoning behind the development of the criteria and the importance of their implementation. Completion of Level 1 training identifies producers as “participants” in the SSQA program.

Level 2: SSQA Certified Development of Site Specific Plans

Level 2 training is designed for education of small groups of producers, assisting them in the development of mission statements, production flow diagrams, and SOPs that will be needed to implement the SSQA program. Certification at Level 2 implies that producers understand the concepts needed to develop a site-specific plan, complete with SOPs. It is important to realize that the “certification” applies to the producer who completes Level 2 training, not to the production unit. The development of written site SOPs will include the mission statement, description of products produced, production flow diagram, a preventative defect analysis, written SOPs to meet the required SSQA criteria, procedures for monitoring, procedures for internal verification, and record keeping.

Level 3: SSQA Verified-Verification

Level 3 training is designed to verify that producers have implemented the SSQA program and that they are following the guidelines as outlined in this manual. Verification will be accomplished by trained, independent third parties who will visit production units to assure that appropriate objectives and procedures are in place, are being monitored, and are effective. Audits are not meant to criticize producers’ practices but to assist in the process of “continual improvement” of their management practices in ways that will generate safe, high-quality sheep products. Level 3 verification implies that the SSQA is in place and operating successfully in an individual production unit

Chapter 2: SSQA Safety

Criteria Achieved by Implementation of Written SOPs

S.1 Do NOT feed prohibited mammalian-derived protein.

- **Meat and bone meal or any other prohibited protein sources derived from mammalian muscle or bone tissue cannot legally be fed to ruminants.**
- **This regulation is intended to prevent amplification of transmissible spongiform encephalopathies, known as scrapie in the sheep industry.**

The causative agent that creates transmissible spongiform encephalopathies (TSE) cannot be detected via testing in rendered, animal-origin by-products. The USDA has formulated rules and regulations that deal with the feeding of mammalian-derived products. Therefore, no “prohibited” mammalian-derived protein can be fed to sheep that are produced in an accredited SSQA program. Some protein products derived from mammals are exempt (non-prohibited) and are approved for use by the FDA and in the SSQA program. Always refer to the manufacturer’s label to determine whether the products are approved for use in sheep. While some products may be exempt, ensure that only accepted products are being fed by obtaining letters of guarantee, such as a certificate of assurance, from feed suppliers. More information on mammalian-derived by-products is available in Appendix 5.

S.2 Use only approved medicated feed/water additives, according to label directions and FDA Good Manufacturing Practices.

- **Use only Food and Drug Administration (FDA)-approved, medicated feed additives in rations, according to FDA-approved labels.**
- **Extra-label use of feed additives is strictly prohibited.**
- **No one has the authority to adjust the dosage of medicated feed additives.**

- **Follow usage per FDA Good Management Practices.**

Use only FDA-approved products and administer them as directed on the label. All directions for the use of a medicated feed additive will be on the label attached to the bag, or will be supplied with a bulk order. No one, including a veterinarian, can legally prescribe the use of any feed additive other than as directed on the product label. Extra-label drug use provisions of federal regulations do not apply to feed additives or feed medications. Veterinary Feed Directives (VFD) do not apply to extra-label drug use; they pertain to the use of medicated feeds. At present, however, no products have been approved for use in sheep with a VFD. Water medications are not considered feed medications and, therefore, can be used under the extra-label drug use guidelines provided by the FDA Center for Veterinary Medicine (CVM) in reference to the Food Animal Residue Avoidance Databank (FARAD).

Medicated feeds must contain the proper drug level and be fed at appropriate levels. The term “medicated feed” includes all medicated feed products intended to be a substantial source of nutrients in the diet of an animal. This includes products commonly referred to as supplements, concentrates, premix feeds, and base mixes, and is not limited to complete feeds. Medicated feed also applies to the use of feed additives, such as antibiotics, coccidiosis control medications, or dewormers.

The most important responsibility of a feed manufacturer relative to the SSQA is to assure that the feed produced — whether medicated or non-medicated — meets all legal and intended specifications. All feed-mixing operations, regardless of size or products used, share this responsibility. Commercial feed companies, as well as sheep producers and feeders who mix their own medicated feeds, are required by FDA to follow labeled guidelines for use.

The withdrawal time of a drug (the time from last treatment, to the time when animals can be harvested) is based on the recommended dosage and feeding period. Careful reading of the feed additive label, checking all equipment, measuring ingredients accurately, and following mixing and clean-out directions will help ensure that chemical residues do not occur in the meat and milk products. Properly adjusted and maintained mixing equipment is essential for the prevention of drug residues. It is important to thoroughly clean equipment after using medicated pre-mixes. As little as 20 pounds of medicated feed can contaminate a ton of unmedicated feed and can cause detectable drug residues.

Medicated feeds should be mixed last, and the equipment should be thoroughly cleaned after mixing. Feed bunks/troughs and storage facilities containing medicated feed must be cleaned after the treatment period in order to follow proper withdrawal schedules.

Use medicated feed additives only in accordance with the FDA Good Manufacturing Practices (GMP) regulations. GMPs provide guidelines for proper use and maintenance of mixing equipment, methods of cleaning such equipment to prevent contamination of unmedicated feeds, proper record-keeping, and proper feed storage. These regulations require a formula record of all medicated feed rations produced, and production records of all batches of feed produced that contain medicated feed additives. Production records must include production date, lists of additives used, ration name or number, amount produced, and the earliest date animal(s) could clear the required withdrawal period. Also, identity of the animal(s) to which the feed was given must be recorded. GMPs also require that records be kept on the purchase, use, and sequence of mixing feed additives and should be kept for at least one year.

Sheep operations that handle highly concentrated medications may be required to register with FDA via a FD-1900 permit. Pre-mix or formulated supplements typically used by smaller sheep operations do not require FDA registration of any type. Contact the SSQA Coordinator or your veterinarian with questions about specific production units that may need FDA registration.

The Federal Food, Drug, and Cosmetic Act provides that a medicated feed containing an animal drug is considered adulterated if it is not produced in conformance with current GMP regulations. Manufacturers of medicated feeds that are not used in the correct manner are subject to regulatory action. Refer to Appendix 5 for the objectives for both registered and non-registered facilities. For more information on medicated feed usage objectives, contact: FDA-CVM, 7500 Standish Place, Rockville, MD 20857, (301)594-1724.

S.3 Adhere to all required withdrawal times to avoid violative residues.

- **Check all sheep being shipped for slaughter to ensure that treated animals meet or exceed label and prescription withdrawal times of all products that have been administered. A release slip must be signed and dated prior to releasing animals from the sheep operation (the SSQA-certified individual that checks records should examine**

processing records, feeding records, hospital records, and all other records that may apply).

- **Verify drug withdrawal on all sheep sold.**
- **Should there be any question about withdrawal periods being met, the veterinarian will evaluate the treatment history against information provided by the Food Animal Residue Avoidance Databank (FARAD), if available, and the animal will be subject to passing a residue screening test such as the Live Animal Swab Test (LAST). Residue screening shall be performed under the supervision of a licensed veterinarian. The results of such testing will determine the appropriateness for releasing the animal in question for shipment, but cannot be used to shorten the labeled withdrawal time.**
- **The sheep operation will collect random urine samples from animals that have received extra-label drugs for residue testing as directed by their veterinarian.**
- **Strictly follow all FDA/USDA/EPA guidelines for all product selection (pharmaceuticals, herbicides, pesticides, etc.).**

Persons involved in raising, handling, transporting, holding, and marketing of food-producing animals are encouraged to establish systems to ensure that animal drugs are used properly and to prevent the presence of potentially hazardous drug residues in edible animal products.

These control systems should include, at minimum, the following measures:

1. Identify and track animals to which drugs were administered preceding the sale of edible animal tissue or milk (identification may be by specific animal identification, pen or lot, quarantine/segregation, or other means).
2. Maintain a system of medication/treatment records that, at a minimum, identifies the animal(s) treated (individual animals, pens, lots, etc.), the date(s) of treatment, the drug(s) administered, serial and lot number of product, who administered the drug(s), the amount administered, and the withdrawal time prior to harvest.
3. Properly store, label, and account for all drug products and medicated feeds.
4. Obtain and use veterinary prescription drugs only

through a licensed veterinarian based on a valid veterinarian-client-patient relationship (VCPR).

5. Educate all employees and family members involved in treating, hauling, and selling of the animals on proper administration techniques, observance of withdrawal times, and methods to avoid marketing adulterated products for human food consumption (See the FDA Compliance Policy Guides, Chapter 25-Veterinary Drugs).

Make applicable records available to FSIS and FDA personnel and to the SSQA program coordinator if unacceptable levels of residues are found in any of the sheep shipped for slaughter (the source and cause of the violative residue will be determined and corrective action must be taken to prevent recurrence).

If an unacceptable residue is found by FSIS, a joint investigation will be conducted by the sheep operation, the veterinarian, the nutritionist, and representatives of FSIS, the FDA, and the SSQA program. Consequently, corrective action must be taken to prevent recurrence of such violation. Corrective action is defined as procedures to be followed when a deviation occurs. All violations will be reported to the SSQA coordinator for review and action.

Use all pesticides according to FDA/EPA label directions. Record all use of pesticides (such as pour-ons or injectables), including product ID, lot/serial number of the product, date used, amount used, and withdrawal time.

There are no drugs approved for use in dairy sheep. In order to prevent drug residues in milk, sheep being treated should be removed from the milking string in accordance with the Pharmaceutical's withdrawal time. If no withdrawal time can be found for this drug in sheep, they should be removed from the milking string for the duration of their lactation. Detection of drug residues is grounds for milk rejection. Milk producers and their veterinarians should develop a written treatment plan for disease prevention and control. The Pasteurized Milk Ordinance contains guidelines for Grade A milk production that are set by the Interstate Milk Shippers.

The sheep industry should pride itself in minimizing violative drug residues in lamb and mutton by emphasizing identification of each animal treated; and accurately recording the treatment, treatment date and dosage, while following prescribed withdrawal times. Flock owners are encouraged to work regularly with their veterinarian to develop flock health programs tailored to the specific needs of their sheep.

The program should be practical and cost-effective. Such a program will ensure that livestock are healthy and sheep products are safe and wholesome. The benefits will include increased flock productivity, well-being, and profitability.

S.4 Employ extra-label drug use only when prescribed by a veterinarian within the context of a valid veterinarian-client-patient relationship (VCPR).

- **Administer/inject all products to comply with label directions for all treatment regimens unless otherwise prescribed by a veterinarian.**
- **All sheep treated with extra-label medications shall comply with prescribed extended withdrawal times, which have been set by the veterinarian under the guidelines of a valid VCPR.**

There are two classes of drugs — over-the-counter (OTC) and prescription. OTC drugs can be purchased and used as directed on the label, without establishing a relationship with a veterinarian. For example, the label on penicillin G directs that 1 cc/cwt be given intramuscularly; a 100-pound sheep would receive 1 cc. Producers are not allowed to adjust the dose outside the label directions.

Proper storage of drugs and vaccines will help prevent improper use and maintain effectiveness. Read the label to determine temperature conditions for storage. The label will also describe an expiration date. Outdated drugs should not be used, but rather disposed of properly.

Prescription drugs can be used only by the order of a veterinarian within the context of a valid VCPR. Medications used in this fashion must contain an additional label identifying the contact veterinarian and instructions given, including the withdrawal time. Drug cost is not considered a valid reason for extra-label drug use under the Animal Medicinal Drug Use Clarification Act or the regulations promulgated to implement the Act. Records of such use of medications must be kept in accordance with the criteria. Compounding of medications to treat any animal by a veterinarian is strictly regulated by Section 530.13 of the Extra-Label Drug Use in Animals, and Section 608.400, Compounding of Drugs for Use in Animals. The FDA-CVM has interpreted the regulations to allow extra-label drug use for treating disease or preventing pending disease. The compounded medication must meet strict FDA-CVM guidelines. The FDA-CVM policy

states that “The veterinarian will need to be able to defend why the compounded drug works where a labeled product or an extra-label use of a NADA (New Animal Drug Application) or human compound would not”

The extra-label drug usage policy of the FDA-CVM specifies the following criteria:

- A careful diagnosis is made by an attending veterinarian within the context of a VCPR.
- A determination is made that: (1) there is no marketable drug specifically labeled to treat the condition diagnosed, or (2) treatment at the dosage recommended by the labeling was found clinically ineffective.
- Procedures are instituted to ensure that the identity of the treated animal is carefully maintained.
- A significantly extended period is assigned for drug withdrawal prior to marketing the treated animal, and steps are taken to ensure that the assigned time frames are met so that no violative residue occurs. The Food Animal Residue Avoidance Databank can aid the veterinarian in making these estimates.

There are a limited number of drugs a producer can legally use for sheep. FDA policy requires that livestock producers use drugs only in accordance with the label instructions. Uses that are contrary to label directions include ignoring labeled withdrawal times, using the product for a species not indicated on the label, using the drug to treat a condition not indicated on the label, administering the drug at a different dosage than stated on the label, or otherwise failing to follow label directions for use and administration of the drug. These uses would only be allowable with a valid VCPR and would then be considered as extra-label drug use.

Locate and use a licensed veterinarian who is willing to be involved with the SSQA program as a team member. Your veterinarian must understand that each animal carries the reputation of your business and that of the entire U.S. sheep industry. Be cautious about sheep treatment advice from anyone who is not highly qualified and well acquainted with the operation. Ask your veterinarian for help in finding and obtaining medications that meet all SSQA guidelines.

A VCPR exists when the veterinarian has assumed the responsibility for making clinical judgments regarding the health and need for medical treatment of an animal, and the

client has agreed to follow the veterinarian’s instructions.

The veterinarian must have sufficient knowledge of the animal to initiate at least a general or preliminary diagnosis of the medical condition of the animal. This means that the veterinarian has recently seen and is personally acquainted with the keeping and care of the animal by virtue of an examination of the animal or the medically appropriate and timely visits to the premises where the animal is kept. The veterinarian must be readily available for follow-up evaluations in the event of adverse reactions or failure of the treatment regimen.

Strictly follow all FDA, USDA, and EPA guidelines for product selection. Only products approved by these agencies can be used in processing and treatment programs of SSQA sheep operations. Records must be maintained for any pesticide, medication, or biological product administered.

The records include, but are not limited to, the following:

- Date administered.
- Group identification number.
- Individual identification number, as appropriate.
- Name of product administered.
- Manufacturer of product administered.
- Lot/serial number of product administered.
- Dosage administered.
- Route and location of administration.
- Withdrawal period.
- Name of person administering the product.

All drugs must be used in accordance with label directions unless otherwise specified by a legal prescription. A legal prescription will consist of the drug ordered/prescribed, along with a dated and signed Treatment Protocol Book. Over-the-counter medications that are used in an extra-label manner must be specially labeled by your supplier, including outlines of procedures as described in your operations current signed and dated Treatment Protocol Book in accordance with FDA-CVM regulations. Extra-label drug use must be prescribed by a veterinarian per FDA guidelines.

Ask your veterinarian to develop a Treatment Protocol Book specific for your operation. **A Treatment Protocol Book is a record detailing treatments and the following information:**

- Drug name.
- Condition being treated.
- Identity of animals being treated.
- Proper Dosage.
- Route of administration.
- Frequency of administration.
- Date treatment starts.
- Date treatment ends.
- Withdrawal time.
- Treatment response.
- Name of person(s) administering treatment
- Name of veterinarian prescribing treatment
- Veterinarian's contact information (address, telephone numbers).
- Veterinarian's signature.
- Owner's signature.

The book should be reviewed regularly and updated at a minimum of every 90 days, or more frequently as appropriate. Updating does not require the book to be reproduced, but rather that it be signed by the veterinarian and dated on the day that the book was reviewed. Maintain all versions on file, as well as an updated book at the treatment facility. The Treatment Protocol Book must include revised administration procedures for any medication used extra-label. Ask suppliers to attach a revised label obtained from your veterinarian to each bottle delivered. These labels must include the veterinarian's name, address, phone number, and revised directions for use, along with the prescribed withdrawal time. Contact your veterinarian for an example Treatment Protocol Book.

Extra-label drug use of aminoglycosides (kanamycin, gentamicin, neomycin) or other banned compounds is strictly prohibited. Check the FARAD website for an up to date list of prohibited substances.

S.5 Follow Judicious Antibiotic Use Guidelines.

- **Minimize development of antimicrobial/antibiotic resistance in human and animal pathogens.**

Antibiotic resistance is receiving close public scrutiny due to the concern that treating livestock with antimicrobials may contribute to resistance of human pathogens to antimicrobial treatment of people for an applicable illness. Currently, the best way to minimize development of antimicrobial resistance is to follow the Judicious Antibiotic Use Guidelines as outlined by the Academy of Veterinary Consultants (AVC, 1998).

Judicious Guidelines (AVC, 1998):

- Preventive strategies, such as appropriate husbandry and hygiene, routine health examinations, and vaccinations, should be emphasized.
- Judicious use of antimicrobials should be within a VCPR.
- Therapeutic alternatives should be considered prior to antimicrobial treatment.
- Avoid using certain antimicrobials that are considered important in treating refractory infections in human or veterinary medicine for initial treatment.
- Utilize culture and susceptibility results to aid in the selection of antimicrobials whenever possible.
- Confine therapeutic antimicrobial use to proven clinical indications, avoiding inappropriate uses, such as for viral infections without bacterial complication.
- Optimize regimens for therapeutic antimicrobial use with current pharmacological information and principles.
- Utilize narrow-spectrum antimicrobials whenever possible.
- Minimize therapeutic exposure to antimicrobials by applying treatments for the shortest period possible.

- Limit therapeutic antimicrobial treatment to ill or at-risk animals, treating the fewest animals possible.
- Minimize environmental antimicrobial contamination whenever possible.
- Maintain accurate records of treatment and outcome to evaluate therapeutic regimens.
- Follow label instructions carefully.
- Extra-label antimicrobial therapy should be prescribed only in accordance with the Animal Medicinal Drug Use Clarification Act amendments to the Food, Drug, and Cosmetic Act and its regulations.

There are several position statements in the industry regarding antibiotic resistance in bacteria. The Animal Health Institute states that antibiotic resistance is a top concern of the animal health industry. It is the responsibility of all who utilize antimicrobials to do so judiciously to preserve their effectiveness in both human and animal medicine.

S.6 Use only feeds and feed ingredients that are free of contamination.

- **Receive and store feeds and feed ingredients properly to ensure safety.**
- **The goal of SSQA is to eliminate contamination resulting from molds, mycotoxins, pathogenic microorganisms, or chemical contamination (e.g., pesticides).**
- **All pesticides (herbicides, insecticides, etc.) must be stored in an area separate from feedstuffs to avoid contamination.**
- **Analyze, at a qualified laboratory and before use, any feed ingredient suspected of contamination.**

Protecting the health of a sheep flock and the quality of consumer products starts with selecting and using high-quality feeds. Preventing contamination of livestock feeds involves proper harvesting, mixing, and storage. Sheep can be exposed to harmful chemicals through contaminated feed. Accidental chemical contamination of sheep feeds, or mistakes made in mixing medicated feeds, can cause health problems in the animals that consume such feedstuffs. Contaminants can be deposited in meat or milk products, thereby providing exposure to consumers.

Feed handling facilities should be designed and constructed to reduce the risk of feed contamination with chemicals, foreign materials, disease-causing infectious agents, or pathogens. The most common source of infectious agent or pathogen contamination is animal or human feces. When possible, protect feedstuffs, feed troughs, and water supplies from contamination by chemicals, foreign materials, and feces. Implement strategies to protect against feed contamination with fecal material from pets, wild animals, and birds. As producers renovate or make new purchases, selection of equipment that will reduce fecal contamination and/or be easier to clean is advised. Ask nutritional advisors, veterinarians, and extension educators about practical ways to protect and maintain clean feed supplies.

Feeds can become contaminated accidentally with chemicals and disease-causing organisms if they are not properly stored. Safe storage of feeds includes protection from chemicals, rodents and other animals, as well as maintenance of quality. To keep feeds from becoming contaminated, products such as fertilizers, herbicides, insecticides, fungicides, and other chemicals should be stored in facilities separate from feed. Poisonous products should be kept in a locked room or cabinet to protect animals and humans from exposure. Protecting grains and forages from moisture prevents deterioration of feed and limits mold growth. Proper storage also helps to maintain the quality of feed.

Always obtain feedstuffs from a reputable supplier that furnishes the required, SSQA-related information with delivery of product. Be certain that suppliers understand that grain protectants can have withdrawal times, and adhere to them. Reputable feed suppliers will have a quality-control testing program of their own, and can provide producers with test results. Bonded suppliers often test for PCBs, chlorinated hydrocarbons, organophosphates, pesticides, herbicides, heavy metals, and pathogens (e.g., *Salmonella* spp.). It is neither efficient nor economically feasible to test every load of grain or forage for contaminants. However, it is a good and sensible practice to obtain and store a representative sample of each newly purchased batch of feed. Commonly, investigation of suspected feed-related problems is hampered because no representative sample is available for testing. If feed sampling and storage are conducted on a routine basis, and a suspected feed-related problem occurs, a sample for appropriate laboratory testing will be available. One suggestion for purchased grains, supplements, or complete feeds is to randomly sample each batch of feed in five to ten locations, pool samples into a larger collection, and retain two- to five-pound pooled samples. The pooled sample should be placed in a paper bag

or small cardboard box, labeled with date, supplier, and feedstuff, and then stored properly. Plastic bags should be avoided to prevent mold growth in retained samples. Dry samples can be stored in a dry area. High moisture feedstuffs should be frozen. A feed tag should be attached to the sample for future identification.

Forage samples should be collected and stored. If multiple bales of hay are purchased, representative samples should be obtained from several bales and mixed together before storage. Forage testing probes should be used, if possible, to obtain representative samples, particularly from large square or round bales. Most hay samples can be placed in a labeled paper bag and kept in a clean, dry area. Forage samples should not only be tested for contamination, but also should be evaluated for nutrient value.

It is essential to monitor feed sources. Feedlots and other operations purchasing outside feeds should set up a sampling program to test for quality specifications, such as moisture, protein, foreign material, etc., in feedstuffs. Inform suppliers of your involvement in the SSQA program and that sampling of all products delivered will occur.

A good business practice is to require that all products be accompanied by an invoice which includes the date, amount, and signatures of both the person who delivered the product and the person who received the product. Meat and milk quality is affected both by the type and amount of feed consumed by sheep.

High-risk feeds are defined as single loads or batches that will be fed to sheep over a prolonged period of time. Examples of high-risk feeds include fats, rendered by-products, plant by-products, supplements, and additives. Typically, these feedstuffs are only a small percentage of the total diet and are very expensive to test. Make certain that suppliers understand SSQA concerns and ask them to provide quality specifications with their product. It is best to do business with a bonded supplier. Once a dependable supplier is found, it is ideal to stay with them, and consider their total value to your SSQA program before purchasing less expensive feeds.

Because the environment may contain several potential poisons, it is important that producers have some knowledge about their relative toxicities to livestock. Therefore, extremely toxic chemicals, such as soil insecticides, should be handled and stored properly. The best advice for avoiding accidental livestock poisoning is to treat all chemicals, including animal drugs, as potential hazards by placing them

away from feed storage and mixing areas, as well as livestock housing facilities. If feed-related poisoning is suspected, it is critical for the producer or veterinarian to contact a diagnostic laboratory for assistance in confirming the suspicion.

Mycotoxins are naturally occurring chemicals produced by molds. Mycotoxins can be found in grains, forages, and milk. If present in sufficient concentrations, they can cause reduced feed consumption, poor production, and adverse health effects. The environmental conditions that are conducive to the growth of molds and the production of mycotoxins are quite variable. They can be produced in feedstuffs prior to harvest or during storage. Mycotoxins include vomitoxin, zearalenone, and fumonisins in grain — primarily corn — and salframene in red clover. Ergot alkaloids can be found in both grain and grass hays.

Suggestions to prevent mycotoxin-related problems include proper storage of feedstuffs and avoiding moldy feed. Mycotoxins can be present in feeds without visible mold growth. Conversely, visibly moldy feed may not contain harmful levels of mycotoxins.

Harvested feeds such as hay, silage, and grain may be exposed to insecticides, herbicides and fungicides during the growing season. These pesticides have preharvest withdrawal times, and following label directions will ensure that residues do not remain on the feeds when harvested and fed to livestock. If feeds are purchased, inquiries can be made about the preharvest use of chemicals. If possible, the pesticides used, and the time at which they were applied relative to harvest, should be determined and documented through letters of guarantee. These precautions will help assure that milk or meat products are free from residual chemicals. When pesticides with preharvest withdrawal times are used in the production system, records must be kept of such use. Records should include the feedstuff that was treated with the insecticide, herbicide, or fungicide; the date the feedstuff was treated; the specific product with which it was treated; the person who applied the pesticide to the feedstuff; and the preharvest withdrawal time.

Rodents can cause the spread of disease by contaminating feeds with droppings and urine. Cats, dogs, raccoons, and other animals can carry diseases and parasites that can cause illnesses in sheep and, in some cases, even humans. Preventing access of animals to stored feed is important in disease prevention.

Meat, milk, and pelt quality may also be affected by the

presence of parasitic diseases.

Because many of these organisms are passed in the manure, it is important to prevent contamination of feed and water with sheep droppings. Using properly designed feeders and waterers, and cleaning regularly, can assist in reaching this goal. In confinement management systems, sheep should not be fed on the ground. In extensive range systems, where clean areas are available, supplements can be fed on uncontaminated ground. Effective disease prevention will also lower production costs by reducing expenses for medications and improving feed efficiency.

S.7 Implement biosecurity procedures to prevent introduction and/or transmission of animal diseases.

- **Address biosecurity issues to control animal health and foodborne contamination.**

In the context in which it is used in the SSQA program, biosecurity is defined as measures, management, and hygiene practices that decrease the risk of introducing or spreading infectious diseases or pathogens. Used in combination with disinfection and sanitation practices, biosecurity can reduce the potential for animals to come into contact with pathogens. The implementation of a biosecurity plan can assist in the control of pathogens, and their vectors, and reduce economic losses caused by disease outbreaks or transmission of foodborne illnesses.

Biosecurity should be addressed within each production unit to improve animal health and minimize foodborne contamination. Key areas — such as sanitation, traffic control, proper isolation, and testing of newly introduced replacement animals — should be addressed to prevent the introduction and/or spread of disease to the livestock in the production unit. Implementation should focus on evaluating risk factors of potential diseases, along with determining and establishing realistic contamination intervention strategies.

To effectively address biosecurity for prevention of animal disease in a production unit, specific disease targets need to be defined. Producers should outline the diseases of concern, their current flock status, flock goals for prevention and/or control of the diseases, and management limitations. Producers must also consider biosecurity issues between production units, such as feedlot-to-feedlot contamination. Disease vectors can be clothing (e.g., footwear), vehicles, and/or

other equipment that is used in multiple locations within the production system.

Biosecurity also is related to food safety. Biosecurity practices can help reduce the occurrence and treatment of infectious diseases, control diseases with possible human health implications (e.g., *Escherichia coli* O157:H7 and *Salmonella* spp. infection), and potentially reduce the need for using animal health products. Biosecurity is an area of utmost importance to ensure that the SSQA program benefits both producers and consumers.

Suggested Biosecurity Considerations [Adapted from Colorado Livestock Association in cooperation with Colorado State Veterinarian's Office and Colorado State University.]:

- Limit visitors entering with sheep or feed, and be watchful of unusual visitors or activities.
- Require consultants, veterinarians, and buyers to wash and disinfect footwear before entering sheep and feed storage areas.
- Isolate new sheep from resident animals for a minimum of four weeks.
- Minimize sheep handling and processing stress.
- Regularly monitor sheep for signs of illness.
- Necropsy animals for all deaths that are unexplainable.
- Control birds and vermin.
- Keep pets, guardian animals, and wildlife from contaminating feedstuffs and feeding areas.
- Remove dead animals promptly and dispose of their carcasses properly to prevent spread of disease (to animals and humans) and to avoid wild and domestic carnivores from feeding on them.
- Regularly administer tapewormer medicines to guard dogs.
- Store feed in areas that will not contact drainage from sheep areas and manure piles.
- Regularly clean water tanks.
- Require commercial sheep trucks to be cleaned prior to

arriving at facility to load sheep, especially if trucks have hauled another producer's animals previously.

Leakage of fluids from transmissions and transformers poses a potential problem. Both types of fluid contain polychlorinated biphenyls (PCBs), which can leave a violative residue in slaughtered animals. Avoid installing transformers near feed grain or forage storage areas and move, if possible, existing transformers from storage areas. Other sources of potential residues could occur from inappropriate storage of lead batteries, paints, solvents, or petroleum wastes.

Control of rodents and birds is a continuous battle for most sheep operations. These pests are vectors for disease and can cause costly damage to equipment, especially sensitive electrical connections. Effective control measures must minimize possible residues and be safe for humans and livestock, while controlling rodents and vermin.

Protection of the water supply from contamination must be a high priority of every sheep operation. Clean-water supplies should be available to sheep at all times. Everyone in the sheep operation must be on constant alert for practices that could cause contamination of the water supply or the water dispensers. Water contamination can result from biological sources (bacteria, viruses, etc.), physical sources (sediment, algae, etc.), or chemical sources (nitrates/nitrites, phosphates, etc.). Any contamination source must be reported to the manager as soon as possible, and corrective action must be taken.

The Scrapie Eradication Program went into effect in September 2001, and compliance is mandatory for sheep producers. This regulation provides the standards and procedures that will identify, monitor, control, and eradicate scrapie from domestic sheep flocks and goat herds. For more information about scrapie, contact the federal veterinarian in your state, USD A, APHIS, Veterinary Services, 4700 River Road, Riverdale, MD 20737, or your State Veterinarian office.

S.8 Implement sanitation and hygiene procedures to prevent introduction and/or transmission of foodborne pathogens.

- **Use proper sanitation practices, including disinfection of facilities.**
- **Maintain an environment that fosters cleaner fleeces.**

- **Reduce excessive mud because it can result in decreased performance, increased stress, and immunocompromised sheep.**

- **Prevent accumulation of dirt, mud, and manure on the fleece in as much as it can result in contamination of the carcass at harvest (e.g. during pelt removal).**

Sanitation includes first cleaning, and then disinfecting, livestock facilities and equipment. The most important aspect of sanitation in livestock facilities is the regular removal of manure to prevent the build-up of bacteria and parasites in the environment

Proper sanitation is important for several reasons:

Sanitation reduces disease. Fewer disease problems result in lower production costs.

Healthy sheep require fewer drugs, reducing the risk of residues in meat and milk, as well as less potential for misuse of antibiotics resulting in resistant pathogens.

Proper sanitation reduces the likelihood that bacterial contamination of consumer products will occur. Food poisoning from bacteria, such as *E. coli* O157:H7 and *Salmonella* spp., cause significant illness and sometimes death in humans every year. Pathogen reduction and/or elimination from the food supply should be a primary goal.

Bacteria in meat or milk products cause rapid spoilage. Pathogenic bacteria are frequently found in the feces of livestock. Milk from dairy sheep can pick up unacceptable odors and flavors from exposure to an unsanitary environment

It is very important that every measure be taken to keep livestock facilities clean and reduce the potential for transmission of pathogens.

Wet conditions also contribute to poor sanitation and disease problems. Bacteria grow rapidly in high-moisture conditions, such as standing water and mud. When sheep are confined, it is important to provide dry areas on which they can bed. This can be accomplished by providing good drainage, furnishing bedding, or creating a raised mound. Feeding and watering areas should be well drained to maintain dry, sanitary conditions.

Bacteria transferred from the pelt to the carcass can contaminate the resulting meat products. Soiled fleeces on dairy

sheep can contaminate milk at milking time. Manure and mud on wool or pelts reduce the value of these products by limiting options for the processor. Freight cost and the cost of cleaning the pelts also are increased. During the wet seasons of the year, feedlot lambs should be shorn to prevent the accumulation of mud and manure in their wool. The use of clean, well-drained facilities and furnishing of plenty of bedding, will reduce disease and contamination problems.

Disinfecting involves the use of chemicals to kill disease-causing organisms and potential foodborne pathogens on equipment and in facilities. Commercial disinfectants or a diluted bleach solution can be used. Disinfectants are inactivated by manure and other organic materials. Therefore, it is important to do a thorough job of physical cleaning before using a disinfectant. Always follow label directions for exposure time and rinsing instructions, and consider environmental ramifications of disposal of outdated disinfectants.

Sheep are often exposed to contagious diseases when their feed or water is contaminated with manure, nasal secretions, or uterine discharges. Feeders and waterers should be cleaned and disinfected regularly to prevent the build-up of disease-causing agents. Sick animals should be isolated to protect the remainder of the flock from contamination of the feed and water supply.

Each state has standards for production of manufacturing grade milk. The Pasteurized Milk Ordinance contains guidelines for Grade A milk production that are set by the Interstate Milk Shippers. Bacteria counts in milk are directly linked to parlor hygiene and milk handling. Milk should be checked for abnormalities in color, odor, or texture prior to attaching the milking machine. Ewes with abnormal milk should be milked last and the milk discarded. Routine pathogen testing for purposes of developing verification history is recommended.

For proper milking hygiene:

- Clip wool from the udder.
- Clean the teats.
- Dry the teats.
- Attach teat cups with minimal suction loss.
- Adjust the milk claw to provide complete milking out.

- Use teat dip after milking.

A treatment plan for ewes with mastitis should be developed with the help of your veterinarian. This process may include bacterial culturing and sensitivity testing of milk samples. Information about sanitation procedures and causative organisms can be used to develop a treatment protocol.

Sanitizer residues can cause difficulties in the use of milk for cheese production. Because of the small volume of milk produced by a ewe, even a trace amount of chemical residue can contaminate the product. Label instructions for the use of sanitizers should be strictly followed. Chlorine, iodine, and other agents that break down quickly are preferred. Ammonium chloride compounds are persistent and should not be used.

Sheep milk may be frozen and processed later. It must be cooled per state dairy standards, usually to less than 50°F within two hours after milking. If milk is to be frozen, it should be frozen as quickly as possible and stored at temperatures equal to or below 0°F.

Caseous lymphadenitis (CLA) caused by *Corynebacterium pyogenes*, is a common disease of sheep that is directly related to sanitation. This disease has a significant economic impact on the sheep industry. It is the leading cause of mature sheep condemnations and the seventh leading cause of condemnations of lambs and yearlings in the United States. Affected flocks have a high culling rate. CLA is caused by bacteria that multiply inside a lymph node resulting in an abscess. When the abscess ruptures, the bacteria are released contaminating the environment, and the pelt is damaged. CLA bacteria can survive in soil and bedding and on the surface of feeders, waterers, fences, and gates for several months. During this time, other sheep can become infected. The bacteria can penetrate normal skin, but more commonly infect an animal through cuts, scratches, and other wounds. Aerosolized bacteria are frequently inhaled when sheep are penned closely together for routine management practices, such as shearing. This results in infection and subsequent abscessation of internal organs and lymph nodes. Range sheep are most often infected at shearing time, while farm-flock sheep can become infected from contaminated feeders and housing, as well as during shearing.

The incidence of CLA in affected flocks can be reduced with proper control methods and good sanitation:

- Cull or isolate affected animals before abscesses rupture.

- Disinfect equipment, facilities, or surfaces that come into contact with pus.
- Disinfect skin wounds to prevent infection.
- Shear sheep in the order of youngest to oldest; shear sheep with swellings or abscesses last
- Disinfect shearing equipment between sheep, by dipping the comb and cutter into a disinfectant
- Maintain equipment and facilities in good repair to prevent sharp objects from causing injury and abscess rupture.
- Control ectoparasites, as scratching increases skin lesions, making it more susceptible to infection.
- Vaccinate the entire flock to reduce the rate of CLA infection by boosting flock immunity.

Good sanitation is essential to prevent disease transmission within the flock, reduce the need for drug use, and reduce the contamination of food products. In addition, clean sheep yield clean, high-quality wool and pelts of maximum value. To increase productivity, safety, and income, keep feed, water, and handling equipment clean and disinfected.

S.9 Use a validated pathogen intervention system where appropriate.

- **Vaccines.**
- **Probiotics.**
- **Prebiotics.**
- **Chlorate.**
- **Plant-derived microbiological inhibitors.**
- **Antibiotics.**
- **Bacteriophages.**

Microbial contamination includes pathogens that can be transmitted to consumers, via carcasses, and cause foodborne illness. Research indicates that there are control points within a production system at which it is possible to decrease the

amount of microbial contamination from a source to the sheep in the production unit. Producers should take measures to control contamination of sheep resulting from birds, water, feed, and feed bunks. Control procedures should be outlined and documented to verify that preventive measures have been taken. Research conducted by Colorado State University has suggested that there may be some pre-harvest management practices that impact microbial contamination of lamb carcasses, including shearing, bedding, and pen conditions.

As food safety concerns escalate regarding meat products, it is important for sheep producers to be progressive in their actions to maintain a safe product for consumer acceptance. Pre-harvest interventions are necessary and recommended to decrease incidence of contamination of lamb product. Continuous testing of potential pathogen inhibitors have concluded that several intervention methods are beneficial in preventing meat contamination.

Proper farm management practices can assist in reducing potential problems. Use of non-contaminated feed and water can reduce prevalence of microbial organisms. Inappropriate manipulation of diet may cause undesirable microbial numbers in the feces. The prevalence of contamination can be decreased through reduction in stocking, housing, and grouping densities.

Pre-harvest interventions have proven advantageous in reducing contamination in other sectors of the livestock industry. The use of a probiotic containing *Lactobacillus acidophilus* is an effective method. The best method for reducing pathogen counts in and on harvest livestock involved use of a combination of these three treatments (probiotic, antibiotic, vaccine) (Ransom et al. 2003).

Lamb packing plants also use chemical intervention strategies to enhance safety. The use of lactic acid in reducing microbial contamination is a valuable method that can be applied at harvest facilities. The prevention and/or reduction of carcass contamination during the slaughter process adds to the assurance that a safer product will be produced.

The lamb industry must realize the importance of providing a product to consumers that is free of microbial contamination taking advantage of the use of intervention technologies and following good production practices.

S.10 Eliminate contamination from foreign materials in meat.

- **Needles.**
- **Birdshot.**
- **Plant materials.**

Foreign material contamination is of grave concern because of the difficulty of detecting it in meat products. Common foreign objects found in meat products include needles and birdshot. Appropriate sized needles should be selected for processing and/or animal health treatments. Improper animal restraint is the root of most injection problems, especially bent-needle problems. If a needle bends, stop immediately and replace it; do not straighten it and use it again. Ask your veterinarian how the situation should be handled if a needle breaks off during an injection. Broken needles migrate in tissue and, if not immediately removed, will be impossible to find, requiring that the animal be destroyed. Under no circumstance should animals with broken needles be sent to a packer. Purchasing high-quality needles, changing and discarding damaged needles, and providing proper restraint are all key preventive measures. Use a subcutaneous injection or oral treatment protocols when such options are appropriate.

Birdshot is difficult to detect and is considered an adulterant by USDA-FSIS because it can contain lead. Producers should limit contact between animals and hunters to avoid the possibility of animals being inadvertently contaminated with birdshot.

Another contaminant that can make a large impact on both wool and meat quality is the exposure to a common feedstuff known as Needle-and-Thread Grass. This range grass, predominately found in the western ranges and northern plains, can become a detrimental nuisance to livestock operations. During the mid- and late-summer months as the plant reaches seeding, the seeds will often burrow into the skin and wool of the sheep. The plant can affect not only sheep by attaching and irritating the mouth and eyes but also by penetrating the wool. Furthermore, the plant may also permeate the skin and the plant material will contaminate the lamb product, leading to discounts and product waste due to plant contamination.

Chapter 3: SSQA Quality Criteria Achieved by Implementation of Written SOPs

Q.I Administer/inject all products according to label directions. Intramuscular injections must be administered in the neck.

- Strive to only use products cleared for subcutaneous (SQ), intravenous (IV), or oral administration.
- Products labeled for SQ (under the skin) use should be administered using the tented technique.
- Use products with low recommended dosage and administer injections at proper spacing intervals on the neck, with a minimum of three inches separating injection sites.
- Administer IM products with no more than 5 cc per injection site.

Administer all products labeled for intramuscular (IM) use in the neck region only. All products labeled for subcutaneous (SQ) use must be administered in front of the point of the shoulder (in the neck region). No injections shall be given in locations other than the neck region, regardless of animal age.. Injections can be administered at the point of the shoulder, axillary or ventral chest. Using sites in the neck region rather than in areas of the back or hind leg prevents the loss of value in the most desirable cuts of lamb and reduces the potential for discounts in price .

The use of biological products for the prevention of disease may lessen the chance of microbial resistance or residue problems later in the production cycle. However, sheep do not always arrive in healthy condition, and immediate treatment may be necessary. Many treatment regimens include vaccines to stimulate an immune system response and lessen the need for re-treatment. Vaccines should be considered before antibiotics and other medications that can lead to residue or resistance problems, even though vaccines can have extended withdrawal times.

Use products with low recommended dosage and ad-

minister injections at proper spacing intervals in the neck, with a minimum of three inches separating injection sites. Administer IM products with no more than 5 cc per IM site. For example, if 12 cc is the calculated dose, use three 4-cc injections. When injecting greater than 5 cc, divide out dosage evenly among injection sites. The volume injected at a site will directly influence tissue damage, scar tissue, and potential abscesses, particularly when adjuvants are present. Always use SQ or IV routes of administration when permitted by the product's label. Check product labels closely and administer the product as specified on the label. Ask the supplier or a veterinarian to find products that have SQ, IV, or oral routes of administration rather than an intramuscular route of administration.

Injection of animal health products can affect the quality of meat and pelts that come from the animal. Eliminate injection-site lesions by administering products via the preferred routes and in the preferred locations. Correct administration is important for the proper use of animal health products. Abscesses and lesions must be trimmed-out and removed, thereby diminishing carcass value — especially when found in expensive cuts of meat. Defects in pelts can also result from injection-site problems. These are especially costly if they develop in the middle of the pelt and cannot be easily removed. This loss can be passed back to the producer in the form of price discounts, or forwarded to the consumer via an inferior product and/or an increased price.

Injection Quick Tips

- Do not use chemical disinfectants in syringes while using a modified live virus vaccine because efficacy will be decreased or even eliminated.
- Provide proper animal restraint to avoid bending and breaking of needles in animal tissue.
- During bad weather, take extra care to ensure that the injection site is free of moisture, manure, and dirt. Ensure that syringes and needles are clean and disinfected. Injecting sheep during wet weather increases the potential for carrying a contaminant into the injection site.
- Wetting the area around the chute processing area will reduce the chance of contamination from dust and other foreign material in injection sites and open incisions.
- Overall sanitation of equipment, working area, and personnel will reduce injection-site defects. A sound

educational effort directed toward sick-pen and processing crews offers great potential for helping to eliminate these problems.

- Avoid the rear leg and loin areas when giving injections. These regions contain high-priced cuts of meat Use the neck region, in front of the point of the shoulder, for injections. The meat in this region is less valuable, and the affected area can be easily trimmed and discarded if damage occurs.
- Administer products SQ rather than IM when applicable. SQ injections cause less damage to muscle tissue. However, there are injectable products that should only be administered IM. Read and follow product labels carefully. If products must be administered IM, the injection site must be in the neck region.
- Use the smallest gauge needle possible. This creates a smaller opening in the skin, which reduces the chance for wool, dirt, and bacteria to penetrate the skin and cause an abscess.
- Choose an injection site that is clean and dry. Wet animals should not be injected because moisture stays with the needle carrying bacteria into the injection site. Vaccinating shorn sheep is the preferred practice because less dirt will be carried into the injection site and it is easier for the operator to see that the injection is made properly.
- All equipment should be clean. Wash syringes in hot water after each use. Rinse syringes multiple times with clean, hot water to ensure that no traces of cleaning solution remain in the syringe, especially when giving vaccinations. Some products can be inactivated by disinfectants. Syringes that cannot be properly cleaned or are defective should be discarded.
- Purchase high-quality needles. Needles should be clean and sharp and should not be used if they are bent, dull, or dirty. Needles detectable by a metal detector are preferred. Needles and syringes should be kept in a clean, dust-free cabinet or container and out of the reach of children. Use a product-recommended lubricant in automatic syringes.
- Always use a clean needle when drawing medications or vaccinations from a bottle. A needle that has been used to administer medication should never be used to draw another dose from the bottle. A used needle introduces bacteria into the bottle and can infect other animals.

Change needles frequently. If multiple doses are drawn from a bottle, place a clean needle through the stopper of the bottle, using it to draw out the dose(s) needed. Always use an aseptic method, e.g. sponge the needle between injections.

Producers who need assistance in administering injections should ask their veterinarian to demonstrate proper technique. Also, family members or employees who assist a producer in giving injections should be instructed in proper techniques and record-keeping.

Assistance from your veterinarian can be requested regarding needle-selection information for vaccines, antibiotics, and supportive therapies. Improper use of needles causes injection-site defects. Use needles that are no larger than necessary to adequately complete the injection, but large enough to avoid bending or breaking off in muscle tissue. The leading cause of needle bending is improper restraint, but using dull, damaged, or poor-quality needles may also contribute to the problem.

Needle Selection Chart		
	SQ (1/2 to 3/4 inch)	IM (1 inch)
Thin Solution (Ex. Vaccine)	18 Gauge or smaller	18 Gauge
Thick Solution (Ex. Penicillin)	16-18 Gauge	16-18 Gauge

Primary considerations in needle selection include route of administration, weight of animal, and location or site of injection (SSQA requires that all injections be given in front of the point of the shoulder). Secondary consideration in needle selection includes thickness and volume/amount of the fluid being injected.

Producers should also maintain an accurate system for needle inventory. This can prove beneficial in documenting whether needles were broken off in the muscle tissue during processing or treatment, and can indicate when employees need additional training.

Summary of Injection Procedure:

- Select and use high-quality, appropriate needles.

- Change needle immediately if it bends.
- Change needle if it becomes contaminated with feces, dirt, or irritating chemicals.
- Change needle if the point is damaged or if a burr develops.
- Change needle before it becomes dull.
- Change needle between sheep that are known to have blood-borne infectious disease.
- Protect needles from contaminants such as feces, dirt, or irritating chemicals.
- Store unused needles in a protected area.
- Follow EPA guidelines for disposal of used needles.
- Do not use disinfectants on needles that are to be used for administering injectables. Disinfectants kill modified-live virus vaccines and cause severe tissue irritation.
- When possible, select injectable products that can be given SQ or IV.
- If you must use an IM product, the product must be given in front of the point of the shoulder.
- Do not exceed 5 cc per IM injection site.
- Properly space injections, with a minimum of three inches separating injections.
- Follow your veterinarian's instructions.

Q.2 Prevent wool contamination with foreign material.

- **Eliminate contamination by vegetable matter, mud and manure, as well as paint.**
- **Shear lambs to maintain shorter and cleaner fleeces.**
- **Maintain acceptable growth of wool on slaughter lambs to increase pelt value.**

Wool contamination is a major concern; contamination can originate from several sources. These include natural

sources such as urine, manure, colored fiber, and vegetable matter, as well as man-made sources such as paint and insecticides. Contamination can be minimized with good sanitation and handling practices. Examples include crutching (shearing of wool from around the dock and the udder) and shearing lambs as they enter the feedlot. Crutching and shearing will reduce the incidence of urine and manure staining, increasing the value of wool and pelts. Parts of the fleece that are heavily soiled should be removed (skirted) at shearing time to increase value. Maintain high pelt quality by eliminating mud, manure and parasite concerns.

The producer assumes the responsibility for being prepared for shearing. This includes sufficient labor, facilities in good order, and organizing activities so that the shearers have minimal problems performing their work. It is very important that plenty of help be available during shearing. Tasks such as vaccinating, paint-branding, and treating for parasites are easier to accomplish after the flock is shorn.

Prior to shearing, the flock should be sorted. If possible, sheep with a common fleece type should be grouped together. Place all sheep with black fiber in one group, and white-fleeced sheep in another group. Colored and black face sheep should be sheared after all white sheep to prevent contamination of white wool with black fibers. When colored wool is mixed with white wool, it creates defects in the resulting fabric. Colored fleeces or wool with black fibers should be packaged separately. Separation of belly wool will reduce the amount of black fiber contamination. Ideally, colored sheep, or those with black fibers, should not be co-mingled with sheep in an all-white flock.

Shear young sheep first to avoid the spread of caseous lymphadenitis. Separate any sheep that have swellings or draining abscesses and shear them last. Be prepared with soap, water, and a disinfectant for cleaning shearing equipment and work area in case an abscess is accidentally opened. It is a good idea to disinfect shearing equipment routinely while shearing. Sick sheep or those that are losing wool as a result of illness also should be separated. Wool from these animals will be weak and of poor quality and should be kept separate.

Shear only dry sheep, and store the wool off of the ground in a dry area. This will prevent deterioration of the wool due to mold and mildew. Prevent access to insects (e.g., moths) and rodents into wool storage areas; use mothballs or other insect repellents.

A high-quality wool clip provides the producer with more options and opportunities for marketing the wool. Wool quality is dependent on the means of preparation, the cleanliness of the wool, and freedom from chemicals. Cleanliness of wool can be accomplished by removing belly wool and other contaminated wool, keeping the shearing floor clean, and properly packaging the wool. Freedom from chemicals can be accomplished by using only approved insecticides, reading and following insecticide labels, including those pertaining to proper storage.

Professional shearers who are known to minimize stress, prevent damage to the pelt, and avoid cutting the sheep are highly preferred. The shearer also should avoid second cuts that result in short, less valuable fibers. It is often assumed that the shearer knows the best procedure for wool handling and preparation. However, it is the producer's final responsibility to understand how to harvest high-quality wool and blemish-free pelts that meet the desires of the buyer.

When harvesting wool, it is important that producers know the preferences of the wool buyer and make every attempt to meet the buyer's specifications. Packaging of wool should be considered; most large wool manufacturers prefer synthetic wool bales. Baled wool allows more weight to be loaded on trucks and reduces transportation costs. Easier storage with minimal dust and dirt contamination in the warehouse are additional advantages of wool bales over traditional burlap wool bags. The American Sheep Industry's *Code of Practice* is an excellent source of information for proper wool handling and preparation.

Quality wool preparation starts long before shearing. Wool producers must understand the demands of the market and consider their marketing goals before the time comes to sell the wool. Wool processors are concerned about the diameter of the fiber as well as its length. They prefer wool with a consistent fiber diameter and a uniform length greater than three inches. Producers can, through genetic selection, manage their flock to meet the needs of their wool market if wool production and value are priorities for the operation.

Vegetable matter contamination can come from a variety of sources including feed, bedding, and weed-infested pastures. Wool used for fine woollen production is not carbonized (treated to remove organic materials); this means hay stems, grass leaves, and weed seeds are not removed. These materials align with the wool fibers and are incorporated into the scoured wool used to make yarn. The presence of the foreign material significantly reduces the value of the final

wool products. Skirting or separation of the belly wool and other contaminated areas may be necessary to increase the value wool.

If paint branding cannot be avoided, use only products labeled as "scourable." Even scourable paint can stain wool. Freezing or overheating of the paint causes congealing of the pigment, making it very difficult to remove. Use of excessive paint may also result in undesirable staining of wool. When using marking crayons or chalk, marks should be placed on the head or face to prevent fleece and pelt contamination.

Polypropylene (poly) is a contaminant that originates from many sources. Plastic baling twine made of poly is the most common source. Square balers leave approximately one inch of loose twine fragments when cutting the knot after the bale is tied. These fragments stay with the baled hay until it is fed to the sheep, at which time the twine fragments will often incorporate into the wool. Poly is made up of small fibers that are difficult to detect once they become mixed with wool. When contaminated wool is made into cloth, the fibers cause a defect that is costly to remove. Other sources of poly include feed or salt bags, frayed tarps, sheep jackets, and bags for baling wool. Most poly contamination occurs in the belly and britch. This means removal of belly and britch wool from the fleece at shearing is an effective method for reducing poly contamination.

Q.3 Harvest fed lambs at US Yield Grade 3 or better.

- **Feed sheep to a compositionally appropriate endpoint.**
- **Avoid the sale of over-fat lambs.**

Due to the lost potential profit from over-fat lambs in the lamb industry, producers should strive to slaughter market lambs that are nearly ideal in fat cover. Preferably, lambs should be slaughtered with a maximum of 0.25 inches of measurable backfat. This will result in lambs being categorized as US Yield Grade 3 or better. Sheep producers must realize that lambs with less external fat cover are more desirable because the product is more useful to the packer, and subsequently for the consumer. A useful guide for producers to slaughter their lambs at the right time is to use frame size and muscle thickness scores provided by USDA, as currently no USDA Feeder Lamb Standards are utilized.

Table 1 provided by the USDA should be used as a reference for when lambs are getting close to slaughter weight.

losses in demand that have resulted from excessively fat lamb products.

Table 1. USDA Frame Size and Muscle Specifications for Feeder Lambs.

There are no official standards at this time for feeder lambs. For reporting purposes feeder lambs will be classified according to frame size and muscle thickness.

1. Frame Size	Expected Slaughter Weight (at or about 0.2 in fat)
Small Frame	100 lbs. and less
Medium Frame	100-135 lb.
Large Frame	More Than 135 lb.

2. Muscling Specifications

No. 1 Thrifty animals that are thick throughout. Lambs that are thick & full in the forearm & leg, showing a rounded appearance through the back & loin. Lambs that are wide between the legs, both front & rear.

No. 2 Lambs that are thrifty & are slightly thick through the forequarter & the middle part of the leg. The forearm & leg are slightly thick & the back & loin have a slightly thick appearance. The legs are set slightly wide, both front & rear.

No. 3 Feeder lambs included here are thrifty animals that have less thickness than the minimum requirements specified for the No 2.

Inferior Animals that are unthrifty.

Feeders should realize lambs with compositionally smaller frames will deposit fat earlier in their maturity pattern. Likewise, larger-framed lambs are able to have more market weight flexibility as they grow and put on fat at a slower rate. This is important in determining slaughter date and producing lamb that can be most financially profitable not only for the producer, but for the entire industry. Harvesting lambs with this in mind, allows the industry to begin to recapture

Q.4 Age, Flavor and Quality

The 2015 National Lamb Quality Audit benchmarked the Preferences & Complaints Associated with American Lamb Quality in Retail & Foodservice Markets. From the audit, the most influential factor consumers cited when deciding to purchase or not purchase lamb was flavor. Lamb provides a unique flavor, but can vary tremendously (NLQA, 2015). Consumers desire a positive dining experience; however, many may not know what creates a pleasurable eating experience with lamb. Desired aroma, taste and flavor are critical aspects of eating satisfaction. Most studies on lamb flavor have shown that meat sourced from various ages of sheep provide differing aroma and flavor profiles. Most studies have shown that as an animal ages, tenderness decreases and the flavor intensity increases often causing a “mutton flavor” (Sink and Caporaso, 1977). Increasing the levels of excess fat also increases the levels of the undesirable branched chain fatty acids. The lipid filling can increase in fat due to age but, may also be affected by sexual maturation. The highest concentration of lipids are most commonly found in sheep over 2 years of age (Tatum, 2014). Age and fat, has been found to decrease meat quality and in turn, decrease live animal and carcass value. Lambs harvested at a younger age provide a higher quality product to consumers. However, most studies conducted on lamb quality have shown there is no significant difference between lambs (12 months old and younger) and USDA classification yearling mutton (12 to 24 months old). The older the animal becomes, the coarser the lean texture becomes and the stronger the flavor, which all decrease quality and price of product. It is vital that lambs are harvested at an optimal weight and age in order to achieve a mild, tender product.

The USDA has set specific standards for live market sheep to segregate feeders, slaughter animals; sex of animal; age group and grade. The slaughter standards are ram, ewe and wether; lamb (under 14 months of age), yearling (between one and two years of age), and sheep (over 24 months of age) determined by dentition. Once sex and age are determined the sheep can be graded; yield (1-5) and quality (prime, choice, good, utility and cull) based upon handle and visual inspection. The live grades provide a rough estimate of carcass quality. These grades may be very subjective based on wool length and thickness of the hide of the sheep. Currently, ovine meat is marketed and classified in 3 age categories; lamb, yearling mutton and mutton. Lamb is split further into

Table 2. Maturity Classifications for USDA Grading (USDA, 1992).

Maturity class (approximate age)	Type of joint on metacarpals	Rib shape	Lean color	Lean texture
Lamb, A-Maturity (3 to 8 months)	At Least One Perfect Break Joint	Moderately Narrow, Slightly Flat	Slightly Dark Pine Fine	Fine
Lamb, B-Maturity (9 to 14 months)	At Least One Perfect Break Joint	Slightly Wide, Moderately Flat	Light Red	Fine
Yearling Mutton (15 to 24 months)	Break or Spool Joints	Moderately Wide, Tends to Be Flat	Slightly Dark Red	Slightly Course
Mutton (more than 24 monts)	Spool Joints	Wide and Flat	Dark Red	Coarse

2 categories, A and B maturity, determined at time of grading by USDA-AMS graders. The USDA-AMS graders assess the ossification of the epiphyseal cartilage located on the metacarpal (front cannon) bones (i.e., presence of “break joint” or “spool joint” on the distal ends of the metacarpals), the width and shape of the ribs as well as lean color and texture. Table 1. Describes each maturity classification (USDA, 1992).

Producers need to harvest lambs at an appropriate age (< 12 months of age) to provide the highest quality lamb possible. As the animal ages, lean color becomes darker and texture becomes coarser; even within A and B maturity of lamb carcasses the lean color changes. Unfortunately, this is only regularly used in market reporting and grading (conducted by USDA-AMS) and USDA-FSIS has not officially defined the term “lamb”. Even ungraded ovine meat can be marketed and labeled as lamb. The American Sheep Industry Association and others are exploring methods of defining the term “lamb”, to help producers and processors sell a consistent, age-verified product.

Differences in production systems have also been found to affect the flavor profile of the meat. A flavor profile that has had negative connotations for consumers is a pastoral flavor which is usually associated with lambs that were pasture finished (Young et al., 2003). Meat from grain-fed lambs is known to have a milder aroma and flavor compared to pasture finished lamb (Tatum, 2014).

Producers should strive to provide a consistent product and continuously improve their production operation. Data

show that overly fat lambs and, at times, older lambs are a problem in the industry, not only increasing the cost of the product but also changing its flavor profile. It is imperative that the industry begins a paradigm shift into marketing lamb based on its flavor profile and overall eating quality; i.e., tenderness, juiciness, etc., to increase consumption of, and satisfaction with, American Lamb. The producer should aim for a USDA Yield Grade 3 or better carcass, but also an animal that is less than 12 months of age.

Q.5 Reduce stress and prevent bruising and other injuries.

- **Implement animal handling and welfare guidelines.**
- **Maintain facilities and equipment.**
- **Monitor bruising rates encountered by the packing plant.**
- **Review excessive bruising rates and seek corrective action.**

Minimize bruises by handling sheep appropriately, maintaining facilities, and utilizing proper transport methods. Care must be taken to prevent bruising and injuries. Sheep should not be poked and prodded, especially with electric prods, or restrained by their wool. This can cause carcass damage, such as bruising and fiery fat. The defective product must be trimmed-out and discarded, resulting in economic loss. Furthermore, damaged pelts caused by excessive prodding have few uses and less monetary value. Prevent stress, bruising and/or injury during animal handling. Monitor

bruising rates at the packing plant when possible. Review excessive incidence rates, and seek and implement corrective actions whenever possible.

Q.6 Control internal and external parasites.

- Keds.
- Flukes.
- Mites.
- Worms.

Internal and external parasites are a constant economic concern to sheep producers. Parasites directly affect animal performance, transmit disease, and affect the wholesomeness of sheep products. Improperly handled pesticides can lead to residue contamination, feed contamination, by-product contamination, and environmental damage. Only pesticides approved by the EPA, FDA, and USDA can be used for treatment of sheep for external parasites. These products must be used in compliance with label directions. Chemicals applied to sheep become concentrated in the lanolin. The proper use of approved insecticide products will prevent harmful chemical exposure to the users of lanolin-based products.

Internal parasites, such as worms, flukes, and nasal bots, can cause undue stress and permanent damage to sheep. While including a dewormer and/or a flukicide in the processing schedule may be economically sound, improper administration leads to residue problems and a higher percentage of abscesses and skin lesions. Consult your veterinarian for further information.

Internal parasitism is a common problem. Scars in the liver and cysts in the muscle, both due to internal parasites, cause tissue condemnation at the processing plant. In addition, the presence of parasites can reduce the performance and productivity of host animals. Animals with low parasite loads grow more efficiently and have fewer carcass condemnations than those with heavier parasite burdens. The control of parasites depends upon careful management of the flock's environment, as well as strategic use of dewormers. Avoiding exposure of sheep to parasites is the best method of control, but that is not always possible. Range flocks have fewer problems with internal parasites because they seldom regrazed the same area within a grazing season and because the dry conditions do not support increases in parasite levels.

Veterinarians and producers can detect internal parasites using a fecal exam. Periodic fecal exams indicate when the number of parasites is increasing and help determine proper treatment. Periodic FAMACHA (eyelid exams for signs of anemia) are also very helpful in the control of blood sucking worms such as *Haemonchus*. Internal parasites can develop resistance to medications. To test for resistance, a fecal exam can be administered both before and after treatment. A strategic deworming program, based on the results of fecal exams, is less expensive and more effective than deworming flocks on a fixed schedule. It also prevents unnecessary exposure of the flock to drugs that are not needed. Excessive exposure makes parasites more resistant to drugs.

Some management recommendations that will help control internal parasites include:

- Place harvested feeds in feeders, not on the ground. Use feeders that are designed to keep dirt and manure out. Most internal parasites are passed to sheep when they consume parasitic nematode larvae from the ground (i.e., grass) or coccidia oocysts in manure along with their feed.
- Provide clean pastures for grazing. Clean pastures include those that were not grazed by sheep the preceding year, those from which crops were harvested, or fields that were grazed by another species.
- Remember that lambs are more susceptible to parasites than are adult sheep. If clean grazing areas are not available, it may be better to wean the lambs and raise them in dry lots rather than to pasture them in areas where parasite build-up is a problem.
- Have fecal exams conducted periodically to determine the need for treatment.
- Do not allow dogs, cats, or wild carnivores to eat dead sheep or the offal from harvested animals. Several parasitic diseases are passed from sheep to carnivores and then back to sheep; some of these diseases can even be transmitted to humans. Carcasses and offal, including placentas, should be disposed of in an environmentally appropriate and safe manner.
- Regularly deworm herding and guardian dogs for tape worms. Carcass condemnation due to "measles" (muscular infection with tape worm larvae) can be very costly. Sheep become infected with tape worms by ingesting their eggs on contaminated pastures. Infected dogs and other canine spe-

cies are the common sources of these parasites.

A good parasite control program will benefit the producer in many ways: (a) animals will be healthier, making them more resistant to other infections, (b) lambs will grow more efficiently, (c) medication needed for effective treatments will be reduced, and (d) fewer carcasses will be condemned at the harvest plant

Like internal parasites, external parasites result in inferior sheep products and lost income to producers. Common external sheep parasites include lice, keds, mites, and ticks. These parasites bite the animal and cause skin irritation, resulting in rubbing, scratching and chewing of the skin by their host. This can lead to wool and pelt damage. Some parasites also feed on the sheep's blood, causing blood-loss anemia, especially in lambs. The result is unthrifty, poorly performing sheep.

The best time to treat for external parasites is immediately after shearing. All sheep should be treated per label direction with an approved product. If infestations are heavy, the treatment should be repeated two weeks later. Unapproved products should never be used; such products can cause illness in the sheep as well as chemical residues in products that contain lanolin, such as cosmetics and medicated ointments. Always read the product label to ensure appropriate use, and do not treat pregnant ewes unless the label documents that such treatment is safe.

A routine program for detecting, treating and preventing external parasites is an important part of a flock health program. Treatment of sheep soon after shearing is recommended. Benefits include increased comfort for the animals, improved performance, and higher-quality wool and pelts. Newly purchased sheep should be treated upon arrival while still in isolation.

Meat, milk, and pelt quality can be affected by the presence of parasitic diseases. Since many of these organisms are passed in the manure, it is important to prevent contamination of feed and water from sheep droppings. This can be accomplished by using properly designed feeders and waterers. In confinement production systems, sheep should not be fed on the ground. In extensive range systems, where clean areas are available, supplements can be fed on uncontaminated ground. Effective disease prevention will lower production costs by reducing expenses for medications and improving feed efficiency.

Q.7 Adequately maintain facilities and equipment and apply proper handling techniques.

- **Use recommended animal handling and welfare practices.**
- **Maintain an environment appropriate for the production setting.**

The environment in which sheep live affects the quality of the products derived from them. Protruding nails, pipes, boards, and sharp edges can injure animals. Besides causing them pain, this results in bruising and trimming of the carcass, along with pelt defects. Buildings and pens should be kept in good repair to prevent these problems. Other methods of fastening gates and panels should be used in place of polypropylene twine. Frayed plastic tarps also can cause polypropylene contamination and should be repaired or discarded. Inspect and maintain facilities (fences, corrals, load-outs, pens, etc.) regularly to ensure adequate maintenance and ease of handling.

Proper design of housing and handling facilities simplifies sheep movement and protects their well-being. Chutes and pens should be designed to take advantage of the natural, gregarious "following behavior" of sheep so that physical force is unnecessary. A curved chute with solid sides prevents sheep from seeing the activities taking place up ahead. The use of well-designed facilities will minimize the need for prods, resulting in more humane treatment of the animals, as well as improved quality of consumer products.

Housing units must have adequate ventilation to prevent pneumonia. Dust must be controlled to prevent damage to the respiratory tract and to keep dirt out of the wool. Pneumonia is one of the most common problems observed in confinement-fed lambs. Plans for sheep housing and facilities can be found in the Midwest Plan Service Sheep Housing and Equipment Handbook as well as in the Sheep Production Handbook, available from state extension offices and from the American Sheep Industry Association.

Handling and transportation play a very important role in overall sheep management. Improvements in handling techniques have proven to decrease incidence of condemnation rates due to injury since 2000. However, improper handling or transportation can result in bruising, broken bones, pelt and wool damage, condemnation, and even death. Proper handling facilities and techniques minimize stress to the sheep and the handler. In addition, it is no longer acceptable

to deliver “downer” (non-ambulatory) animals to a harvest plant. If the animal is in extreme distress or the condition is obviously irreversible, it should be humanely euthanized without delay. It is the responsibility of livestock producers to consider the welfare of the animals in their care. Cruelty, abuse, and neglect cannot be tolerated.

Injuries to sheep can occur during transportation. Several factors should be considered when transporting animals. The use of a reputable livestock hauler with experience handling sheep is preferred. Overcrowding should be avoided, especially for long-distance hauling, to reduce injuries and stress to the animals. A 12-hour fast (water should never be withdrawn) is recommended before loading sheep onto trucks or trailers. Sheep that have fasted are easier to load onto trucks. They also produce less urine and manure, minimizing sanitation problems and wool contamination. Fasted sheep are less likely to lie down in the trucks. This reduces the chance of animals being stepped on or crushed and suffocated.

Producers should be involved in the transportation process to let the trucking contractor know what is expected. In some instances, producers also may outline routes and even follow routes of trucking contractors with global positioning systems to maintain biosecurity, thereby limiting contact with other livestock during transport. Involvement of truckers in careful handling and transport will result in healthy, unblemished sheep being delivered to the packing plant or feedlot

Sometimes sick or injured animals do not respond to treatment or may have a condition that is irreversible. In such cases, the animals should not be allowed to suffer unnecessarily, but should be humanely euthanized.

The American Veterinary Medical Association recommends the following procedures:

- If the animal is in extreme distress or if the condition is obviously irreversible, it should be immediately and humanely euthanized.
- If the animal is not in extreme distress and continues to eat and drink, the producer should contact a veterinarian for assistance, and provide food, water, shelter, and nursing care to keep the animal as comfortable as possible.
- If the condition involves a recent injury to a healthy animal, the animal should be shipped directly to a state or federally inspected harvest plant or harvested on the farm or ranch.

- Animals that are unable to walk should never be sent through intermediate marketing channels. They should be euthanized and properly disposed of.

An understanding of sheep behavior will allow the appropriate design of facilities and equipment, resulting in improved ease of handling. There are several factors to consider regarding sheep behavior: their vision, flight zone, lighting, noise, lead animals, memory, and environmental conditions.

Sheep have a range of vision that allows them to see behind themselves without turning their heads. They depend heavily on their vision. Excess wool around their eyes (wool blindness) causes severe problems in handling and loading sheep. Wool-blind sheep are more likely to spook and are difficult to move. Wool blindness can be managed by shearing face wool (facing). Wool blindness is a highly heritable trait, and can therefore be eliminated through genetic selection.

All sheep have a flight zone that can be used to the handler’s advantage when moving them. As a person enters the sheep’s flight zone, the animal will tend to move away. However, chasing sheep will only cause them to panic, which often results in injury to the animal and frustration for the handlers.

The lighting of handling facilities is an important factor to consider. Sheep tend to move toward light and are attracted to diffuse light. Bright glaring lights or lights that cast shadows cause balking and should be avoided. The position of the sun should be taken into account when constructing handling facilities. Corrals and runways with variable lighting make sheep processing difficult.

Sheep are very sensitive to noise. Excessive noise and confusion will cause them to balk. Sheep should be handled as quietly as is possible.

Lead animals, such as a halter-trained or a leader-trained (rewarded with food) sheep or goats, can be of great help as sheep have a strong herding instinct. Herding dogs can also be useful when moving groups of sheep. However, they should work calmly and not be allowed to bite, bark, or chase unnecessarily. Sheep should not be moved or restrained by their wool. This causes bruising and pain for the animals.

Sheep are gregarious animals and are likely to become highly agitated and stressed when they are separated from the flock. Many serious sheep handling accidents have been caused by isolated, frantic sheep. If an isolated animal

becomes agitated, move it to a group of sheep or move other animals in with it. Sheep instinctively want to maintain visual contact with each other. Allow livestock to follow the leader and do not rush them. If animals bunch up, handlers should concentrate on moving the lead animals instead of pushing a group of animals from the rear. Proper handling management will reduce stress and carcass damage resulting from bruising.

Sheep remember bad experiences. Therefore, well-designed facilities and humane handling should be employed at all times. Handling problems will only increase, if improper techniques are used. Understanding and utilizing sheep behavior is vital in proper handling. Every possible effort should be made to ensure that the sheep are kept moving on their own without poking, prodding, or shouting. This will result in a less stressful, more efficient working situation, both for the sheep and their handlers.

Providing environmental protection and adequate water is not just an issue of animal welfare, but is also vital for optimizing sheep performance. Environmental protection should include excellent pen maintenance for confined animals. Mud can result in lower returns in confined sheep as it increases maintenance requirements and has a negative impact on feed efficiency. Mud also causes considerable loss of pelt value, increases the cost of processing at the packing plant, and may increase the microbiological load transmitted to carcass surfaces inside the packing plant. Providing environmental protection, mud control, and an adequate supply of fresh, clean water are important parts of quality sheep management.

Working sheep in muddy conditions should be avoided, because it causes handling difficulties and contamination of wool. Practices that result in pain or injury to the animal should be avoided and are unnecessary if facilities are designed correctly. If animals experience pain or injury, evaluate environmental conditions, and apply corrective action to avoid further complications.

To avoid environmental problems, select products that are environmentally friendly.

Herbicides and insecticides used around facilities to control weeds and flies can help create a clean and neat environment, but improper use of these materials may create environmental damage. These chemicals are highly persistent; it only takes small amounts to cause a residue that can be easily detected at slaughter. Take time to realize where run-off will

accumulate if rain occurs after application of such products.

On-the-job training, subsequent to well-planned classroom instruction in operating procedures, is potentially the most effective method of helping new employees to understand how written procedures are to be implemented. Documentation is important to provide evidence of the training process followed and to facilitate the learning process of new employees. Training must be ongoing and regularly updated to be effective.

OSHA requires that all employees be made aware of any hazardous chemicals to which they may be exposed. In addition, managers must be sure that a Material Safety Data Sheet (MSDS) accompanies all shipments of hazardous materials. Many chemicals that might not normally be considered hazardous, such as household bleach, are required by OSHA to have an MSDS on file. An MSDS contains information, such as the proper use of each chemical, and must be provided by the distributor of the chemical. The MSDS must be on file and readily accessible to all interested employees. Regular training updates (approximately every year) are important for all employees who work or are associated with pesticides.

The Federal Worker Protection Standard requires all workers who handle or are exposed to general or restricted-use pesticides be trained for handling, protective equipment, notification, decontamination, restricted-entry intervals, and emergency assistance. Contact your extension educator for more details.

Summary of Criteria

SSQA Safety Criteria Achieved by Implementation of Written SOPs

S.1 Do NOT feed prohibited mammalian-derived protein.

S.2 Use only approved medicated feed/water additives according to label directions and FDA Good Manufacturing Practices.

S.3 Adhere to all required withdrawal times to avoid violative residues.

S.4 Employ extra-label drug use only when prescribed by a veterinarian with a valid veterinarian-client-patient relationship (VCPR).

S.5 Follow Judicious Antibiotic Use Guidelines.

S.6 Use only feeds and feed ingredients that are free of contamination.

S.7 Implement biosecurity procedures to prevent introduction and/or transmission of animal diseases.

S.8 Implement sanitation and hygiene procedures to prevent introduction and/or transmission of foodborne pathogens.

S.9 Use a validated pathogen-intervention system where appropriate.

S.10 Eliminate contamination from foreign materials in meat.

SSQA Quality Criteria Achieved by Implementation of Written SOPs

Q.1 Administer/inject all products according to label directions. Intramuscular injections must be administered in the neck.

Q.2 Prevent wool contamination with foreign material.

Q.3 Harvest fed lambs at US Yield Grade 3 or better.

Q.4 Age, Flavor and Quality.

Q.5 Reduce stress and prevent bruising and other injuries.

Q.6 Control internal and external parasites.

Q.7 Adequately maintain facilities and equipment, and apply proper handling techniques.

Chapter 4: Record Keeping

Record-keeping, either electronically (on a computer — if tamper proof) or hand-written, is a critically important management tool. Inventory and usage records can point out inefficiencies, theft, and negligence. With narrow profit margins, correct inventory management is essential. Regulatory inspections by the FDA, USDA, EPA, or the Occupational Safety and Health Administration will prove the necessity of good records. Effective documentation that shows appropriate compliance with training, inventory control, use orders, individual animal identification, withdrawal, and disposal will help ensure a safe and high-quality product

To facilitate record-keeping, each animal should be assigned an ear tag identification. The tag should include a number that identifies each animal by group and, if possible, an individual number unique to that animal. The tag will assist in identification for further treatments, and allows for proper harvest withdrawal to be followed. A colored mark on the face or head or a distinguishing collar may also be used for easy recognition.

Administration of all processing products (e.g., vaccines, dewormers, pour-ons, etc.) needs to be recorded. Keep all records for no less than two years from the date of transfer or sale of the sheep, and have the capability of trace-back. Record information for all animals treated individually for problems unique to that animal, stating the animal's identification, date treated, product(s) administered, serial/lot number of the product, dosage used, approximate weight of animal, route and location of administration, withdrawal time assigned to each product, and earliest date the animal could clear the withdrawal period. Record information for all animals that are group processed or mass medicated, as a group or lot. Withdrawal information is assigned to the entire pen. Recording animals under this system assumes that every animal in the lot or group received the treatment. Record must be kept by producers, veterinarians, and the feed mill for two years, for audit under VFD guidelines.

Animal health products are costly items. Accurate records can highlight inefficiencies on an animal-by-animal basis and prevent ineffective administration of treatments.

Furthermore, this information informs the veterinarian of the treatments administered so he or she can validate treatment recommendations and adjust treatment regimen as animals and environmental conditions change. Most systems fall

into one of two categories — receiving records or inventory records. The most common type of system is an action record describing when, why, where, how, etc., actions were taken to remain compliant with the criteria. These records allow for tracing product origin, expiration dates, and product use.

Some sheep operations employ an inventory record system that allows all processing medications to be recorded under a running, or beginning and ending inventory. This also allows for product usage calculation. Such a record can be a great benefit when charging and billing customers, and can also provide valuable information in monitoring management of the production unit. Several pharmaceutical companies have developed computer programs to generate records of animal health product inventory.

Producers should also maintain an accurate system for needle inventory. This can prove beneficial in documenting whether needles were broken off in the muscle tissue during processing or treatment and can indicate when employees need additional training.

Harvested feeds, such as hay, silage, and grain, may be exposed to insecticides, herbicides, and fungicides during the growing season. These pesticides have preharvest withdrawal times, and following label directions will ensure that residues do not remain on the feeds when they are harvested and fed to livestock. If feeds are purchased, inquiries can be made about the preharvest use of chemicals. If possible, which pesticides were used and when they were applied relative to harvesting should be documented through letters of guarantee. These precautions will help assure that milk or meat products are free from residual chemicals. When pesticides with preharvest withdrawal times are used in the production system, records of such use must be kept. Records should include the feedstuff that was treated with the insecticide, herbicide, or fungicide; the date the feedstuff was treated; the specific product with which it was treated; the person who applied the pesticide to the feedstuff; and the preharvest withdrawal time.

Medicated feed additives records should be kept including a formula record of all medicated feed rations produced, and production records of all batches of feed which contain medicated feed additives. Production records must include additive used, date run, ration name or number, amount produced, and the earliest date animal(s) could clear withdrawal period.

A record of pesticide use must be kept and must include

product identification, serial/lot number of the product, date used, amount used, the person who administered the pesticide, the animal or animals exposed to the pesticide, and withdrawal time. If a pesticide, such as a pour-on, is used at processing, the record of its use can be included on the group /lot processing record. If a premises pesticide is used, a record of its use can be included on a Premises Pesticide Use Record. Records for Restricted Use Pesticides must be kept for three years. Maintain records of pesticides (herbicides, insecticides, etc.) used that could cause a violative residue in grazing sheep or feedlot sheep. Use all pesticides according to FDA/EPA label directions.

Check all sheep to be shipped to slaughter to assure that treated animals meet or exceed label and prescription withdrawal times for all products that have been administered. Sign and date a release slip before releasing animals from the sheep operation. The SSQA-certified individual who checks the records should examine processing records, feeding records, hospital records, and all other records that may apply. Transfer a copy of the appropriate SSQA records with the sheep as they are transferred from one operation to another. (This includes all individual and group treatment records, processing and vaccination records and other information as deemed appropriate.)

Assure that all SSQA records are available for inspection by SSQA-verification auditors to allow them to determine compliance and to ensure program integrity. Keep records, on a computer or in written form, documenting that specifications are met and that verifications of actions taken are achieved. Existing records will do, if all aforementioned qualifications are met.

Make applicable records available to FSIS and FDA personnel and to the SSQA program coordinator. If unacceptable levels of residues are found in any of the sheep shipped for slaughter, the source and cause of the violative residue will be determined and corrective action will be taken to prevent recurrence.

The record-keeping systems presented in Appendix 4 were developed from systems currently in place. They are examples that you can use or that may generate ideas to create or revise your current system. Computer record systems make extensive evaluation easy and efficient; however, they must be tamper proof. Hand-kept record systems are still very effective for proof of implementation and credibility. Each system has its own merits, and you should select the system that is the most feasible for your sheep production unit.

In addition to taking the necessary actions to create a safe and high-quality, marketable product, and maintaining accurate records to validate correct production procedures, the sheep industry must realize the crucial importance of traceability and source verification in today's world. Source verification of animals has been a concern in the livestock industry for several decades. The livestock industry has established the importance of source verification and animal identification programs. The demand for secure source verification systems will continue as consumers, retailers, vertically integrated programs and governments expect dramatic improvements in food safety, animal welfare, environmental protections, and health management.

Country-of-Origin-Labeling (COOL) was enacted in 2009 and requires retailers to inform consumers of the country of origin of certain agricultural commodities. Lamb and mutton products are under these regulations. A retailer may use the following on the product label: "Born, raised and harvested in the United States". All claims by the retailers must be supported through sufficient documentation. Many of the economic implications of mandatory country-of-origin labeling rest in the record keeping and tracking systems that may have to be developed and maintained to verify country-of-origin labels. Consumers should benefit from this regulation through greater knowledge of source verification of product, resulting in increased demand for American meat products and greater profits for U.S. agriculture.

The Scrapie Flock Certification Program is an option for which progressive sheep producers may enroll, to monitor the scrapie status of their flock. Animals must be individually identified, and accurate record-keeping is necessary. Due to the incubation period of scrapie, enrolled flocks are monitored for five consecutive years before they are deemed a certified scrapie-free flock (seven years to attain "Export Certified" status). This program may have substantial economic benefits, especially for seedstock producers to market certified scrapie-free replacement breeding animals for other flocks.

The National Animal Identification System deals with the implementation and maintenance of a national animal identification system for the United States. The plan aims to trace-back the infected source of disease outbreaks to premises herds and flocks within 48 hours of discovery of the disease. Also, it should provide benefits regarding global trade and consumer demand.

Official ear tag devices, such as electronic identification

or radio frequency identifications are preferred, but exact method is yet to be determined for livestock species. The plan proposes that the U.S. Premises Identification Number (PIN) become the official number for use in the scrapie eradication and other disease programs.

To ensure consumer confidence and maintain market share, the sheep industry must be able to document the use and safety of its product. The industry must be able to prove, through effective documentation, that tight control over risk factors that have a residue potential has been implemented. As a result, consumer confidence will be strengthened and regulatory pressures will be reduced.

Chapter 5: Developing a Plan

to all criteria regarding the Sheep Safety & Quality Assurance Program. Below is a chart to be used in determining which specific criteria need to be evaluated regarding production practices. The rows on the left represent the actions followed by a lamb feeding operation. The columns are the criteria explained earlier that outline practices necessary for SSQA.

For a producer to attain SSQA goals, he/she must adhere

	S.1	S.2	S.3	S.4	S.5	S.6	S.7	S.8	S.10	Q.1	Q.2	Q.3	Q.4	Q.5	Q.6
Receiving Sheep															
Processing															
Feeding															
Shearing															
Sorting															
Receiving And Storing Feedstuffs															
Feed Mixing															
Receiving and Storing Pharmaceuticals															
Doctoring															
Shipping and Selling to Packer															

Chapter 6: Verification Process

Sheep Safety & Quality Assurance Program System Requirements

System requirements have been outlined to assist with the implementation of the Sheep Safety & Quality Assurance (SSQA) program criteria. Producers will be guided through the logic of the system requirements during an in-depth exercise in Level 2 of the SSQA program. Upon completion of Level 2 training, producers will be SSQA certified and should be able to implement the SSQA program criteria into their production units in preparation for Level 3, SSQA Verification via a third-party review.

The system requirements can be characterized by PDCA (Plan, Do, Check, Act). Specifically, there are five system requirements that should be utilized to implement the SSQA criteria and that will be evaluated during Level 3 verification. These five system requirements include characterization of the product/processes, written procedures, monitoring and verification schemes, remedial action, and knowledge management

1. Characterize the product/processes — Define the production goal(s) of the production system and the processes that take place while meeting those production goals.

- a. Identify inputs and outputs — Outline the inputs needed to produce the output, define the output(s).
- b. Process mapping — Outline the process by which the inputs are used to produce the output.
- c. Process Matrix — Outline the criteria that can be addressed at each processing step in the production system.

2. Write procedures — Document the steps personnel need to comply with the SSQA criteria.

- a. Define — Outline the processing step for which the procedure is being written.
- b. Write — Outline the steps that should be taken in order to adhere to the criteria of the SSQA program.
- c. Document control — Review/approval, distribution,

and access — Assure that procedures are valid and that all personnel have access to the most current version of the procedures for the production unit.

3. Monitoring and Verification — Determine compliance with procedures and verify that the procedures are effective.

- a. Determine what to measure — What measurements will indicate compliance with the procedures and subsequent SSQA criteria.
- b. Determine how to measure and record — Outline how measurements will be taken, how often measurements will be taken, and how/when/where measurements will be recorded.
- c. Revise procedures to include monitoring — Update procedures from number 2 to include the procedures for monitoring.
- d. Verify & record/report compliance (not needed in the procedure) — Verify that the procedures are valid and that they result in compliance with the SSQA criteria and record the verification results.

4. Remedial Action — Control of non-conforming sheep and sheep products.

- a. Identify the non-conformance — Upon verification, it is probable that, at some point in time, a non-conforming sheep or sheep product (sheep or products from sheep that were not produced under the procedures and/or SSQA criteria) will be identified, indicating that there are gaps in the production system. The non-conformance must be identified in some manner.
- b. Segregate the non-conformance — Segregating the non-conformance from the rest of the sheep in the production system will assure that the non-conformance is dealt with in the appropriate manner. If the non-conforming sheep or sheep product has been shipped from the production unit upon identification of the non-conformance, segregation should include notification of the non-conformance to the party to which the sheep or sheep product was sent.
- c. Disposition of the non-conformance — Determine what should be done to deal with the non-conforming sheep or sheep product.

d. Determine the cause of the non-conformance and prevent recurrence — Outline the problem that occurred subsequently causing the non-conformance, and outline means to prevent the recurrence of a similar non-conformance.

e. Record a-d — Records of the actions taken as a result of the non-conformance should be completed and should include identification of the non-conformance, segregation of the non-conformance, disposition of the non-conformance, the cause of the non-conformance and how to prevent the non-conformance.

5. Knowledge Management — Assure that personnel have an adequate knowledge base and adequate skills in order to complete the procedures outlined for the production system.

a. Assess new worker skills — Determine if employees fit the job for which they were hired.

b. Train to remove skill gaps — Provide education and training to personnel so that they can best fulfill the requirements of their job.

c. Periodically re-assess skills — Assure that personnel are up-to-date in their education and training.

d. Record assessment — Provide records of the skill assessment and training procedures including the dates of completion of such activities.

Sheep Safety & Quality Assurance Program Review Program Requirements

1. Procedures

a. Reviewers attend and complete the reviewer training session sponsored by the American Sheep Industry Association (ASI) Sheep Safety & Quality Assurance (SSQA) Program.

b. Producer requests a 'review' and submits their SSQA program procedures and process map to ASI.

c. ASI assigns a review team leader and additional 'reviewers,' if appropriate, to conduct the review and sends the producer's SSQA program procedures and process map to the reviewer(s).

d. Reviewer(s) develops the plan for the audit, in writing,

and sends the plan to ASI. The plan should include the purpose of the review, the scope of the review, resources (who will be conducting the review), the requirements for the review, and when the review will be conducted, including a time for the opening and closing meetings of the review.

e. The written plan is reviewed by ASI for completeness. ASI sends the plan to the producer at least 30 days prior to the review.

f. The review team conducts the desk review of the local procedures and the process map prior to arriving for the on-site visit. The goal of the desk review is to determine written compliance before the on-site visit is conducted. If major problems are evident from the desk review, the on-site visit may be cancelled with approval from the ASI.

g. Review team develops the checklist for the on-site visit.

i. The checklist will be developed from the standardized checklist provided to the review team and will be modified in such a manner to add uniqueness to each review.

ii. Statements on the checklist should be yes/no type questions and answers must be based on fact(s), not opinion.

iii. The checklist should avoid the use of adequate, appropriate, significant, etc. in the questions.

iv. The format of the checklist should outline the major topic area followed by questions for that topic area. The review team should modify the format to allow room for note taking during the on-site visit.

v. The checklist should be no more than 10 pages in length, double spaced.

h. Review team performs the on-site visit

i. The on-site visit should take no longer than 1 day.

ii. The opening meeting should be short and should include the manager/owner of the production unit and others, as deemed necessary by the owner/manager. The review team should explain how the on-site visit will be conducted.

iii. Traceback should be completed by at least one team member. The reviewer should start with livestock shipped by the producer and follow back through the production system to arrival at the production unit.

iv. If more than one reviewer is conducting the review, meetings should be conducted at lunch to determine the status of the review process and late afternoon to put together final thoughts before the closing meeting.

v. Review team conducts the closing meeting to discuss findings.

i. Reviewer(s) completes the review report and problem sheets.

j. Reviewer(s) send report to ASI.

k. ASI files, into the producer's SSQA file, the review checklist, review report and any email communication and updates the status of the review in the SSQA database.

l. ASI sends the report to the producer.

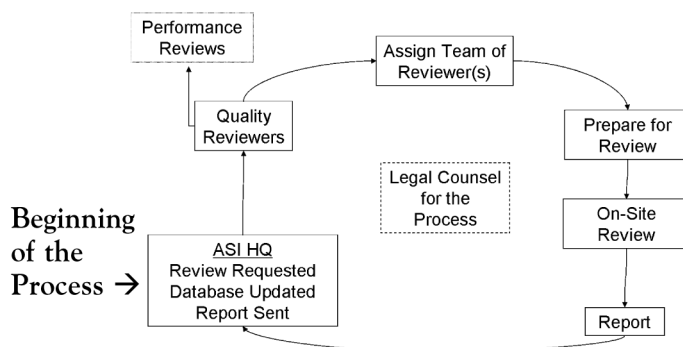
m. Producer receives report and must respond to problem sheets within 30 days; responses must be sent to ASI. The producer also will complete a 'Review Evaluation' form to provide feedback to ASI regarding the review process as well as individual reviewers.

n. ASI forwards producer responses to reviewer(s) for acceptance.

o. Reviewer (s) responds to the problem sheet responses within a week and outlines the reasonableness of the response along with a statement of whether a follow-up on-site visit will be conducted.

p. Upon the review team leader's acceptance of the producer problem sheet responses, the physical review certificate for those who 'pass' the review will be sent to the producer.

2. Process



3. Report Format

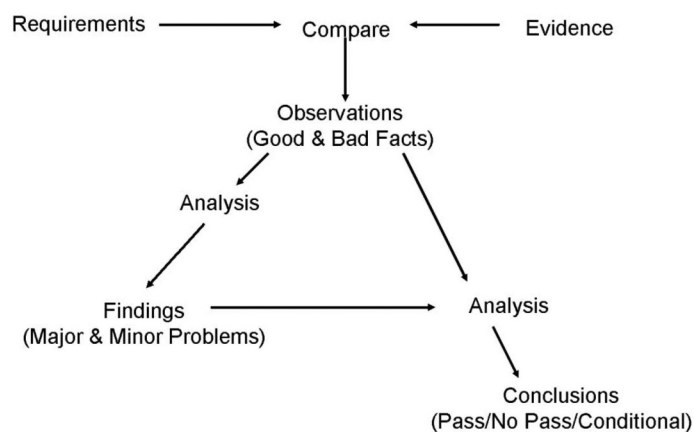
a. The 'Review Report' should be completed using the standard format (following) and should be limited to two pages plus attachments:

I. Introduction

ii. Conclusions

1. Overall conclusions based on subjective and objective observations

2. Recommendation of Pass/No Pass/Conditional



iii. Highlight of major and minor problems

iv. Highlight of positive practices

v. Problem Sheets provided as Attachments

b. Report should not include the checklist used during the audit; the checklist should be filed along with a copy of the report at ASI headquarters.

4. Problem Sheet Format

a. The 'Problem Sheet' should be attached to the 'Review Report' using the standard format (Appendix A) and should include:

i. Problem statement — based on opinion of the Review Team

ii. Observations — based on facts from the desk review and the on-site review

5. Problem Response Sheet Format

a. Producers are required to respond to the 'problems' identified during the review within 30 days of receiving the results of the review using the 'Problem Response Sheet' (Appendix A). The 'Problem Response Sheet' will be provided in the review report. The statement of the problem on the 'Problem Response Sheet' will be completed by the 'Review Team' leader.

b. The 'Problem Response Sheet' outlines the schedule for implementation of action to address the problem. This date will determine the point at which a follow-up on-site visit will be conducted, if necessary.

6. Definitions

a. Third-party review — A review of a production system to determine compliance with the SSQA criteria. The review includes a review of the system requirements and compliance with the SSQA criteria and will be conducted by Reviewers trained specifically for the SSQA program.

b. Major problem — A significant portion of the safety or quality program is either undefined or not implemented, or both.

c. Minor problem — Controls are present for safety and quality of the product(s), but gaps in the implementation of the program exists.

d. Pass — Result of a 'Review' that indicates system control of the products and processes in the production system and successfully addresses the system requirements and the SSQA criteria. This production system may have minor problems, however, the system does not require an additional on-site visit, as the problems will be resolved through paperwork and trust.

e. No pass — Result of a 'Review' that indicates system failure in addressing the system requirements and the SSQA criteria. This production system has major and minor problems that need to be addressed before they can request another 'Review.' A "No Pass" could result from the desk audit alone should the production system requesting the audit not provide ample documentation for the "Desk Audit" to be completed. Producers receiving a "No Pass" from the desk audit will be asked to address the problems resulting in the documentation and to reapply for review.

f. Conditional — Result of a 'Review' that indicates system control of the products and processes in the production system with minor problems. The production unit addressed the system requirements and the SSQA criteria, however, several minor problems may exist. In such instances, the problems require a follow-up, on-site visit that will (more than likely) be conducted by a 'Review Team' member to confirm that the conditional standards are met as outlined in the producer response.

**AMERICAN SHEEP INDUSTRY ASSOCIATION
SHEEP SAFETY & QUALITY ASSURANCE PROGRAM REVIEW CHECKLIST**

PRODUCTION UNIT: _____ **DATE:** _____

REVIEW TEAM LEADER: _____ **TEAM MEMBERS:** _____

SYSTEM REQUIREMENTS

1. Has the producer characterized the product and processes for the production unit?
2. Has the producer written procedures to address the processes in the production unit?
3. Has the producer completed monitoring activities to verify compliance with procedures?
4. Has the producer verified that procedures are valid and result in compliance with SSQA criteria?
5. Has the producer maintained control of non-conformances?
6. Has the producer evaluated employee knowledge?
6. Has the producer maintained a quality-control system such that ruminant-derived protein sources, including meat and bone meal, are eliminated from the feeding system?
7. Has the producer maintained records to verify that all sheep receiving medicated-feed rations met withdrawal times prior to shipment for harvest?
8. Has the producer completed a release slip dictating that animals shipped have met withdrawal times?
9. Has the producer shipped records with the sheep to dictate that they are free of antibiotic residues?
10. Are feedstuffs and feed additives/medications stored properly to eliminate contamination of feedstuffs?
11. Does the producer use feed suppliers who have implemented a quality control program for feedstuffs?

FEEDSTUFFS AND FEED ADDITIVES/MEDICATIONS

1. Has the producer maintained a system to prevent pesticide or herbicide use that could cause a violative residue in sheep?
2. Has the producer maintained a quality control program for incoming feed ingredients and tested feed ingredients suspected of contamination with residues, mycotoxins and/or bacteria?
3. Has the producer used only FDA-approved, medicated-feed additives in rations and documented this quality control system?
4. Has the producer used and documented that all medicated-feed additives are used in accordance with FDA-approved label criteria?
5. Has the producer kept a record of all formulated medicated-feed rations produced and a record of all sheep that received those rations?
12. Has the producer kept feed handling equipment clean to eliminate feed contamination?
13. Are records available to verify that sheep are free of residues (traceback)?
14. Are sheep fed to a compositionally appropriate endpoint?

ANIMAL HEALTH TREATMENTS

1. Has the producer documented that all products labeled for SQ administration are administered SQ?
2. Has the producer assured that all injections are administered in the neck region and documented when and where injections were administered?
3. Has the producer documented that all products which cause tissue damage, including aminoglycosides, were avoided?

4. When aminoglycosides are used, has the producer used them according to label directions?
5. Has the producer used treatment regimes that comply with label directions or a licensed veterinarian prescription or VFD and maintained documentation of prescriptions, VFD, and label directions?
6. Has the producer administered animal health products under extra-label drug usage only when prescribed by a veterinarian under the guidelines of a valid veterinarian-client-patient relationship?
7. Has the producer maintained documentation of extra-label prescriptions, along with the name and phone number of the veterinarian writing the prescription?
8. Has the producer checked animals treated with any product that has a withdrawal time for withdrawal compliance prior to shipment, and documented such compliance?
9. Have all animals treated with any product that has a withdrawal time been identified with a permanent ear tag or other permanent form of identification and has treatment information been maintained?
10. Have all treatments been documented with animal identification, drug and dosage used, route of administration, earliest date the animal could clear withdrawal, and the person who administered the product?
11. Has the producer maintained a quality-control program to ensure that all pesticides are used according to the FDA/EPA label directions?
12. Has the producer used all pesticides in accordance with label directions and recorded all pesticide use including product ID, lot/serial number, date used, amount used, and withdrawal time?
13. Has the producer accounted for all needles to assure that no broken needles remain in sheep?
14. Has the producer used Pharmaceuticals with low dosage?
15. Has the producer administered products with no more than 5 cc per intramuscular injection location?
16. Has the producer used Pharmaceuticals with SQ, IV, and oral routes of administration?
17. Are animal health products stored properly?
18. Has the producer implemented remedial action when antibiotic residues have been found in sheep?
19. Has the producer followed the “Judicious Use of Antibiotics” guidelines?
20. Has the producer implemented procedures, such as keeping feed away from the ground and provided clean pastures, to control internal parasites in sheep?
21. Has the producer treated sheep for external parasites following shearing?
22. Has the producer completed a release slip dictating that animals shipped have met withdrawal times?
23. Has the producer shipped records with the sheep to dictate that they are free of antibiotic residues?
24. Does the producer work with his/her veterinarian, consult the Food Animal Residue Avoidance Databank, and/or use the Live Animal Swab Test to verify drug withdrawal of questionable sheep?
25. Are records available to verify that sheep are free of residues (traceback)?
26. Does the producer use equipment to provide proper restraint during treatment of animals?
27. Is treatment equipment and the treatment area clean and sanitary?

RECORD-KEEPING

1. Has the producer kept an accurate record of all documents representing all sheep transferred into or out of the production unit?
2. Do the records meet all SSQA specifications including dates, identifications, product identification, and product specifications such as withdrawal times?
3. Has the producer maintained records for at least two years from the date of transfer or sale of the sheep in

order to have the capability of traceback?

WOOL

1. Has the producer sheared lambs to maintain short and clean fleeces?
2. Has the producer removed heavily soiled fleeces from cleaner fleeces?
3. Are sheep sheared in a manner to assure that fleeces are sorted by type?
4. Are sheep sheared in a manner to avoid cutting the sheep, avoid damaging the pelt, and limiting stress to the sheep?
5. Are procedures implemented to avoid wool contamination?
6. Are sheep sheared when they are dry?
7. Is wool stored to prevent deterioration?

GENERAL

1. Are facility personnel properly educated and trained as to the correct techniques to be used for administration of all animal health products?
2. Have proper sanitation practices been implemented to keep equipment clean?
3. Has the producer implemented procedures to prevent bruising, stress and/or injury during animal handling?
4. Has the producer implemented and documented the standard sanitation operating procedures?
5. Has the producer implemented a system for keeping sheep and sheep pens clean?
6. Has the producer addressed biosecurity to control animal health and feed-borne contamination?
7. Has the producer implemented a Scrapie Eradication program?
8. Has the producer handled pesticides and herbicides per label directions?

9. Has the producer stored pesticides and herbicides to eliminate contamination of other products and environmental damage?

10. Has the producer eliminated foreign contamination of sheep by using appropriate needles and limiting contact with hunters?
11. Has the producer maintained a sanitary environment by removing manure on a regular basis?
12. Has the producer maintained a sanitary environment by keeping feed, bedding and watering areas clean?
13. Has the producer maintained a sanitary environment by cleaning and disinfecting feeders and waterers?
14. Has the producer maintained a sanitary environment by separating sick sheep from the rest of the flock?
15. Has the producer maintained a sanitary environment by practicing milking hygiene?
16. Are facilities inspected regularly to keep facilities in proper working condition?
17. Are sheep handled and transported in a safe manner?
18. Are disabled sheep provided appropriate care and handled in a humane manner?
19. Are facilities designed to reflect natural sheep behavior?
20. Are lead animals and herd dogs used correctly?
21. Are sheep provided adequate water and feed?
22. Are sheep provided an environment free of mud?
23. Are sheep provided environmental protection?
24. Has the producer trained employees for their task(s) and maintained records of such training?
25. Has the producer provided an occupationally safe work environment?

American Sheep Industry Association
Sheep Safety & Quality Assurance Checklist Compliance Sheet

Production Unit: _____ Date: _____

CATEGORY

System Requirements:

Feedstuffs and Feed Additives/Medications

Animal Health Treatments

Record Keeping

Wool

General

I, _____, have completed the SSQA Program review checklist, and to the best of my ability have implemented the listed requirements to fulfill compliance of Level 2 Sheep Safety & Quality Assurance Program. Any deviations from requirements in the checklist have been explained above. I hereby request to be contacted by an auditor in order to pursue SSQA Level 3 verification.*

(Signature)

(Date)

**Producers are financially responsible for completion of auditor reviews. Prices may vary and to be determined between auditor and producer.*

Send this form to: American Sheep Industry Association
9785 Maroon Circle, Suite 360, Englewood, CO 80112

Review Example:

Organization Reviewed:
Jim Buck Ranch, Candy, WY

Dates of Review:
May 6-7, 2002

Report Number:
2002-14

Background:

An SSQA review of the Jim Buck Ranch in Candy, WY, took place on May 6-7, 2002. The purpose of the review was to determine if the ranch is in general conformance with the Sheep Safety & Quality Assurance program criteria of March 4, 2002. The review also examined the management controls in place to provide assurance of continuing compliance. The review examined all on-site ranch sheep operations. It did not examine services provided by contracted suppliers, other than records. Activities from June 30, 2001, to present were examined.

A team of two SSQA-certified reviewers conducted the review. Chas. Burns was the team leader, assisted by Mary Alice Williams. The reviewers met with owner Jim Buck and his administrative assistant on the morning of May 6 to explain the review process and answer any questions. The remainder of the time was spent interviewing ranch personnel, watching shearing operations, and examining records. Review results were discussed with Mr. Buck and Ms. Regan on the afternoon of May 7, 2002.

Conclusions and recommendations:

Within the scope of this review, there was evidence to support the application of SSQA practices to the ranch operations. Management practices are in place to provide confidence of continued implementation; although, training of new employees is lacking in some respects.

Sheep receiving, raising, shearing, and health maintenance practices are consistent with ASI standards. Feed is closely examined for safety and nutrition prior to use. Health of the animals is maintained through good ranch practices and close consultation with Dr. Elias Smidt, a veterinarian based in Sweetwater, WY. Corrals and pens are maintained in good order. Records are kept in a computer database, with frequent backup. Recommendation: The Jim Buck Ranch should be awarded a certificate of satisfactory SSQA registration.

Problem Areas:

Training of new employees is lacking in some areas. The manner of assessing skills and knowledge is quite informal. Ranch hands are given full responsibilities, without oversight, before necessary training is conducted. Many stated that they were unsure of proper procedures for administering antibiotics. See Minor Problem Report #2002-14A.

Positive Practices

The Jim Buck Ranch has implemented an excellent record-keeping system, using the SheepSafe software package. The database can integrate both feed and health maintenance records. Both hard copy and electronic files are provided to the customer and are available to government inspectors.

Prepared by: Chas. E. Burns, team leader

Date prepared: May 13, 2002

Chapter 7: Process Principles

Sheep safety and quality can be achieved through the application of the principles of Process control, which helps the industry meet the needs of its customers. Sheep producers cannot expect those at the next stage of the production system to fix safety or quality problems; success is achieved when those in every sector do whatever is necessary to meet the needs of the final customer. Process control does not provide a quick fix for sheep safety and quality problems. It is a long-term business concept in which returns for doing things right may not be direct or immediate. Dr. W. Edwards Deming, among others, developed the process control philosophy, and he described the process as one in which things are done right the first time.

Quality products, according to Deming, can be defined as those that conform to a set of standards and that meet consumer wants and needs. Once standards have been set to provide quality products, suppliers need to assure that products are manufactured in a manner that conforms to these standards. The International Organization of Standardization (ISO) has developed systems to do just that. These systems or standards (ISO 9000 Series Standards) are models for quality assurance in design, development, production, installation, and servicing of products.

Food Safety Management.

In 1959, Dr. Howard Bauman developed the Hazard Analysis Critical Control Point (HACCP) system to guide the preparation of safe, high-quality food for use in the U.S. space program. The HACCP program gained approval of the Food and Drug Administration (FDA) and USDA. Through regulation, all U.S. packing plants have developed and implemented HACCP systems for meat inspection. The philosophical approach and principles used in the HACCP system are the basis for the essential elements of the SSQA program. The SSQA program is not a HACCP program per se, but both programs involve use of a systematic approach for preventing problems or defects from occurring and for documenting the elements by which processes are controlled. The HACCP program focuses on control of physical, chemical and biological hazards, with much of its emphasis on prevention of contamination of meat with bacterial pathogens. The SSQA program emphasizes minimizing physical, chemical and biological hazards in sheep products, but also strives to optimize

the quality of meat, wool, and milk.

Principles of HACCP:

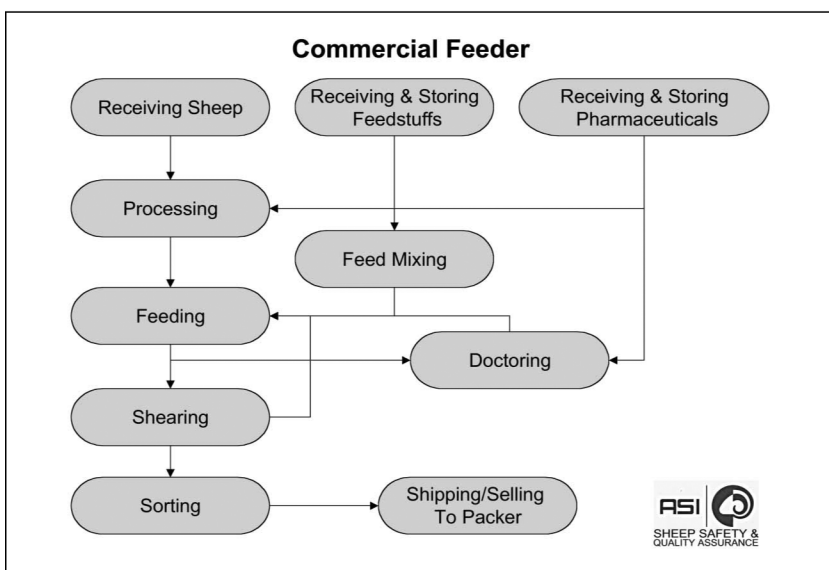
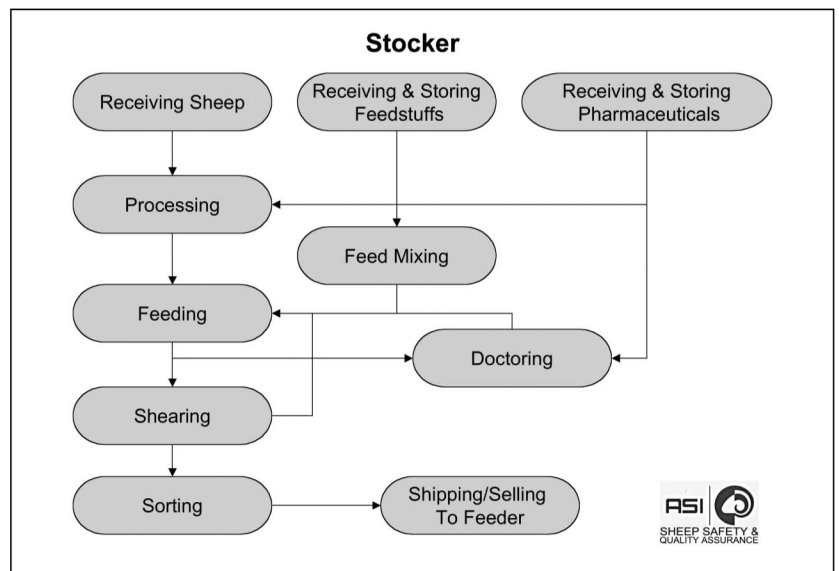
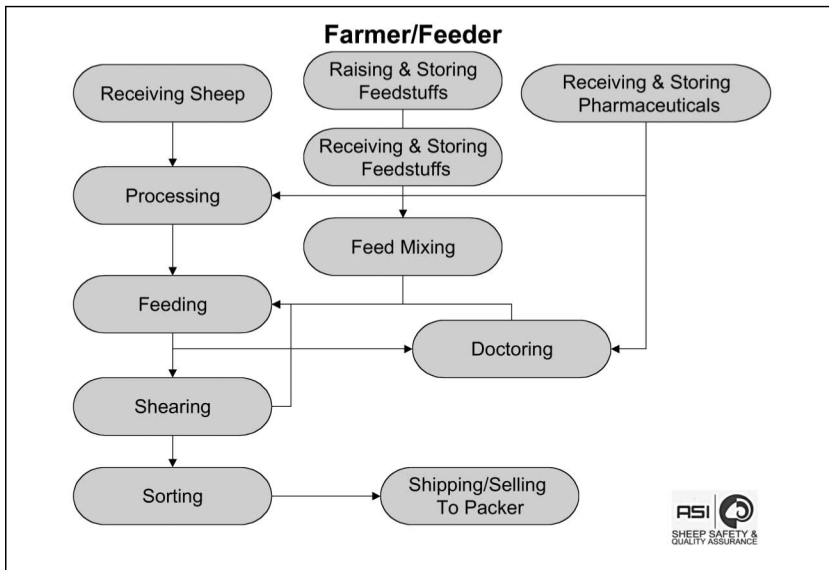
- Conduct a hazard analysis
- Identify the critical control points
- Establish critical limits for each critical control point
- Establish monitoring procedures
- Establish corrective action
- Establish verification procedures
- Establish record-keeping procedures

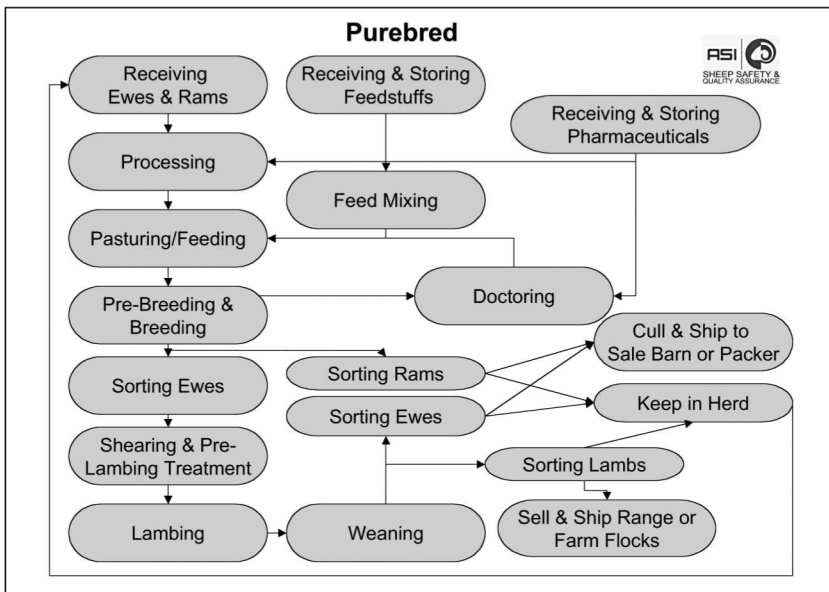
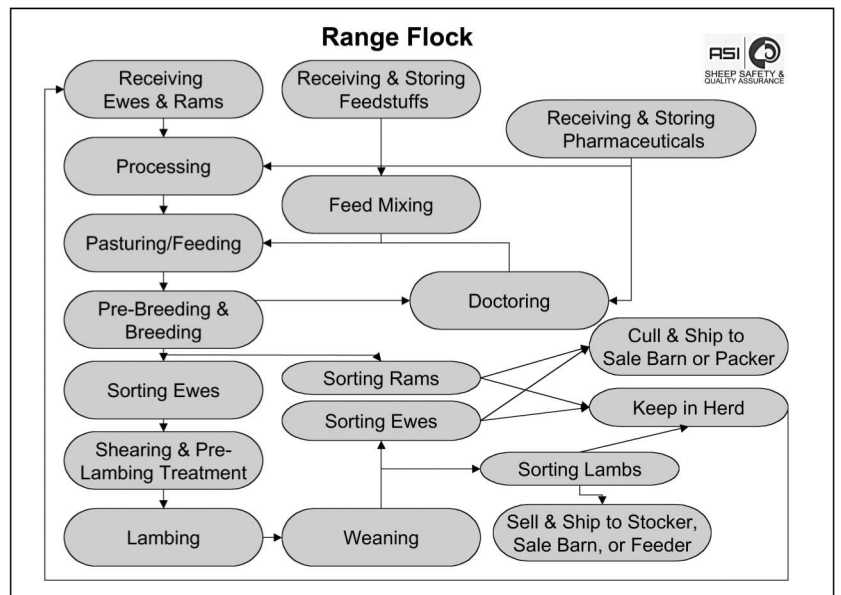
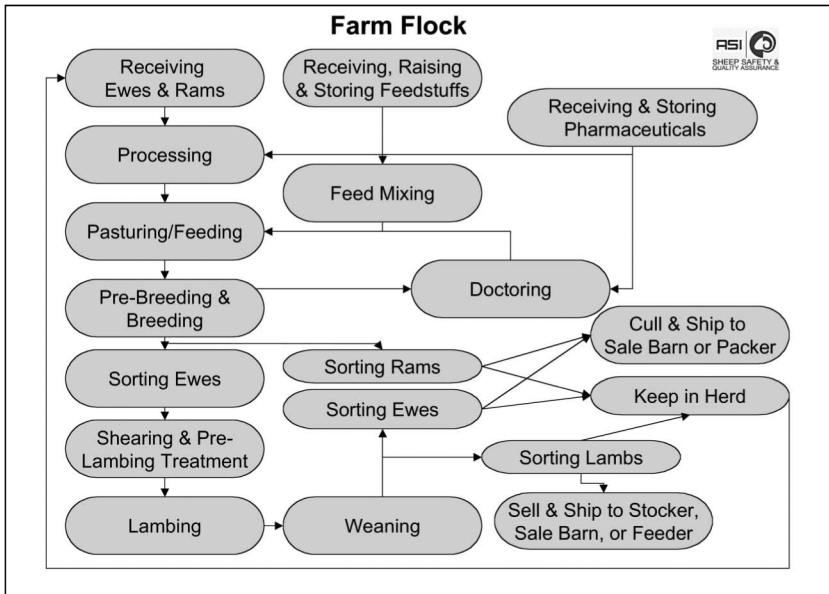
Means of Implementing Safety and Quality Assurance Programs.

While HACCP and ISO systems are the pillars upon which the SSQA program, as described in this manual, was constructed, it would be different for those systems to be implemented by procedures in animal production systems. The philosophies of each of these systems are included in the foundation for the SSQA program. However, the SSQA program will be implemented by focusing producers' attention on the development of Standard Operating Procedures (SOPs) that will, in turn, result in the production of safe, high-quality sheep products. SOPs detail specific sequences of events that are required to perform a task. Safety, ergonomics, processing costs, facility design, animal/product flow, environmental issues, and personnel management affect procedures.

Procedures include: (a) what the person is going to do, (b) how, specifically, the person is going to do it, (c) why it is done, and (d) who is doing the task.

Appendix 1: Process Flow Diagrams





Appendix 2: Example SOP

DRAFTING STANDARD OPERATING PROCEDURES

Each official establishment shall develop, implement, and maintain written standard operating procedures in accordance with the requirements of the SSQA program to, at a minimum, address the following:

Development

The standard operating procedures shall describe all procedures, in detail, that an official establishment will conduct daily, before and during operations, sufficient to prevent safety and quality defects.

The standard operating procedures shall be signed and dated by the individual with overall authority on-site or a higher level official of the production facility.

The standard operating procedures shall specify the frequency with which each procedure in the standard operating procedures is to be conducted and identify the individual responsible for the implementation and maintenance of such procedures.

Implementation

Each production facility shall conduct procedures in a systematic order such that all SSQA criteria are accounted for and adhered to in accordance with the SSQA program.

Each production facility shall conduct procedures at the frequencies specified in the procedure. Each production facility shall monitor daily the implementation of the procedures.

Maintenance of SOPs

Each production facility shall routinely (at least once every 12 months) evaluate the effectiveness of the standard operating procedures in adhering to the SSQA program criteria and shall revise procedures as necessary to keep them effective and current with respect to updated program criteria and/or changes in facilities, equipment, and operations.

Corrective Actions

Each production facility shall take appropriate corrective action when it is determined that the standard operating

procedures or the implementation or maintenance of the standard operating procedures have failed to adhere to the SSQA program criteria.

Record-Keeping Requirements

Each production facility shall maintain daily records sufficient to document implementation, monitoring, and internal verification of the standard operating procedures and any corrective actions taken. Production facility employees identified as responsible for implementation and monitoring of a procedure(s) shall authenticate the records with his or her initials and the date.

Records required by this part may be maintained on computers or in written form provided the production facility implements appropriate controls to ensure integrity of the records (tamper-proof).

Records required by this part shall be maintained for at least two years from the date of transfer/sale of the sheep.

OBJECTIVE EXAMPLE 1

Address biosecurity issues to control animal health and foodborne contamination.

PROCEDURE EXAMPLE 1

1. All traffic, including human and vehicle traffic, will be controlled through the main office of the production unit. All people will check in at the office before proceeding through the production unit. All vehicle traffic will be scheduled at proper times.
2. All guests will submit to sanitation requirements (e.g., footbaths, sterile coveralls) before being allowed access to production areas. Furthermore, no guests will be permitted contact with feedstuffs or pharmaceutical supplies, and contact with feed-animal interfaces (e.g., feed trucks and bunks) will be limited to areas marked as suitable for guest observation. Only employees of the facility are to have direct human-to-animal contact within production facilities.
3. All transportation of livestock will be monitored to limit exposure to outside livestock in route to the production unit.
4. All newly arrived livestock will be isolated and tested/evaluated by an accredited veterinarian to assure the health

of the animals before they are moved to their appropriate location in the production unit.

5. All equipment and trucks will be sanitized before use. In addition, equipment will only be used in the location of the production unit for which it was purchased (i.e., separate loaders will be used for feedstuffs and for removal of dead livestock).

6. Sick animals will be removed from pens as quickly as possible to limit the spread of disease to other livestock.

7. Dead animals will be necropsied to determine the cause of death. If the cause of death is disease related, proper measures will be taken with other livestock to ensure proper health.

8. Fresh water will be available to animals at all times. Watering equipment will be cleaned and sanitized, using sanitation procedures, once per week.

9. Birds, rodents, and other potential pests will be controlled via the pest control procedures.

OBJECTIVE EXAMPLE 2

Maintain a quality-control program for incoming feed ingredients and storage of those ingredients.

PROCEDURE EXAMPLE 2

1. Feed ingredients will be delivered to the office (headquarters) of the sheep production unit.

2. Feed ingredients will be inspected upon delivery to verify the product received, the amount of product received, and the quality of the product received.

3. The feed ingredients inventory database/log will be updated based on the information recorded in number 2, plus lot and serial number.

4. Product use will be recorded and inventory database/log updated based on the lot and serial numbers, as well as the amount of product used, date used, and the person who administered the product.

Appendix 3: Records and Forms

Sheep Health Record

Name: _____

Address: _____

City: _____ State: _____ Zip: _____ Phone: _____

Sheep ID	Product Name /Procedure	Lot & Serial #	Company	Date Given	Withdrawal Date	Route of Admin	Dose	Booster (Y/N)/Date

Owner's Signature: _____ Date: _____

Veterinarian's Name: _____ Phone: _____

Address: _____

Veterinarian's Signature: _____

When possible, select subcutaneous administered products. Never give injections in the leg.

Appendix 4: Product Use Information

Feed Additives and Medications

Drug Categories

CATEGORY 1 — Drugs that have no required withdrawal time when used at lowest usage level.

CATEGORY 2 — Drugs that either (1) have withdrawal times at lowest usage level or (2) are regulated because of a “no residue” tolerance level.

Medicated Feed Type

TYPE A — Medicated feed articles that usually consist of highly concentrated forms of the drug in the form of mill premixes, super-concentrates, and fortifiers that have a higher potency than permitted in Type B or Type C feeds. Type A feeds are used to produce Type B and Type C feeds.

TYPE B — Medicated feeds that usually consist of dilute drug premixes, some feed concentrates, supplements, and other mixtures that require further mixing with one or more feed ingredients to achieve final dilution before being fed.

TYPE C — Medicated feed in its final form that does not require any additional dilution prior to being fed. These usually consist of top dressings, complete feed, or fed as a free-choice supplement.

The only regulatory requirements are to follow a set of guidelines:

- Current Good Manufacturing Practices (CGMPs) and
- Registration with the Food and Drug Administration (FDA)

Who must register with the FDA?

Any establishment that uses one or more Type A sources of a Category 2 drug to manufacture or produce medicated feed articles. Registration requires completion of either Form FD-2656 (for first time registrants) or 2656e (for annual re-registration), together with a separate Form FDA-1900 for each of the Type A, Category 2 drugs being used.

What about feed mixed on the farm?

All producers of medicated feeds are subject to the same rules. If commercial mills, feedlots, producers, mobile mixers, etc., use only Category 1 products and/or Category 2.

Type B drug products, registration with the FDA is not required. These products are subject to following the set of CGMPs and are not subject to routine inspections by the FDA.

If a firm uses one or more Category 2 Type A medicated articles as drug sources, it must register with the FDA and comply with the full CGMPs and is subject to FDA inspections for compliance with these CGMPs at least once every two years.

Forms used by the FDA

FD-2656. Registration of Drug Establishment This form is required for initial registration with the FDA and must be submitted within five working days after commencement of operation of the facility.

FD-2656e. Annual Registration of Drug Establishment. This form is used for annual registration of facilities. The FDA will send this form to your facility on an annual basis.

FDA-1900. Medicated Feed Application. This form is used to obtain FDA approval to manufacture or use any Type A Category 2 feed article at your facility. Purchase of a medicated premix or complete feed does not require an FDA-1900 form because the facility that blends and manufactures the feed will have one on file. However, each user is responsible for the correct level of drug contained in the total feed. If your facility does not have an FDA-1900 on file for the proper drugs, your facility must first pass a CGMP inspection conducted by the FDA for approval of your Medicated Feed Application 1900.

These forms can be obtained by writing to:

Department of Health, Education and Welfare,
Food and Drug Administration, Bureau of Drugs
Drug Listing Staff (HFD-315)
5600 Fishers Lane
Rockville, MD 20857

Or call or write to:

Colorado Department of Agriculture
700 Kipling Street, Suite 1100
Lakewood, CO 80215-5894
303/239-4161

Record-keeping requirements for non-registered facilities

1. Maintain a record of formulas of all feed rations produced.
2. Maintain production records of all batches or runs including date run, ration name or number, and amount of ration.
3. Maintain a record of any distribution of feed if not used for consumption at your facility.
4. Keep all records for not less than two years and have the capability of a recall if necessary.

Feed Additives and Medications Use

Any medicated-additive combinations not listed in the table are not approved by the FDA and therefore are illegal. Other medicated-feed additives (not listed) are illegal unless the label clearly states they may be used in sheep. Furthermore, it is illegal for a veterinarian to prescribe any level of a feed additive or medication of any type to be added into a feedstuff. This has been a misconception in the past.

Anyone using a Type A Category 2 medicated-feed article with a drug concentration higher than the percentage indicated in Table 1 is required to secure an FDA-1900. If you hold an FDA-1900 for any of the following ingredients, you are required to sample and test (assay) the feed or supplement that contains a Category 2 drug three times per year:

- AureoS-700
- Neo Terra
- MGA
- Rumatel
- Tramisol50%

Generally, the pharmaceutical representative will assist

with the annual tests. It is not necessary to have a commercial lab run these assays. Drug companies will do this as a service for you.

A complete description of the approved feed additives is available from:

The Feed Additive Compendium
The Miller Publishing Company
12400 Whitewater Drive
Minnetonka, MN 55343
Animal Proteins Prohibited from use in Ruminant Feed*

Purpose of the Regulation

The regulation is intended to prevent establishment and amplification of bovine spongiform encephalopathy through animal feed. It prohibits the use of certain proteins derived from mammalian tissue in feeding ruminant animals. However, certain products are exempt.

The following protein products derived from mammals are exempt:

- Milk products (milk and milk protein)
- Pure porcine protein products
- Pure equine protein products
- Inspected meat products, that have been cooked and offered for human food and further heat processed for animal feed

The following non-mammalian-protein products are exempt:

- Poultry
- Marine (fish)
- Vegetable

The following products are also exempt because they are not protein or tissue:

- Grease
- Oil

- Fat
- Amino Acids
- Tallow
- Dicalcium Phosphate

Is My Operation Affected by The Regulation?

1. This provision applies to livestock feeding operations that feed ruminants. The regulation applies to “establishments and individuals that are responsible for feeding ruminants” to make it clear that all responsible persons, in both large and small feeding operations, are subject to the regulation.

2. Examples include dairies, cattle feedlots, operations raising calves or lambs, and grazing operations with cattle, sheep, or goats.

3. If a feed is intended for ruminants and contains animal protein, the protein can consist only of non-prohibited material.

4. Feed and feed ingredients not containing animal protein are not subject to the regulation.

5. Persons who mix ruminant feed containing prohibited material or who feed prohibited material to ruminants would be subject to regulatory action under the Federal Food, Drug and Cosmetic Act. Regulatory action could include seizure of inventory, injunction against feeding prohibited material to ruminants, or prosecution.

6. Renderers who sell meat and bone meal or other animal protein products to you or your supplier may not be able to determine the species of their incoming materials. Such material is considered “prohibited material” because it “contains or may contain prohibited material.”

7. The Association of American Feed Control Officials has identified the following ingredients listed in their official publication as prohibited material:

- Meat and meat by-products
- Dried meat solubles
- Stock

- Fleshings and leather hydrolysate
- Meat meal and meat and bone meal
- Animal by-product meal and animal liver
- Animal digest
- Meat meal and meat and bone meal tankage
- Hydrolyzed hair
- Bone meal — cooked or steamed
- Meat protein isolate
- Unborn calf carcasses
- Cooked and mechanically separated bone marrow
- Dehydrated food — waste or garbage
- Hydrolyzed leather meal
- Glandular meal and extracted glandular meal

**Excerpts from FDA Guidance for the Industry 69 and 70.*

Appendix 5: Resource Directory

Agricultural Marketing Service
<http://www.ams.usda.gov>

American Feed Industry Association
703-524-0810 <http://afia.org>

American Lamb Board
303-759-3001 <http://americanlamb.com>

American Sheep Industry Association
303-771-3500
<http://sheepusa.org>

American Society of Animal Science
<http://www.asas.org>

American Veterinary Medical Association
<http://avma.org>

Animal and Plant Health Inspection Service
<http://www.aphis.usda.gov>

Center for Animal Health
National Animal Health Monitoring System
970-490-7801
<http://www.aphis.usda.gov/vs/ceah/cahm/cahm-act.htm>

Center for Veterinary Medicine
<http://www.fda.gov/cvm>

Colorado State University
970-491-6672
<http://ansci.colostate.edu>

Food Animal Residue Avoidance Databank
888-USFARAD
<http://www.farad.org>

Food Safety and Inspection Service
<http://fsis.usda.gov>

United States Department of Agriculture
<http://www.usda.gov>

United States Food and Drug Administration
<http://www.fda.gov>

Center for Animal Health — National Animal Health Monitoring System
970-490-7801
<http://www.aphis.usda.gov/vs/ceah/cahm/cahm-act.htm>

Glossary of Terms

Abscess — Pus-filled pocket due to bacterial infection. Leading cause of ewe carcass condemnation. Also, causes pelt damage.

Anthelmintic — Any drug used for control of internal parasites; also, called a dewormer. **Antibiotic** — A chemical agent that prevents the growth of a germ or bacteria. **Antimicrobial** — A substance that can destroy or inhibit the growth of microorganisms. **APHIS** — Animal and Plant Health Inspection Service.

Bale — A compressed pack of wool in a convenient form for transit, ranging in weight from 150 pounds to 1000 pounds.

Belly wool — Wool from the belly region with a pronounced crimp. It is often shorter staple length and discolored.

Bolus — A large oval pill often containing antibiotics or anthelmintic. **Bots** — Fly larvae that crawl into nasal passages.

Britch wool — Wool from the hindquarters of the sheep, usually the coarsest on the body, often approaching hair in its characteristics.

By-products — Edible and inedible items produced from non-meat portions of lamb carcasses. Items include leather, sausage casings, tallow, cosmetics, glycerine, sutures, and lanolin.

Carbonizing — Removing vegetable matter from wool after converting it into carbon by the action of acid and heat

CGMPs — Current Good Manufacturing Practices.

CLA — Caseous lymphadenitis; a contagious bacterial disease that causes external and internal abscesses. It is the number one cause of condemnation of older sheep and is one of the major causes of chronic wasting. Prevention is by sanitation and culling of carrier animals.

Coccidiosis — Disease in (feeder) lambs characterized by diarrhea, dehydration, loss of weight, and weakness due to coccidia (protozoan) damage to small intestine.

Colored fleeces — Presence of colors, other than white, that cannot be removed in scouring of fleeces.

Corrective action — Procedures to be followed when a deviation occurs.

Critical limit — The maximum or minimum value to which physical, biological, or a chemical hazard must be controlled at a production step to an acceptable level of occurrence to adhere to the SSQA criteria.

Crutching — Shearing of wool from around the tail, vulva, udder, and inside rear legs.

Deworming — Management practice of administering medication to kill internal parasites (nematodes).

Disinfection — Using chemicals to kill disease-causing organisms on equipment or facilities.

Drenching — The oral administration of medication.

Drug residue — Presence of a drug in a carcass, milk, or pelt

Ectoparasiticide — Any drug used for control of external parasites that is effective against ticks and mites.

External parasite — Parasites that may be found on the fleece, skin, and in the nasal and ear passages.

Extra-label drug use — Use of a pharmaceutical product that is different, in dosage, species treated, or route of administration, from what is specified on the label.

Euthanize — Painless death administered for humane purposes.

Facing — Correcting wool blindness by shearing wool from the face.

FARAD — Food and Animal Residue Avoidance Databank.

FDA — Food and Drug Administration; a division of the federal government.

Feed additive — Drug added to the feed mix.

Fiber diameter — Thickness of individual wool fibers.

Fiber length — The length of an individual wool fiber or group of fibers.

Fleece — The entire coat of wool shorn from the sheep at one time.

Flight zone — Minimum zone of comfort or security; the animal will take flight if the zone is penetrated by another animal, including people.

FSIS — Food Safety and Inspection Service. Fungicides — Chemicals used to destroy fungi.

GMPs — 1. Good Management Practices — guidelines used to achieve the criteria set forth by the Sheep Safety & Quality Assurance program. 2. Good Manufacturing Practices — guidelines that commercial feed companies are required by the FDA to follow.

Herbicides — Chemicals used to destroy plants, especially weeds.

Injection — Introducing a substance into the body using a syringe and needle.

Insecticides — Chemical agent used to kill insects.

Internal parasites — Usually a type of nematode worm located in the stomach (abomasum), intestines, or lungs of sheep.

Intramuscular injection (IM) — An injection into the muscle tissue.

Intravenous injection (IV) — An injection directly into the venous blood bloodstream (usually through the jugular vein).

Keds — Bloodsucking wingless flies that pierce the skin causing damage to pelts.

Lambs weaned per ewe exposed — Measure of reproductive efficiency. Calculated by dividing the number of lambs weaned by the number of ewes that were exposed to rams.

Lanolin — Purified wool grease.

LAST Test — Live Animal Swab Test; can be used to determine the presence/absence of antibiotic residues in the urine of animals.

Lousiness — Infestation of biting or sucking lice.

Mange mites — Mites that infest and damage the skin and wool.

Monitor — Observe, supervise, keep under review; measure or test at intervals, especially for regulation or control.

Mycotoxin — Poisonous substance produced by a fungus.

Non-violative residue — Residue levels that do not exceed the maximum tolerance levels as set by the Food Safety and Inspection Service.

Paint branding — Identification method that is a source of wool contamination. Parasite — An organism that lives off a host.

Pasteurized Milk Ordinance (PMO) — Guidelines for Grade A milk production that are set by the Interstate Milk Shippers.

Pathogen reduction — Elimination of human disease-causing organisms from the food supply.

Pelt — The skin of a sheep including the wool.

Pesticide — Any poison (chemical) used to destroy pests of any sort; the term includes fungicides, herbicides, insecticides, and rodenticides.

Pharmaceutical — Medicinal drug.

Pinkeye — Contagious disease that affects the eyes of sheep.

Pneumonia — A respiratory disease that affects the lungs of sheep.

Polypropylene — Plastic twine used on hay and straw.

Prescription drug — Drug that requires a veterinarian's written permission for use.

Preventive Measure — A management practice that can be used to maintain control at a production step in order to adhere to the SSQA criteria.

Range wool — Wool shorn from sheep raised under ranching conditions. In the United States, better known as territory wool.

Residue — Drugs and their metabolites that are found in the edible tissues and/or milk of animals after being medicated with specific drugs.

Salmonellosis — Serious disease of feeder lambs, characterized by gastroenteritis, diarrhea, septicemia, and death. In humans, it is a type of food poisoning.

Scouring — The removal of grease and soil from wool by washing with water, soap, and alkali.

Scours — Diarrhea.

Scrapie — A fatal, degenerative disease affecting the central nervous system of sheep and goats. It is among several diseases classified as transmissible spongiform encephalopathies (TSE).

Seedy — A term applied to wools containing grass seeds of various descriptions that are difficult to remove.

Shearing — The removal of the wool from sheep.

Skirting — The practice of removing the stained or inferior wool, such as grows on the belly and legs of the sheep, from fleeces.

SOP — Standard Operating Procedure. An instruction for work.

SSOP — Sanitation Standard Operating Procedure. Instructions for sanitation, master sanitation schedule.

Stained wool — Wool that has become discolored through the effects of urine, feces, or any other coloring agent, such as heavy mud.

Subcutaneous injection (SQ) — Injection given just beneath the skin. Tagging — Practice of shearing wool on the udder and dock/tail regions. Tags — Trade term for dung locks, floor sweepings, or stained pieces of wool.

Ticks — Wingless bloodsucking insects that infest sheep during the summer.

TSE — Transmissible spongiform encephalopathy. Group of degenerative diseases of the central nervous system that are fatal.

United States Department of Agriculture (USDA) — Division of the federal government that enforces regulations related to agriculture.

Vaccination — Injection, given to healthy animals, used to stimulate prolonged immunity to specific diseases.

VCPR — Veterinary Client Patient Relationship.

Vegetable matter — Burrs, seeds, straw, chaff, and small pieces of sticks and bark.

Verification — Use of methods, procedures and/or tests that can be used to determine the validity of the plan and that the system is operating according to the plan .

Violative residue — Residue levels that exceed the maximum tolerance level as set by the Food Safety and Inspection Service.

Virus — Obligate intracellular parasites of living but noncellular nature.

White muscle disease — Disease caused by deficiency in selenium, Vitamin E, or both that causes degeneration of the skeletal and cardiac muscles of lambs.

Withdrawal time — The time from the last treatment to the time when products from the animal can safely be consumed.

Wool blindness — Excess wool around sheep's eyes causing limited vision.

Wool break — Weakness of wool at one particular point of the staple, but sound above and below the break, due to illness or poor nutrition at some time during growth.

Wool contamination — Foreign substance adhered to fleece.

Zero tolerance — Food Safety and Inspection Service regulation requiring that no visible feces, ingesta, and/or milk be present on a carcass or on carcass parts (including head meat and other by-products).

Appendix to Glossary of Terms

The following definitions are additional terms for the 'Glossary of Terms' found in the Sheep Safety & Quality Assurance Manual. The terms below will provide additional, necessary information for Program participants, trainers and reviewers as SSQA site-specific plans are formulated and evaluated for completeness.

Continual Improvement — Recurring activity to increase the ability to fulfill requirements. The process of establishing objectives and finding opportunities for improvement is a continual process.

Control — Means of restraining or regulating; standard of comparison for checking the results of an action or measurement

Customer Satisfaction — Customer's perception of the degree to which the customer's requirements have been fulfilled.

Data — Facts, especially numerical facts, collected together for reference or information.

Deficiency — Something lacking, shortfall.

Evaluate — Determine the amount or value of, appraise, assess.

Facilities — Physical means or equipment required in order to do something.

Feedback — Transfer of information about the result of an experiment, performance, activity, etc. back to the input or responsible party.

Implement — Put (a decision or a plan) into effect.

Improvement — Action or process of making or becoming greater; an increase, growth, development, intensification.

Independent — Not influenced or affected by others; of an inquiry, audit, investigator, observer outside of the organization, unit, process, etc. concerned.

Integrity — Condition of having no part or element taken away or lacking; undivided state; completeness.

Justification — Shown to be right, just or proper.

Maintain — Go on with, continue, persevere in (an undertaking); go on with the use of something.

Measurable — Able to be measured or perceived; susceptible to measurement or computation.

Measure — Ascertain or determine the spatial magnitude or quantity of something; ascertain or determine (a spatial magnitude or quantity) by the application of some object of known size or capacity or by comparison with some fixed unit.

Monitoring — Observe, supervise, keep under review; measure or test at intervals, especially for the purpose of regulation or control. Planned sequence of observations/measurements; assesses whether the CCP is under control, produces accurate records for future verification, provides warning if there's a trend toward loss of control; continuous or non-continuous. Monitoring is enhanced when responsible employees are identified, employees are trained, and employees understand the purpose and importance. Monitoring provides written documentation to be used in verification.

Prevention — Action of stopping something from happening or making impossible an anticipated event or intended act.

Process Approach — Systematic identification and management of the processes employed within an organization and particularly the interactions between such processes.

Standard Operating Procedures — Work instructions describing how to do a job. Established or prescribed methods to be followed routinely for the performance of designated operations or in designated situations. Used with GMPs to train employees. Defines who is doing it, why it is done, what the person is going to be doing, and how the person is going to do it. May include a job description and explanation of the monitoring task.

Verification — The use of methods, procedures and/or tests that can be used to determine the validity of the plan and that the system is operating according to the plan.

