

ANR-2457

DAIRY GOAT AND SHEEP OPERATIONS

IN THE SOUTHEAST



PRODUCTION GUIDE

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Preface

Dairy goat and sheep production is one of the fastest-growing agricultural industries in Alabama and the Southeast in general. This guide offers a general overview of the industry along with best management practices. It was developed as a resource for producers, Extension personnel, and industry leaders.

While detailed, this guide is not an exhaustive source of information related to these industries. The goal is to answer common questions and concerns related to management practices and to provide additional resources producers may consult. The authors do not assume any responsibility, make any guarantees, or offer any warranties regarding the results obtained from the use of any management practices or suggestions made in this guide.

Special thanks goes to Oksana K. Singh for researching, editing, writing, and locating sources needed for this guide. Her hard work and dedication has led to a guide that will benefit the dairy goat and sheep industry for years to come.

Contributors

Chance L. Armstrong, *Assistant Professor*, Department of Clinical Sciences, School of Veterinary Medicine, Louisiana State University

Jenna Bayne, Clinical Lecturer, Department of Clinical Sciences, College of Veterinary Medicine, Auburn University

Boyd Brady, *Extension Specialist, Dairy Science*, Department of Animal Science, Auburn University

Maria Lenira Leite-Browning, *Extension Specialist, Animal Science*, Alabama A&M University

Paul Dyce, Assistant Professor, Reproductive Development Biology, Department of Animal Sciences, Auburn University

Misty A. Edmondson, Associate Professor, Farm Animal Section, College of Veterinary Medicine, Auburn University

G. M. (Jim) Gallaspy, Director, Milk and Food Processing Branch, Alabama Public Health Department

Jenny Isham, *Extension Intern*, Undergraduate Assistant Dairy, Auburn University

W. Kenneth Kelley, *Regional Extension Agent*, Farm and Agribusiness Management, Auburn University

Kim Mullenix, *Extension Beef Cattle Systems Specialist*, Department of Animal Sciences, Auburn University

Benjamin Newcomer, Assistant Professor, Department of Clinical Sciences, Auburn University

W. F. “Frank” Owsley, Professor and Department Head, Animal Science and Veterinary Technology, Tarleton State University

Thomas Passler, Associate Professor, Department of Clinical Sciences, College of Veterinary Medicine, Auburn University

Soren Rodning, *Extension Specialist*, Associate Professor, Department of Animal Sciences, Auburn University

Max W. Runge, *Extension Economist*, Farm and Agribusiness Management, Auburn University

Julie Gard Schnuelle, Professor, Large Animal/Food Animal, Department of Clinical Sciences, College of Veterinary Medicine, Auburn University

Oksana K. Singh, Master of Agriculture, Department of Animal Sciences, Auburn University

Robert Spencer, *Urban Regional Extension Specialist*, Alabama A&M University

Katie Sowell, Graduate Research Assistant, Department of Animal Sciences, Auburn University

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- Cindy Brasfield, Designated Scrapie Epidemiologist, USDA/Veterinary Service
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- Ana Kelley, Dayspring Dairy, LLC
- Emery Tschetter, Director, *Extension Communications and Marketing*, Auburn University
- Guy Hall, Director, Alabama Farmer’s Federation Dairy Division
- Nate Jaeger, Director, Alabama Farmer’s Federation Meat Goat and Sheep Division

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Contents

Introduction | 2

- Considerations Prior to Starting a Goat or Sheep Dairy 2
- Alabama Dairy Facility Laws and Standards 3
- Alabama Dairy Goat and Sheep Budgets 7
- Dairy Goat and Sheep Production Variables 8
- Establishing a Valid Veterinarian-Client-Patient Relationship 9

Preparing Your Property for Dairy Goats/Sheep | 11

- Goat and Sheep Facilities 11
- Nutrient Management 17

Selecting and Managing a Dairy Goat/Sheep Herd | 19

- Purchasing Guidelines 19
- Dairy Goat Breeds 20
- Dairy Sheep Breeds 22
- Records and Milk Testing 23
- Identification Methods 24
- Management from Birthing to the Dry Period 27
- Culling Guidelines 29

Herd Health Management | 31

- Estimating the Age of Goats and Sheep 31
- Body Condition Scoring 32
- Common Management Procedures 33
- Temperature Reading 35
- Common Signs of a Sick Goat or Sheep 36
- Scrapie Disease 38
- Diseases to Vaccinate Against 39
- Vaccination Guidelines 40
- Treatment and Drug Handling 42
- Biosecurity 43

Reproductive Management | 46

- General Small Ruminant Breeding 46
- Body Condition 47
- Estrus Detection 47
- Breeding Systems 48
- Pregnancy and Kidding 49
- Raising Kids and Lambs 50
- Abortion Causes and Prevention 51

Parasite Control | 54

- Control Strategies 54
- FAMACHA Scoring 55
- Smart Drenching 56

Common Diseases of Dairy Goats and Sheep | 57

- Abortion 57
- Bacterial Pneumonia 58
- Caprine Arthritis Encephalitis 58
- Caseous Lymphadenitis 59
- Coccidiosis 60
- Contagious Ecthyma 62
- Enterotoxemia 63
- Foot Rot and Foot Scald 64
- Haemonchosis 65
- Johne's Disease 66
- Keratoconjunctivitis 67
- Listeriosis 68
- Mycoplasmosis 69
- Polioencephalomalacia 70
- Pregnancy Toxemia 71

Dairy Goat and Sheep Nutrition and Forages | 73

- Nutrition Management Keys 74
- Feeding Dairy Goat Kids and Sheep Lambs 76
- Feeding Colostrum to Kids and Lambs 78

Milk Care | 80

- Prevention and Treatment of Disease 80
- Milking Protocol 82
- Value-Added Products Using Goat and Sheep Milk 84

Youth Resources | 87

- Dairy Goat and Sheep Showmanship 87
- Alabama Dairy Goat Judging 88

Resources | 90

Introduction

There are numerous reasons for raising dairy goats or sheep, such as the love of animals, 4-H projects for youth, the satisfaction and enjoyment of fresh milk and dairy products, or wanting to start a business.

Considerations Prior to Starting a Goat or Sheep Dairy

The reason for starting a business is extremely important, because it will determine the breed you select and the type of facility to build. Never go into any business venture unless you are certain it is both practical and feasible.

Consider the following questions before you start a goat or sheep dairy:

- Is the dairy an investment or hobby?
- Will you apply for grants or loans (government, commercial, or private) to finance your operation?
- Do you have both the financial means and property to support your operation?

- Will you have the help you need to run your operation at all times?
- Are you going grade A? If so, do you have a market?
- Will you be an organic producer?
- Do you need to produce a year-round supply of milk?
- What products will you make (cheese, fudge, soaps, or lotions)?
- Will the products be seasonal?
- Will you be raising replacement animals or will you be purchasing them?

Once you have made your decision, follow these guidelines:

- Gain as much knowledge about the industry as possible before you begin.
- Determine equipment needed. This will greatly depend on herd size and if processing is a factor.
- Determine your operation goals and select animals that will meet these goals as well as market demand.
- Establish facilities and equipment before purchasing animals.

- Buy only from a trusted and reputable breeder!
- Have a veterinarian examine all animals for potential diseases before buying them.
- Do not experiment with breeds or treatments.
- Buy fewer but higher-producing does.
- Check alternative markets.
- Disbudding is a must.
- Bucks are trouble and dangerous; they require extra management.
- Goats and sheep do not move away from pressure; they move toward it.
- Goats and sheep are pack animals. Purchase at least two when you start.

The dairy industry is a seven-days-a-week job, mornings and evenings. You probably will not become rich in this business. If you are in it to make a profit, you must always keep your return on investment in mind. Do not make decisions based on emotions.

In starting your goat or sheep dairy, build a network. Meet people at shows and meetings. Identify established producers with similar goals. Consult Extension agents. These people will be the most useful in helping to promote your endeavors.

Dairy Facility Laws and Standards

Before construction or operational planning begins, you must become familiar with the laws and standards of dairy operations set forth by the Alabama Department of Public Health. These concepts must be integrated into your business model in order to build a legal, successful business. For clarification of any of the items shown, contact the Alabama Department of Public Health at (334) 206-5375.

- Alabama state law prohibits the sale of raw milk to individuals for human consumption.
- All operations must meet the standards outlined and described in the Alabama State Board of Health Administrative Code, chapter 420-3-16, "Production, Processing, Handling, or Distribution of Milk, Milk

Products and Frozen Desserts,” and/or chapter 420-3-17, “Production, Processing, Handling, or Distributing of Milk for Manufacturing Purposes, Dry Milk Products, Butter, Cheese, or Condensed Milk Products.” These rules apply regardless of size and scope of operation.

- The local office of Natural Resources Conservation Service must be contacted to determine if your operation must develop a waste management plan.
- The Alabama Department of Environmental Management must be contacted to determine if your operation needs an animal-feeding permit.
- The environmental office of your County Health Department must be consulted if an on-site waste disposal system is to be used for restroom waste.
- An outline of your business plan should be submitted for review to the Alabama Department of Public Health. An initial sketch of your facility’s floor plan, including drains, equipment, and operational flow, must be provided prior to the Health Department’s initial on-site visit.

- Careful consideration should be given to how finished products (if applicable) will be handled for delivery off-site to another facility.
- Compliance with local and other governing agencies should be determined.
- Careful consideration must be given to treatment and feeding of lactating dairy animals.

Milk Parlor Construction

- **flooring:** concrete or other impervious material sloped to a trapped drain or gutter
- **walls/ceilings:** metal, concrete block finished, smooth finish, waterproof wood panel, vinyl, or other impervious material
- **holding lot:** covered concrete pad to hold animals waiting to enter milking parlor; should be sloped away from barn with curbing
- **milking platforms for small dairy animals (goats, sheep, etc.):** metal or treated wood, painted
- **lighting:** adequate lighting provided
- **ventilation:** adequate ventilation required (preferably electric roof or window fans)

- **housing or loafing barn:** separate and away from milking barn and holding lot

Milk Room or Milk House Construction

- **floors:** concrete, tile, or other impervious material sloped to trapped drain
- **walls/ceilings:** metal, finished concrete block (walls)
- **doors:** solid, water-resistant, open outward; metal, treated wood, painted, self-closing screen (in addition to solid door)
- **windows:** ledges sloped downward 45 degrees (screened if opened)
- **lighting:** adequate, shielded lighting
- **ventilation:** adequate ventilation (wall or ceiling vent fan recommended)
- **plumbing:** may be exposed in milk room and must consist of hot and cold-running water; include two-compartment sink equipped with utensil racks and separate hand washing sink with hot and cold-running water
- **adequate size:** sized to accommodate all equipment and not crowded to preclude proper cleaning

- **milk cooling facility:** mechanical cooler or bulk tank not to be located directly over floor drain
- **proper concrete pad:** poured outside milk room with a wall port (self-closing door), centered over pad for sanitary transfer of milk from tank to truck; overhead protection required
- **equipment construction:** must be compliant with 3A standards and be PMO approved with milk lines (glass or stainless), steel bulk tank (stainless steel), and milk cans (stainless steel, seamless, umbrella lid design)
- **milking equipment:** must meet 3A standards and be PMO compliant

Plant Construction

- **location:** no low-lying flood-prone areas; suitable drainage system to provide rapid drainage of all surface water
- **building:** of sound construction, kept in good repair, effectively sealed

- **floors:** concrete, tile, or equally impervious material smooth finished, sloped to trapped drain; wood floors allowed in rooms where packaging materials, supplies, and dry products stored
- **walls/ceilings:** concrete, smooth finished, metal, vinyl tile board or other impervious material
- **doors:** solid, water resistant, open outward; metal, treated wood, painted, self-closing screen (in addition to solid door)
- **lighting:** adequate, well-distributed lighting to allow maintenance of sanitary conditions; at least 30-foot candles throughout the plant and at least 50-foot candles where dairy products are graded or examined for condition and quality
- **ventilation:** adequate heating, ventilation, and air conditioning for all rooms to maintain sanitary conditions through the use of exhaust or inlet fans, vents, or hoods; proper filtering devices to eliminate dust and dirt from incoming air
- **toilet:** must be provided; must not open directly into any room where milk or dairy products are processed, manufactured, packaged, or stored; doors self-closing; proper ventilation required

- **laboratory:** must be provided in an area separate from the processing and packaging area; must be adequately equipped and properly staffed to provide for quality control including analytical testing.

Water Supply

- **public:** municipal water supply
- **private:** well or spring; located well out of low drainage areas, at least 50 feet away from possible sources of contamination; must have concrete slab around pipe, sealed and protected from any outside contamination (human and animal excreta from toilet room, septic system, lagoon, and barn or livestock area), poor drainage, and toxic chemical contamination (vacuum pump oil drainage, chemical storage area or building); drilled wells with casing at least 10 feet belowground and extending above concrete slab; well casing cover overlapping and tight fitting to prevent contaminated water from entering top of well casing

Waste Disposal

- **toilets:** Check with local health department for septic system approval.
- **animal waste:** Check with appropriate agency for approval.

Alabama Dairy Goat/Sheep Budgets

The Alabama dairy goat budget will assist you in estimating the potential costs and returns for Alabama dairy goat operations. It is not a production or how-to guide but rather a planning and estimation tool. Prices and costs are based on the best estimates available at the time the budget was prepared. It is important that producers develop their own budgets using the appropriate values. You will find the interactive spreadsheet at www.aces.edu/agriculture/business-management/budgets/. Select “Goat Budgets.” (Sheep dairies use the same budget.)

Terms you need to familiarize yourself with include the following:

Herd information. This includes the number and average weight of does and bucks in the operation. It also has the number of kids that are marketed (sold) plus the average weight of all kids that are sold. The “Milk Produced CWT/Doe/Year” is the average for all milking does.

Note: The number of kids marketed is based on several factors. Conception rate, kidding rate, mortality rates, and cull rates all affect the number of kids that are available to be sold.

Gross receipts. This is the amount that the producer receives from the sale of milk, market/breeding kids, and any cull animals that are sold.

Variable cost. These are out-of-pocket costs associated with producing milk and keeping the herd maintained. Some of the costs include hay, feed, pasture (fertilizer, lime, seed, etc.), medicine, marketing, transportation, etc. Land rent and labor are also included. It is assumed that the producer will provide labor. Larger producers may need to hire labor.

Income above variable costs. This is gross receipts minus total variable cost. This measurement allows the producer to determine if out-of-pocket costs will be covered.

Fixed costs. These costs are incurred whether you produce or not. They include depreciation, interest, insurance, property taxes, etc.

Net returns to risks and management. This figure is sometimes referred to as profit. It is more correct, however, to call it a “return to all resource costs except management.” If the figure is positive, the producer will be rewarded for his/her management efforts and the entrepreneurial risk taken. This is the figure that management should use to make decisions and compare alternatives.

Capital investments. This reflects the investments that are made in the enterprise that are capitalized over a number of years. Milking equipment, breeding livestock, and buildings and equipment are included in this part of the budget.

For questions and more information, contact any of the following Extension specialists:

Max Runge, Extension Economist, (334) 844-5603

Ken Kelley, Regional Extension Agent, (251) 867-7760

Robert Spencer, Urban Extension Specialist, (256) 689-0274

Boyd Brady, Extension Specialist, Dairy, (334) 844-1562

Dairy Goat and Sheep Production Variables

Goats

Table 1 offers a snapshot of production information that can be used in a variety of ways, such as selecting animals to produce a product that is most suitable to your needs, or to provide a comparison of how your goats are producing compared to other goats of the same breed.

Production records should be only one tool used in breed and animal selection; each breed has its own characteristics. These characteristics, along with personal preference, should play a part in the selection process.

Keep in mind, individuals within a breed may vary in milk, fat, and protein production. We strongly recommend studying an individual animal's records, as well as the breed records, prior to purchase. It is important to visually assess any animal before purchase. Have a licensed veterinarian perform a pre-purchase check to prevent introduction of disease into your herd.

Sheep

Milk testing for sheep is a new program that started in 2016. This program is still in the pilot phase and is called P-SMTP for the IDGR-IFBR. There are presently no production records published specifically for dairy sheep production in the Southeast.

Establishing a Valid Veterinarian-Client-Patient Relationship

Establishing a valid veterinarian-client-patient relationship (VCPR) is essential. Your veterinarian plays an important role in preventing, diagnosing, and treating disease, and in developing a health care provide a prescription without a valid VCPR. The

Table 1. Dairy Goat Production Variables

Breed	Number of Animals ¹	Average Days in Milk ²	305 Milk ³	305 Fat Lbs ³	Fat % ³	305 Protein Lbs ³	Protein % ³
Alpine	1430	251	1878	60.6	3.2	53.0	2.8
La Mancha	255	230	1717	63.1	3.7	52.3	3.0
Mixed	247	437	1746	69.0	4.0	57.8	3.3
Nigerian Dwarf	419	200	503	31.2	6.2	21.6	4.3
Nubian	563	222	1365	61.2	4.5	49.1	3.6
Oberhasli	152	251	1714	55.7	3.2	47.0	2.7
Saanen	1156	251	1900	65.8	3.5	54.7	2.8
Sable	60	208	1535	52.9	3.4	41.0	2.7
Toggenburg	173	249	1566	49.0	3.1	44.0	2.8

1. Total number of goats processed as of May 2015
2. Average number of days each goat has been in lactation since May 2015
3. Average pounds and percentages of milk, fat, and protein produced during this lactation

Source: Dairy Herd Improvement Association (DHIA); processed at the Dairy Records Management System (DRMS), Raleigh, North Carolina. A vast majority of these goats are raised and cared for under management practices of the southeastern United States.

American Veterinary Medical Association and the U.S. Food and Drug Administration define a valid VCPR as follows:

1. A veterinarian has assumed the responsibility for making medical judgments regarding the health of the animal(s) and the need for medical treatment, and the client (the owner or manager of the animal(s) and the need for medical treatment,
2. There is sufficient knowledge of the animal(s) by the veterinarian to initiate at least a general or preliminary diagnosis of the medical condition of the animal(s).
3. The practicing veterinarian is readily available for follow-up in case of adverse reactions or failure of the regimen of therapy. Such a relationship can exist only when the veterinarian has recently seen and is personally acquainted with the care of the animal(s) by virtue of examination of the animal(s) and/or by medically appropriate and timely visits to the premises where the animal(s) are kept.



Preparing Your Property for Dairy Goats/Sheep

Goat and Sheep Facilities

While shelters and fences are primary components of facilities, there are additional features to consider, such as feeders, water vessels, working stations, and other equipment. Management practices are more easily accomplished by drafting a comprehensive management plan on paper or computer. Basic factors to consider include the following:

- number of animals to be housed in each location with adequate space
- ability for goats/sheep to move about within areas
- animal/human/equipment accessibility to and from pastures, including pasture rotation

- ease of providing feed, water, and hay
- vermin-free and dry storage of hay and feed
- ability to isolate or separate animals as necessary, including pens for birthing and nursing
- ability to house animals based on gender, age, attitudes, and aggressiveness
- protection from wind, precipitation, and continuous sun exposure
- owner's ability to maintain sanitary conditions

Facility Site and Design

It is important to consider structural costs, materials, accessibility (for people and animals), and functionality when designing, developing, or contracting a facility. Fencing and shelter should be your primary concerns when determining appropriate facilities for goat/sheep production. Feeders, water vessels, and service equipment will be secondary.

Prior to establishing fencing, barns, and shelters, you should acquire an aerial map of the property and draft plans on paper or computer that account for the following:

- topography of land
- movement of water (streams and heavy rains)
- strategic placement for gate access and ease of movement for animals
- equipment
- future fencing

The state office of the United States Department of Agriculture's Natural Resource and Conservation Service can provide assistance in the development of this plan.

Shelters or housing for goats/sheep can be as basic or elaborate as the designer intends. Some farmers have been able to modify former poultry houses or hog parlors into facilities for goats/sheep (figure 1). A semi-enclosed structure may be practical in areas where climates are mild to semi-tropical (figure 2). A well-enclosed structure will be necessary in colder climates.

Keep in mind that the primary purpose of shelter is to minimize stress from extreme environmental conditions (excessive precipitation, high or low temperatures, strong winds, and direct sunlight). Shelters also function as protection from predators, as a nursery during kidding season, and as storage for other relevant items, such as hay, feed, medicines, and tools.

Adequate Space

Adequate space is important to minimize infighting among animals. While head butting is a common method of establishing dominance, infighting may result in blows to the abdomen or backs of pregnant does, resulting in injuries to the fetus, abortions, or miscarriages. Each adult animal needs 15 to 30 square feet to move about at leisure; the footage is less for younger animals. Feeding space should allow for 12 to 18 linear inches of head and body space per animal.

Shelter Types

Premanufactured shelters come in various forms including small large calf hutches that can be readily purchased (figure 3). Small premanufactured shelters have enough space to house only a few animals. They function more like portable pens.

Larger hutches have the capacity to hold about ten adult goats/sheep and come with side feeder doors, a top air vent, front feeder, a water holder, and other features.

Lengths of metal culvert with sufficient height (3 to 4 feet or more), such as those used in large drainage ditches, can be positioned to serve as housing. There are other objects, such as large

commercial fertilizer or chemical vats, that, once sanitized, can be converted into housing. Some modification may be required, such as inverting the container, cutting in doors and windows for ventilation, and installing lights.

Portable shelters should always be considered a viable option, especially when a farm utilizes small paddocks for rotational grazing. These shelters also vary in size depending on availability and ability of equipment to move structures as needed.



Figure 1. Former poultry house converted into facility to house goats; note kidding pens on left



Figure 2. Semi-enclosed barn with potential for additions and modifications (Photo by Sydne and Robert Spencer, Spencer's Farm)



Figure 3. Premanufactured goat hutch (Photo by Pat and Ken Motes, Clear Creek Farm)



Figure 4. This structure is on skids and can be towed to another site using a tractor. (Photo by Sydne and Robert Spencer, Spencer's Farm)

Permanent shelters are every farmer's dream, but budget constraints may place limitations on such dreams. Keep in mind that no matter what type of shelter is built, the structure should have sufficient space, ease of movement, durability, and adequate protection from the elements.

Separate Housing

At times, males, females, expectant or new mothers, and young or sick animals may require separate housing (figure 4). Males may need separate paddocks and housing for isolation from young and mature females during the nonbreeding season. Such areas and facilities should be situated at least several hundred yards away from areas where females are housed. Housing and fencing should also be properly maintained to contain bucks that tend to try to escape. Experienced producers are well aware of the challenges associated with containing an eager herd sire.

Shelter Flooring

Concrete, soil, and gravel serve as practical types of flooring, but function, needs, and affordability will be the determining factors for each structure. Concrete may be desirable and easy to clean with the proper equipment, but the initial coat may be prohibitive. Concrete flooring also requires slightly slopped flooring to allow for drainage of urine and excess water.

Soil and gravel-type flooring are generally affordable and practical. The only time they are impractical is when the stocking rate of animals is excessive and adequate drainage is nonexistent. Slotted flooring and wood are impractical and unsanitary.

Fencing

Perimeter fencing is highly important, as it contains your farm animals and serves as a barrier to other livestock, predators, and nuisance animals (neighborhood and stray dogs). The best fencing plan includes a combination of woven wire in conjunction with electric wire that is strategically placed along the exterior, interior, and top (figure 5). These features will keep your animals away from inside fencing where they may rub along the fence, scratch their sides and back, and stretch. This combination of fencing will also deter predators or nuisance animals from trying to climb or crawl over or dig under a fence.

A fence charger that provides five to six joules of shock is essential to gaining the attention of goats and sheep. Three ground rods 10 feet apart and 6 feet deep are essential to ensure sufficient ground during times of drought.

Fixed interior fencing or cross-fencing to facilitate rotational grazing and to separate animals is a long-term practice that offers a few options, such as the use of woven and fixed knot metal wire, poly wire, and high-tensile wire.

Equipment

Whatever feeder is used, it must be easy to maintain and sanitize. Prefabricated bunk feeders and hayracks can be purchased from any commercial feed store or equipment vendor. Given the opportunity, small ruminants will consume approximately 2 to 4 percent of their body weight in feed, forages, and hay.

A farmer may choose to construct his or her own feeder based on needs and facilities. A feed trough or insert made with plastic or PVC is generally practical and easy to clean (figure 6).

Feeders made out of wood are impractical, since wood is porous, unsanitary, and holds bacteria that cause disease. Also, never leave grain-based feeds on the ground, since this practice may cause animals to ingest gastrointestinal parasites. Feed and water vessels that become contaminated with feces will also expose animals to similar problems. Hayracks should be designed to keep hay off the ground.

Water vessels come in metal, plastic, or rubber; they do require regular cleaning for sanitation purposes. The size of the water vessel will depend on the number of animals drinking from it; each animal will readily consume 2 to 4 percent of its body weight. The vessel must be accessible to young and adult animals, but it should not be

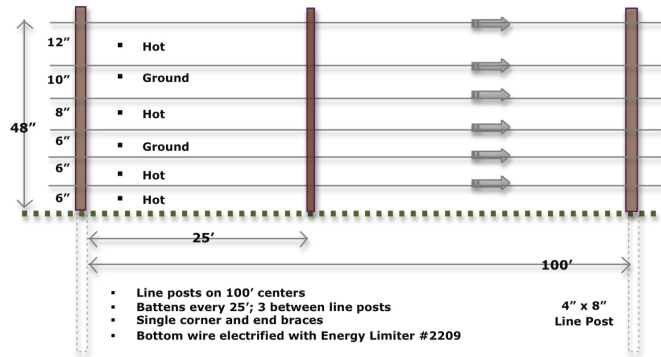


Figure 5. Fencing plan

where the young can easily climb into it and drown because they are unable to escape.

Depending on the time of year and other farm concerns, cleaning vessels on a regular basis is essential in order to provide clean water. An accessory such as an automatic float valve attached to a running hose or pipe will ensure an ever-present supply of water.

Sanitation

When it comes to sanitation, there is a lot to be said for water, sunshine, bleach, and apple cider vinegar. Practice regular cleaning of feeders and water troughs to minimize potential for disease outbreaks. Apple cider vinegar is a simple solution to minimize the accumulation of algae in drinking troughs; it also facilitates ease of cleaning. A simple ratio of 4 ounces vinegar per 10 gallons is a good starting point and can be adjusted accordingly.

Occasional use of a pressure sprayer with a mild batch of soap or bleach to clean inside walls is a good practice. The ability to eliminate mold, mildew, and fungi are an important aspect to ensure healthy housing and equipment.

Barn floor sanitation is an important aspect of minimizing odor, disease, and insects. Floor sanitation requires removing manure and wasted hay or feed as needed, followed by the spreading of hydrated (powdered) lime on recently cleaned flooring or in between cleanings.



Figure 6. This feeder made on the farm from a 15-gallon plastic barrel cut in half is practical, affordable, and easy to clean. (Photo by Sydne and Robert Spencer, Spencer's Farm)

Summary

Goats and sheep will tolerate moderate amounts of inclement weather, but they have their limits. They will seek shelter appropriate to the weather conditions. Facility design and the ability to clean and

maintain these facilities greatly impacts herd health. Ease of function, access, and use is important for regular maintenance and sanitation practices.

Animal behavior and reaction should also be considered when designing facilities. Animals have a herd mentality and flight instinct; safety for handler and animals should be a priority.

When designing a facility, it is wise to plan for the unexpected, for variables, and for future expansion; but keep it practical, affordable, and expandable.

For more information, see *Goat & Sheep Facilities* (Extension publication UNP-0103).

Nutrient Management

Dairy goat and sheep production, like all other aspects of animal agriculture, makes use of available feed resources to produce a consumable product. Production of milk and other products, however, is not 100 percent efficient. There are always waste products, such as manure, bedding, mortalities, etc.

It is important to follow all applicable rules regarding the

storage and use of animal manure. Contact the state environmental regulatory authority for details. Facility design information is available from the Natural Resource Conservation Service (NRCS-USDA). Nutrient application rates are available from the Alabama Cooperative Extension System at www.aces.edu.

There are two basic types of production: intensive and extensive. Intensive production is high input (capital, management, facilities) and requires high output for sustainability. For dairy goats and sheep, this type of production is characterized by minimal grazing/pasture use, with most nutrient needs provided by harvested forages and concentrates.

Extensive production is a lower-input production requiring lower output for sustainability. Naturally occurring feedstuff is used and supplemented as needed with concentrates and harvested forages. An extensive goat or sheep dairy will have few buildings for the animals, allowing them to graze and forage when not being milked.

From an environmental standpoint, an intensive goat/sheep dairy with the animals housed in buildings will fit the classification of an animal feeding operation (AFO). Under some circumstances, it can be a concentrated animal feeding operation (CAFO). The extensive operation can fit under the AFO designation, but is less likely.

In intensive production, manure and other waste materials can build up as dry or liquid products and must be removed from the buildings, handled, and stored. Ultimately, the material must be put to use.

Manure management in an extensive operation is usually taken care of by forage/pasture management. Little manure is allowed to accumulate, as it is spread through foraging and grazing. Only when the animals are in the milking parlor does manure become a potential issue.

Nutrient management for an extensive operation is an integral part of pasture management, since the animals spread manure as they graze/browse. Intensive production, even if only an AFO, should have a plan for making use of the manure and other wastes.

It is the responsibility of everyone to protect our limited land and water resources. Making sure the environmental impact is neutral or positive requires thought and planning. The first step is identifying the potential risks for a farm. Such risks can include a creek, river, or stream on the property, a high water table, drainage ditches, and surrounding residences or public buildings.

Identifying potential risks allows for the development of a plan to minimize problems during operation. Avoiding or minimizing environmental risks is necessary for successful production.

Guidelines

- Apply manure based on soil test recommendations. Maintain pastures in a manner that avoids exposed soil. Do not overgraze!
- For pasture-based dairy goat/sheep production, a pasture plan is tops on the list of essentials from an environmental standpoint.
- For manure application, even an AFO should have documented nutrient management plans and records.
- Records should cover all aspects of manure production and use, even if most animals are maintained on pastures.

Summary

Good production records and practices are excellent tools for preventing problems and conflicts from arising. Considerations must be made for environmental stewardship if a dairy expects success.

Selecting and Managing a Dairy Goat/Sheep Herd

Purchasing Guidelines

There are a number of factors to consider before purchasing your ideal dairy goat or sheep. Follow these guidelines to promote the future success of your dairy herd:

- Before purchasing dairy animals, determine the needs of the animals (food, water, and shelter) and accommodate those needs.
- If the animals are to live in a pasture, the area should be fenced in and also have shelter from the wind and rain. If there is not enough pasture for the herd/flock, provide high-quality hay to maintain body conditions.
- Goats and sheep have herd instincts and are social animals. You need to purchase at least two animals and keep them together.

- Dairy goats and sheep come in all shapes and sizes. Refer to the “Breeds” section of this guide for information on the various breeds. There is no single perfect breed of goat or sheep, only the breed that is right for the needs of the producer. Whichever breed you choose, remember that it takes as much time and money to care for a good animal as it does a bad one.
- Purebred registered animals will provide a much better return on your investment than stock from unknown origins.
- Intact horns can be dangerous, as they often become trapped in fences and hayracks, and can also injure other animals as well as humans. When possible, purchase animals that have been disbudded at an early age. A fully mature goat can still be dehorned with little effort.

Checklist

- Buy animals that suit your needs. Are you making cheese or soap or planning to sell milk?
- Take an experienced producer with you to assist with your first purchase, if possible.

- Buy only from a reputable seller with good references.
- Ask if the seller offers a warranty or guarantee.
- Check milk production and health records of the potential purchase animal.
- Have your veterinarian test for CL and CAE and fecal egg count, as well as determine body condition.
- Observe the handling and milking of the animal.
- Ask to see how easily the animal mounts onto a milking stand.
- Inspect the udder for good confirmation.
- Both teats should be fully functional with no indication of mastitis.
- Ask yourself, Is this an animal I will want to milk twice daily?
- When adding purchased animals to your herd, quarantine them for 30 days before introducing them to the original herd.
- Remember, there is no 100 percent guarantee that an animal will produce the same in your herd as it did in the herd from which it was purchased.

Finding and buying a good dairy goat or sheep can be a confusing and risky task. The future success of your operation depends on good animals; do your homework and take your time when purchasing.

Dairy Goat Breeds

Alpine. The Alpine, also referred to as the French Alpine, is a medium to large animal with erect ears. Animals of this breed are available in a variety of colors and color combinations. The hair is medium to short. This breed is known for hardy, adaptable animals that can thrive in any climate while maintaining good health and excellent production. Alpine are steady producers, averaging 1 to 1½ gallons of 3½ percent butterfat milk per day.

LaMancha. The LaMancha was developed in the United States. There are two types of ears for this breed: gopher ear and elf ear. One type of ear has no advantage over the other. Any color or combination of colors is acceptable. The hair is short, fine, and glossy. LaMancha have an excellent temperament. They are sturdy animals that can withstand a great deal of hardship and still produce well. Through official testing, this breed has established itself in milk production

with high butterfat. LaMancha average 1 to 2 gallons of milk per day, and butterfat percentage is usually 4 to 4½ percent.

Nigerian Dwarf. The Nigerian Dwarf is a miniature breed of dairy goat originating in West Africa and developed in the United States. The balanced proportions of the Nigerian Dwarf give it the appearance of the larger breeds of dairy goats, but it stands no more than 22½ inches (57 centimeters) and bucks no more than 23½ inches (60 centimeters). Any color or combination of colors is acceptable. Does can produce 2 cups to ¾ gallon of milk per day. Butterfat ranges from 6 to 10 percent.

Nubian. The Nubian is of mixed Asian, African, and European origin and is known for high-quality, high-butterfat, and high milk production. This breed is relatively large (males weigh around 200 pounds). Any color, solid or patterned, is acceptable. The ears of Nubian goats are notable; they are long and floppy, extending at least 1 inch beyond the muzzle when held flat along the face. They lie close to the head at the temple and flare out slightly and well forward at the rounded tip, forming a bell shape. The ears are not thick, and the cartilage is well-defined. Nubians produce approximately 1 gallon of milk and average 4 to 5 percent in butterfat.

Oberhasli. The Oberhasli has a vigorous and alert appearance and is medium to small in size. They produce 1 gallon of milk per day. Butterfat is close to 2½ to 3½ percent. Like the Toggenburgs, Oberhaslis are a Swiss breed; their milk has a trademark strong-tasting flavor.

Saanen. The Saanen originated in Switzerland. They are medium to large in size, with rugged bones and plenty of vigor. Males can grow to be over 200 pounds. Saanens are one of, if not the, top producers of the dairy breeds. Production of 2 to 3 gallons per day is not uncommon, although most average 1½ gallons per day. Though high producing, the butterfat content is only 2 to 3 percent.

Sable. The Sable is an adaptation of the Saanen. They are medium to large in size, with males typically standing 32 inches. The average weight for a Sable goat is 145 pounds. The milk produced by this breed is usually between 3 and 4 percent fat.

Toggenburg. The Toggenburg has a vigorous and alert appearance and is medium in size. Toggenburgs are extremely strong and durable animals, as they were bred to survive in the Swiss Alps. This breed

averages about 1 gallon or more of milk each day, while remaining steady in production throughout their lactation. Butterfat content is around 3 percent. Being a Swiss breed, Toggenburgs are noted for their strong-tasting milk.

Dairy Sheep Breeds

Worldwide, most sheep are milked seasonally by hand. This is because many dairy sheep are raised in remote areas where no cow could survive. Modern sheep dairies (many found in the United States) use sophisticated machinery for milking (milking parlors, pipelines, bulk tanks, etc.). Ewes are milked once or twice daily.

While lactating ewes of any breed can be milked, there are specialized dairy sheep breeds. Worldwide, there are more than a dozen of these breeds, but few are available in the United States. East Friesian and Lacaune are the two most common breeds in the United States.

East Friesian. The East Friesian is the more common dairy sheep of the United States. This breed excels in milk production. Ewes can produce 1,100 to 1,540 pounds of milk per 220- to 240-day lactation period.

Lacaune. The Lacaune is a French breed of sheep famous for producing milk that is used in making France's Roquefort cheese. Lacaune ewes produce a lower volume of milk compared to East Friesians, but their milk contains a higher butterfat percentage.

Note: It is becoming common practice to crossbreed East Friesian and Lacaune sheep to produce animals that demonstrate the strong traits of each breed. These crossbred animals provide high milk volume (East Friesian influence) while maintaining higher butterfat percentage (Lacaune influence).

Records and Milk Testing

Goats

The Dairy Herd Improvement Registry (DHIR) is the American Dairy Goat Association's

(ADGA) milk-testing program. It provides producers with management information. The DHIR program is a system of statistically measuring a 305-day lactation by obtaining monthly milk weights and milk samples of individual does. This program informs producers of each doe's milk production as well as the butterfat, protein, and somatic cell counts within her milk.

There is an annual enrollment cost, but there are no additional per-doe fees. To enroll, contact ADGA at (828) 286-3801 for a new herd application packet, or download the forms from their website, adga.org.

- Most Alabama herds use Langston as their DHIA (Dairy Herd Improvement Association) and DRMS Raleigh (Dairy Records Management Systems) for their DRPC (dairy records processing center). ADGA's site designates locations of approved DHI labs and affiliated processing centers. ADGA will assist producers in deciding which of these entities will

best suit their needs. Producers also can join the Facebook group DHIA Goats to venture into the DHI program and get support from other herds that are on test.

Sheep

Milk testing for sheep is a new program that started in 2016. This program is still in the pilot phase and is called P-SMTP for the IDGR-IFBR (International Dairy Goat Registry-International Fiber Breed Registry). The program is designed to encourage dairy sheep breeders to objectively assess the milking abilities of their ewes in order to improve the dairy sheep industry where flock owners cannot feasibly utilize the DHI program. The production figures generated by this system are actual, not projections, and may be used in advertising.

To learn more about this program, contact the IDGR-IFBR at (202) 570-IDGR (4347) or www.idgr-ifbr.com.

Identification Methods on Vaccine Labels

When selecting a method of identification for your herd/flock, use the information provided to decide what will meet the needs of your operation.

Plastic Ear Tags

Plastic ear tags are the most common and relatively inexpensive form of visible animal identification. They come in many colors and sizes, and even some different shapes. The plastic tags come numbered or blank, allowing producers to use their own numbering system.

Plastic ear tags are easy to read from several feet away. They also are relatively simple to apply using an ear tagger, which pierces the button of the tags through the ear.

A major problem with plastic ear tags is their susceptibility to being torn out of the animal's ear. If plastic tags are used, it is best to have a permanent system of identification in place, as well, such as tattooing. There could be instances where several animals lose

their plastic ear tags at the same time. Without another identification method, such as a tattoo, the producer could struggle to identify those animals.

Electronic Ear Tags

Electronic identification involves the use of a microchip placed in an ear tag. The microchip has the number of the tag programmed into it, and is read using a computer and reader device. This form of identification is applied just like a normal ear tag.

This method of identification could help make record keeping easier for producers, as it uses a computer system. Initial cost of this identification method can be expensive. And, like a normal ear tag, this tag could also be lost, resulting in additional expense.

Tattoos

Dairy Goats

- ADGA membership renewal must be completed by September 1 every year to prevent forfeiting tattoo assignments.

- Producers must reclaim their ADGA assigned herd-identifying tattoo sequence within 3 years, or the sequence will be released and available for another member to claim.
- All ADGA members are to use only the tattoo sequence assigned to their ADGA membership identification.
- ADGA will assign a tattoo sequence to a new member if a tattoo application is not presented with a new membership application.
- If unacceptable, a tattoo assignment can be changed within 30 days of certification.
- ADGA herd-identifying sequences must be applied to the animal's right ear. LaMancha dairy goats are an exception; this breed is tattooed in the tail web.
- All kids born into a producer's herd must be tattooed with the member's assigned herd-identifying tattoo sequence.
- Only four letters and/or numerals are allowed within this assigned tattoo sequence.
- No tattoos can be assigned a single letter followed by a number or series of numbers. For example, A412 would not be acceptable for an ADGA herd-identifying tattoo sequence.

- Individual identification (within a single producer's herd) should be tattooed in the animal's left ear. LaMancha dairy goats are an exception; this breed is tattooed in the tail web.
- Use the ADGA-designated letter for the animal's birth year as the first letter within this tattoo sequence. ADGA-designated letters are K= 2018; L = 2019; and M = 2020.
- Follow the ADGA-designated letter with a serial number to distinguish birth order within a herd. Example: The ninth kid of 2018 would be tattooed K9.
- ADGA advises tattooing animals prior to sale or purchase.

Tattooing equipment needed includes the following:

- halter or muzzle
- rubbing alcohol
- sterile gauze or sponges
- tattoo pliers
- tattoo ink (Green ink is recommended for easier identification when the skin to be tattooed is darker pigmented.)
- blank sheet of white paper

The tattooing procedure is as follows:

- Halter or muzzle the dairy goat.
- Using alcohol and gauze, remove debris from the skin (ear or tail web).
- Insert the correct symbols of the tattoo sequence into the tattoo pliers.
- Press the thin rubber sponges of the pliers firmly over the needles.
- Check the accuracy of the sequence by tattooing a piece of white paper.
- Smear ink on the skin that is to be tattooed.
- Choose an area free of warts and dark skin.
- Place the sequence parallel to and between the veins and cartilage of the right ear.
- If tattooing the tail web, place the sequence parallel to and between the veins of the tail web.
- Using the pliers, pierce the skin quickly and firmly.
- Apply more ink and rub the area continuously for about 15 seconds.

- Use an old toothbrush to work in the ink and ensure penetration into the skin.
- Remove the rubber pad from the pliers. Clean it and the needles in water and dry well.
- Replace the sponge rubber when it begins to lose its elasticity.
- Allow the area to heal undisturbed for 5 to 21 days.
- ADGA recommends making an impression of the tattoo on the individual animal's registry papers as well as private breeding records to ensure proper documentation of the tattoo.

For additional information, refer to ADGA's fact sheet, *Tattooing Your Dairy Goat*.

Dairy Sheep

There are presently no rules or regulations for tattooing dairy sheep. Individual producers can design and implement a numbering system for their herd using tattoos (permanent identification) or ear tags (nonpermanent identification). The procedure for tattooing dairy sheep is the same as for dairy goats.

If ear tags are used, it is highly recommended that a producer also use another form of identification, such as tattoos. Ear tags are susceptible to being torn/lost from the animal's ear.

Management from Birthing to the Dry Period

Flock/herd health and production programs target applications of preventative health and production methods to commercial goat and sheep operations. These applications are intended to increase profitability on the farm through superior health and maximum productivity.

Biosecurity is a powerful management tool that must be a common feature of all management plans. It is best to develop several sound management plans based on the specific needs of the subgroups of animals within the entire population. These groups include neonatal period to weaning, bred doelings/ewe lambs and dry females, and lactating females.

Management of Neonatal Period to Weaning

Lambing/kidding should be an event producers are well-prepared for in an operation. The following practices will ensure success during this period:

- Provide pens that offer good lighting, adequate ventilation, dry bedding, and moderate environmental temperatures for females to give birth.
- Monitor bred females intensely (3 or 4 times/day) during late pregnancy to decrease stillbirths and loss of weak neonates.
- Develop a dystocia box to assist during cases of dystocia (difficult birth). Always have it prepared prior to kidding/lambing. The box should include lube, obstetrical (OB) sleeves, nitrile gloves, a bucket for warm water, mild dish detergent, dry towels, and 7 percent iodine for dipping navels.
- Ensure that kids/lambs ingest good-quality colostrum originating from dams that are negative for CAE. The kid/lamb should ingest the colostrum at a rate of 10 percent of its body weight at birth.
- Ensure proper identification of kids/lambs through tattooing and/or ear tags.

- Disbud kids between 7 and 14 days after birth to prevent horn growth.
- Remove extra teats (common in doelings) at the time of disbudding.
- Remove fallen hay that is mixed with organic debris and maintain a clean, dry environment to minimize ingestion of coccidian oocysts.
- Vaccinate for clostridium and tetanus (CD&T) at 4 weeks. Booster 3 weeks later.
- Monitor fecal egg counts and implement FAMACHA scoring beginning at 3 weeks of age.

Management of Bred Doelings/Ewe Lambs and Dry Females

It is common practice to dry off females the last 2 to 3 months of gestation to ensure superior colostrum development and time for mammary gland involution. This period allows for dry treatment of each half if mastitis has been a problem in the herd.

Manage nutrition so that females are not overconditioned when they enter late gestation. Overconditioned females are at higher risk of developing pregnancy toxemia. Body condition scoring is a tool that should be implemented prior to drying off.

The clipping of hair on the udder and hindquarters during late gestation will also improve milk quality by decreasing sediment in the ensuing lactation. Approximately 4 to 6 weeks prior to parturition (birthing), females should be vaccinated (Clostridium perfringens C & D and tetanus) to ensure adequate antibodies are available to neonates through the colostrum. Vitamin E and selenium should be supplemented in areas that are deficient.

Provide routine foot care in addition to monitoring parasite load through fecal egg counts utilizing FAMACHA scoring. Monitor pregnant females for signs of abortion. All abortions should be considered infectious to humans until proven otherwise. Handle aborted tissues carefully, using protective gloves. Communication with your veterinarian or diagnostic laboratory will allow for further direction on a possible diagnosis and management.

Management of Lactating Females

Overall udder health begins at selection for superior udder conformation and attachment.

The major goal for this group of animals is to maximize milk production through superior milking practices and a sound nutrition program designed for each stage and level of lactation.

Producers should provide clean, well-bedded housing for lactating females. Milking hygiene is critical for superior milk quality. For example, single-use towels are recommended during udder preparation. Milking equipment should be in good working order and regularly examined by a qualified technician. Preventative procedures, such as foot trimming, booster vaccinations against enterotoxemia, and monitoring for parasites, should continue throughout lactation.

Establish a good working relationship with a nutritionist or your veterinarian to develop a feeding regimen that specifically meets the needs of your operation. This will prevent serious metabolic disasters and promote the most efficient milk production. Improving nutrition prior to breeding is also a method to improve ovulation rates.

Body condition scoring is important. Performing this allows the producer to evaluate and meet the needs of individuals within the herd/flock. This should be a particular emphasis 3 to 6 weeks prior to breeding and again at mid-gestation.

If you have questions regarding the management of these separate groups on your farm, contact your veterinarian.

Culling Guidelines

Culling, or voluntarily removing an animal from a herd, is necessary to make progress in production, conformation, and health in any operation. It is based on the goals of a producer; these goals may change over time, but they must be established and recorded.

To cull means to cut your losses. A producer needs to make a written list of factors they feel are important in meeting the established goals for their herd. It is easy to let emotion play into the decision whether to cull an animal or not. Pets are usually not profitable. If profitability is a goal, the animal's status as a pet should not influence its status as a potential cull.

If you are selling fluid milk, then volume will be more important than fat or protein content. If you are selling cheese, however, fat and protein will be of greater importance.

Considerations for culling include the following:

- low production of milk or components (butterfat, protein)
- infertility
- difficulty kidding
- mastitis
- other diseases (caseous lymphadenitis, caprine arthritis, etc.)
- continuously high fecal egg counts and poor FAMACHA scores
- aggressive behavior toward people or other animals
- high feed intake as a result of difficulty to maintain body condition
- reoccurring structural problems
- injuries that do not readily heal
- conformation for herds with show animals

Culling records should be kept to help identify any consistencies of problems. An animal that is culled from one herd may be 100 percent acceptable in another herd. Animals that are culled for health issues should not be sold to other producers. These animals should instead be sold at local sales yards. If an animal cannot be part of a show herd, it can still find a place on another operation that does not raise show animals.

Keeping good records for production and health is a valuable tool when it comes to culling. It takes time and effort, but the rewards are great. Please refer to the “Records and Milk Testing” section of this guide for information on records and testing.

Herd Health Management

Estimating the Age of Goats and Sheep

The approximate age of goats and sheep can be determined by their teeth, as illustrated in figure 7. At birth, kids and lambs have eight milk teeth, or temporary incisors, arranged in four pairs on the lower jaw. The central pair of temporary incisor teeth is shed and replaced by the permanent teeth at approximately 1 year of age. At 2 years, a pair of permanent incisors replaces the second pair of milk teeth. At 3 and 4 years, the third and fourth pairs, respectively, of permanent teeth appear. At 4 years of age, the goat or sheep has a full mouth. The amount of wear on the permanent teeth is an indication of the approximate age of animals older than 5 years. When a ewe or doe loses some of her incisor teeth, she is called a *broken mouth*.

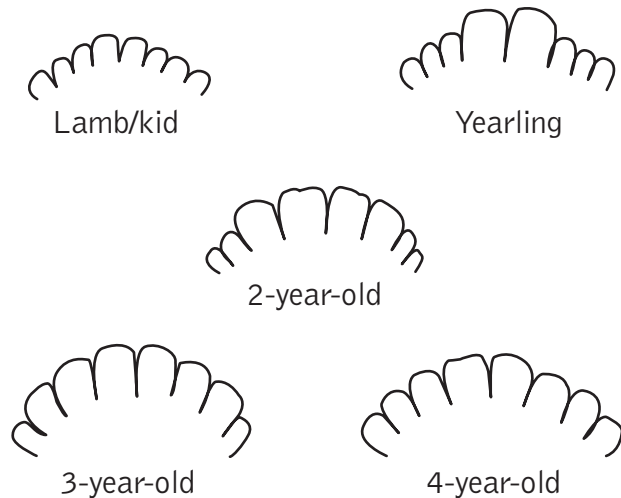


Figure 7. Approximate age of a goat based on its teeth size and shape

Body Condition Scoring

Body condition scoring (BCS) can be a quick and easy method to determine how thin or fat goats/sheep are as individuals and as a herd. Determining BCS can be done in 15 to 20 seconds.

Body condition scoring is based on a numerical scoring system from 1 to 5 with half scores (such as 3.5) given for animals between two scores. A BCS 1 represents an emaciated animal, while a BCS 5 represents an extremely obese animal. It is important to remember that BCS cannot be evaluated by simply looking at the goat/sheep, as hair can hide poor body condition; the evaluator must feel for the amount of muscle and fat cover.

Body condition scoring as part of a routine management program can help the producer effectively monitor feeding and herd health. Low BCS in an individual animal may indicate disease or poor appetite. In a herd of goats/sheep, a large number of animals with low BCS may represent poor overall nutrition or poor management leading to herd health issues.

Body condition scoring is most commonly assessed by evaluating the amount of muscle and fat covering the loin area between the spinous processes and the transverse processes, the sternum,

and the ribcage. The evaluator should feel for the amount of tissue covering the ends of the spinous and transverse processes. The amount of fat and loin muscle also should be evaluated. In animals with a low BCS, the bones feel sharp. As the animal increases in body condition, the bone ends feel more rounded and smooth. When evaluating the sternum, scoring is based on the size of the fat pad that can be pinched. The ribs should then be evaluated for the amount of fat cover.

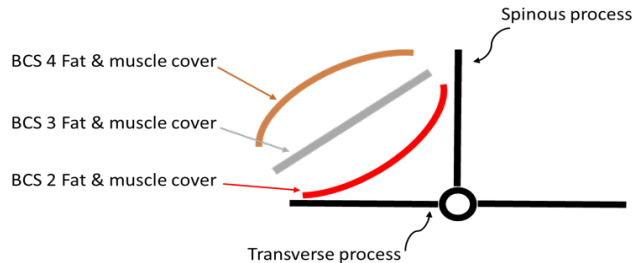


Figure 8. Schematic representation of the vertebrae and muscle/fat covering in a goat/sheep (Adapted from www2.luresext.edu/goats/research/bcshowto.html)

Table 2. Body Condition Score Characteristics

Body Condition Score	Physical Description			
	Spinous Process	Transverse Process	Loin Eye Muscle	Fat Cover over Loin Eye Muscle
1	Sharp and prominent	Sharp	Shallow	None
2	Sharp and prominent	Smooth, slightly rounded	Medium depth	Little
3	Smooth and rounded	Smooth, well covered	Full	Medium
4	Easy to feel with pressure	Unable to feel	Full	Thick
5	Unable to feel	Unable to feel	Very full	Very thick

It is recommended that does have a BCS between 2.5 and 3.5 at breeding and a BCS of 3 to 3.5 prior to kidding. Bucks/rams should be maintained at a BCS of 3 to 3.5 prior to the breeding season

Common Management Procedures

Hoof Trimming

Lameness associated with abnormal hoof growth is quite common in goats/sheep. This abnormal hoof growth is most likely due to anatomical abnormalities, environmental influences, and nutritional factors. Hoof overgrowth is commonly a result of increased nutritional intake, especially increased protein in the diet.

Hoof problems also tend to be more of a problem on soft ground or surfaces. Fewer problems are seen in animals that are able to move about on hard, dry surfaces, because they will wear down their hooves naturally. For animals that have been overfed and suffer from chronic laminitis or rapid hoof growth, hoof trimming may be required every 6 to 8 weeks to minimize problems.

Routine hoof trimming can be easily performed with good restraint and the use of shears, nippers, and a hoof knife. Goats/sheep may be trimmed standing or lying on their side. Some larger

farms may have hoof-trimming stanchions available for use. The goal of trimming hooves is to shape the foot to match the angle of the coronary band so that the sole and the coronary band are parallel. The toe, walls, and sole also may be shaped to correct many hoof problems. Proper hoof trimming and management often prevents hoof disorders.

In addition to trimming, a well-balanced diet with a good mineral program prevents hoof disorders. The key is not to overfeed grains, which can lead to rumen acidosis, to maintain a good mineral program, and to ensure an environment that allows for routine wear of the hoof.

Disbudding/Dehorning

Some producers prefer that goats/sheep have their horns removed. Others (mainly meat, fiber, and pet goat owners) prefer to keep horned animals. Disbudding is more commonly performed in dairy goats/sheep to reduce the risk of injuries related to fighting.

Disbudding is best performed during the first 2 weeks of life. This procedure is performed with the kid/lamb restrained and sedated, and the site around the horns clipped and locally anesthetized. A

commercial electric dehorning iron or an electric cautery unit can be used to burn the area around the base of the horn until it reaches a copper color. If the cautery iron has been applied correctly, a horn cap should be easily removed. Complications include underheating, which can lead to scur or horn remnant formation, or overheating, which can be very dangerous and lead to heat-induced meningitis or inflammation of the brain.

An alternative to cauterization is surgical disbudding. A veterinarian should perform surgical disbudding when the animal is between 2 and 4 days of age. A caustic paste may also be used to disbud; it is applied to the base of the horn buds after the hair has been clipped. Caution should be used to ensure that the caustic paste does not have contact with other areas of the skin or eyes.

Kids/lambs older than 2 to 3 weeks, goats/sheep with scurs, or adult goats/sheep will all require surgical dehorning. It is recommended that adult animals with large horns undergo general anesthesia before dehorning. Sedation and local anesthetic may also be used. A veterinarian must perform surgical dehorning. In older animals, this may leave an opening into the sinus that requires bandaging for a period of time.

Castration

Castration of a young male is one of the most commonly performed procedures in goats/sheep. There is a growing trend to delay castration in male goats/sheep that are fed a high-concentrate diet (pets, show animals, etc.) to help prevent urolithiasis or urinary blockages.

Castration techniques can be divided into two basic categories: nonsurgical (bloodless) and surgical. Nonsurgical, or bloodless, methods include the use of elastrator bands or the Burdizzo emasculatome.

The elastrator band should be used in kids/lambs younger than 1 week of age, typically at the time of disbudding/dehorning. Complications include misplacement of the band so that one testicle is above the band.

The Burdizzo emasculatome is used to crush the spermatic cord in two separate locations within the scrotum, which then causes the testicle to atrophy or shrink without damaging the skin of the scrotum. Complications with the emasculatome include inadequate crushing of the cord and maintenance of a functional testicle.

It is important to remember that tetanus can be a major concern in goats/sheep undergoing routine procedures such as castration and dehorning. Producers should ensure that kids/lambs and does/ewes are up to date on tetanus vaccination prior to undergoing routine procedures.

Temperature Reading

A thermometer is an important diagnostic tool to always have on hand. Before contacting a veterinarian about your goat or sheep, it pays to know its temperature. This helps in diagnosing its condition.

Have several working thermometers on your farm at all times. Place them where they are easily accessible to your work area. A good mercury-ring top or digital thermometer can be purchased from most farm supply stores for about \$12.00.

The healthy temperature of both goats and sheep is 102.3 degrees F (\pm 1 degree F). A goat or sheep's temperature will fluctuate during the course of a day, raising a nominal amount during the heat of the day.

Temperature is measured rectally. Never use a dirty thermometer, even if several animals appear to be suffering from the same

problem. A thermometer should be cleaned with an alcohol wipe after each use, secured in its case, and stored at room temperature. Glass thermometers must be shaken down before and after each use. Never run or agitate your animal immediately before taking its temperature; this will lead to a false reading. If your animal appears sick, take its temperature immediately; later in the day or tomorrow is too late.

How to Measure Temperature

For baby goats and sheep, the most comfortable position is to simply lay them across your lap.

For adult or larger animals, it's helpful to have someone else hold the animal in a standing or reclined position while you take its temperature. For animals that are not very tame, it may be easier to secure them with a collar and rope to a gatepost. Even if you have your animal secured, you may still need someone to help steady it until you insert the thermometer and obtain a reading.

Lubricate the probe end with mineral oil or petroleum jelly and gently insert the thermometer into the rectum. Never force a thermometer; it should slide easily when lubricated. Insert to half

the thermometer's length (about 2½ inches) and hold in place for a minimum of 2 minutes. If your animal's temperature is high (over 103.5 degrees F), consult your veterinarian to develop a treatment plan.

Common Signs of a Sick Goat or Sheep

Basic Physiological Norms of Goats and Sheep

- Rectal temperature of goats and sheep: 102.3 degrees F (\pm 1 degree F)
- Heart rate of goats: 70 to 135 beats per minute (90 bpm average)
- Heart rate of sheep: 60 to 120 beats per minute (75 bpm average)
- Respiratory rate of adult goats: 12 to 20 breaths per minute
- Respiratory rate of adult sheep: 19 breaths per minute

Listed below are some of the most common signs of a sick goat/sheep. Observe your animals daily and know their normal behavior. Remember, these animals are herd/flock oriented; if separated, they will exhibit some of the same signs as well.

Goats/sheep who isolate themselves from the herd/flock. The most common initial signs of a sick goat or sheep are one that is not eating or drinking and is standing with its head and tail down away from others.

Teeth grinding or gritting. This is a sign of pain and an early sign of a sick animal.

Weight loss in normally well-conditioned goats/sheep. Older animals are much thinner than younger ones; you must know who is older and who should be well muscled.

Scourers (diarrhea). Observed on the rear of goat or sheep, this is the result of parasite infestation, coccidia, pneumonia, or a variety of other diseases.

Cloudy, runny, or closed eyes. This is a possible indication of pinkeye or parasites. A severely infected animal will have a purulent (an infected watery liquid) discharge from its eyes, and the tissue

under the eyelid will be extremely pale pink. (This tissue is normally a bright pink.)

Stargazing. A goat or sheep that holds its head up as if looking at the stars could be exhibiting a sign of listeriosis or polio.

Drunken gait. A goat/sheep that staggers as it walks could exhibit another sign of polio.

Stiff sawhorse appearance. This could be a sign of tetanus. Look for puncture wounds over the animal's entire body. Kids/lambs who have been disbudded or castrated recently will demonstrate this appearance. It is always a good idea to prevent this with an injection of tetanus antitoxin at the time of disbudding or castration; this provides an additional 7 to 10 days of protection.

Dull, scruffy coat. This is a potential sign of intestinal worms, lice, or copper deficiency.

Runny nose. This is a possible indication of pneumonia.

Oliguria (decreased urine output). This is a potential symptom of urinary calculi in bucks and wethers and a sign of urinary infection in does/ewes.

Constipation/not defecating. This is indicative of digestive upset.

Scrapie Disease

Scrapie is a degenerative and fatal disease that affects the central nervous system of goats and sheep. It is classified as a transmissible spongiform encephalopathy (TSE). The means of transmission is not completely understood, but animals are most likely infected as kids/lambs. Once an animal is infected, the animal remains infected for life.

Initial signs of scrapie present 2 to 5 years after infection. Most animals do not show signs of the disease until they are at least 2 years of age. The average age of clinical onset of disease is 3 to 4 years.

In the beginning, clinical signs may be subtle or noticed only occasionally. Animals first exhibit behavioral changes, such as aggression, a fixed gaze or stare, or failure to respond to human interactions. These affected animals will begin rubbing and biting their tail head, rump, thighs, and back. The pruritis (itching) becomes more persistent and often leads to self-inflicted trauma.

As the disease progresses, goats/sheep may have difficulty milking, premature kidding, and pica (eating or licking an unusual substance). Infected animals will also become ataxic, or

uncoordinated in their movements, and will begin to lose weight.

Affected animals eventually separate from the herd and go off feed. The animal eventually is unable to stand and may develop convulsions.

There is no effective treatment for scrapie available. Early diagnosis and removal of affected animals from the herd/flock are critical to prevent transmission.

Eradication of the disease from the herd/flock may consist of selective depopulation of high-risk exposed animals—animals that have been heavily exposed, test positive/inconclusive, or show clinical signs. Less commonly, complete herd depopulation may be recommended. All goats and sheep are considered to be genetically susceptible to scrapie.

Scrapie is a reportable disease. If signs or concerns of disease in goats/sheep older than 12 months of age arise, contact the state veterinarian or the USDA Veterinary Services area office. Diagnostics can be made in either live or deceased animals.

As of 2001, the United States Department of Agriculture's Animal and Plant Health Inspection Service requires all goat and sheep producers to observe established federal and state regulations

of official identification methods of their animals. In the state of Alabama, goats and sheep must be registered and identified by an ear tag or tattoo prior to any sale or transport.

For more information on the National Scrapie Eradication Program or to order scrapie tags, phone (866) 873-2824.

Diseases to Vaccinate Against

Vaccines are available for many diseases. But not all diseases are a routine threat to many goat and sheep dairies, and some vaccines are not sufficiently effective to justify their use. Therefore, every farm will have unique vaccination requirements based on individual goals.

The following guidelines for vaccinating goats and sheep may not be applicable in all situations. The best use of these guidelines is as a starting point to develop an effective vaccination protocol with your veterinarian or Extension agent. As applicable, ensure that products are safe for pregnant animals and for kids/lambs nursing pregnant does/ewes.

Properly store and administer vaccines according to label directions or veterinary prescriptions, and adhere to designated milk and meat withdrawal times. If there is a discrepancy between these

guidelines and product label directions, defer to the product label.

Campylobacteriosis (vibriosis). Vaccinate ewes against vibriosis 30 days before breeding and repeat 60 to 90 days later. An annual booster is required.

Caseous lymphadenitis (CL). Commercial vaccines are available for goats and sheep against caseous lymphadenitis (CL). Administering clostridium CD/T plus a CL vaccine can produce a strong adverse reaction and is not recommended.

Chlamydia. A killed vaccine to prevent chlamydial abortion in sheep is available. Vaccinate ewes 60 days prior to breeding, and booster 30 days after the first dosage. This vaccine is not labeled for use in goats; however, it seems to be somewhat effective and might be prescribed by your veterinarian for such use. The vaccine produces side effects that include muscular soreness and stiffness, and the vaccine can cause abortion if goats are vaccinated during the first 28 to 45 days of pregnancy.

Clostridial diseases. Vaccinate pregnant does and ewes against clostridial diseases during the fourth month of pregnancy. This vaccine is commonly referred to as the clostridial CD/T vaccine. Herd

bucks and rams may also receive annual CD/T vaccinations at this time. Vaccinate kids and lambs against enterotoxemia and tetanus at 3 months of age. A booster should be administered according to FDA-approved label directions, usually 3 to 4 weeks following the initial dose and once annually thereafter.

Foot rot. In sheep flocks, vaccinate 2 to 4 weeks prior to the rainy season, with a booster between 6 weeks and 6 months later. Boosters should be given twice a year, 1 to 2 weeks prior to expected outbreaks. The vaccine causes a localized raised lump at the injection site and is not recommended for use in pregnant ewes. The FDA has not approved this vaccine usage in goats.

Leptospirosis. Vaccinate against leptospirosis in regions where the disease is prevalent, or in case of an outbreak under a veterinarian's guidance.

Pneumonia. Vaccinate pregnant does and ewes during the fourth month of pregnancy against pneumonia caused by *Pasteurella multocida* or *Mannheimia haemolytica*. Kids and lambs vaccinated when less than 3 months of age should be revaccinated at weaning or at 4 to 6 months of age.

Rabies. There are several killed virus rabies vaccines made for sheep that are not labeled for goats. The vaccines seem to

be effective in goats, however, and may be prescribed by your veterinarian. Vaccination against rabies is especially recommended in case of an outbreak in your area.

Vaccination Guidelines

Vaccinations are a precaution that goat and sheep producers should adopt into their herd health plan to help prevent introduction and spread of infectious diseases. Consult your local veterinarian and Extension agent for diseases commonly vaccinated against in your area.

Three types of vaccines are available for sheep and goats:

1. Modified-live vaccines use live microorganisms that replicate in the animal after injection. This has been termed a controlled infection, since the organisms have been modified so that they do not cause disease but still stimulate the immune system. This type of vaccine often causes a quick and prolonged response of the animal's immune system. The vaccine for sore mouth disease is an example of a modified-live vaccine.
2. Killed vaccines use killed (inactivated) bacteria or virus and adjuvant. The adjuvant helps create a stronger immune

response in the animal's body. Most pneumonia vaccines are killed vaccines.

3. Toxoid vaccines provide immunity against bacteria that produce disease-causing toxins. Toxoid vaccines, such as those for enterotoxemia and tetanus, use bacterial toxins that have been rendered harmless to stimulate immunity against the toxin.

General Vaccination Guidelines

- Follow all FDA-approved manufacturer's guidelines for vaccine dosage, storage, route of administration, boosters, and expiration date.
- Avoid drug residues in meat and milk by following the FDA-recommended withdrawal times printed on the product label for treated animals that will enter the food chain via slaughter or will provide milk for human consumption.
- Use sterile needles and use a new needle for each animal.
- Administer vaccines to adult goats and sheep using a 20-gauge 1-inch needle.
- Use 1/2-inch needles for smaller does/ewes and kids/lambs.

- Keep used needles in a safe, rigid container for disposal.
- Keep vaccination records.
- Consult a veterinarian for disease control and product information.

Booster Vaccinations

A second (booster) vaccination may be required for young animals being vaccinated for the first time. A booster vaccination is definitely required for killed vaccines to provide optimal protection. FDA-approved product label directions indicate when and if a booster vaccination is required. Consult your veterinarian if there are any questions about if and when booster vaccinations should be administered. Failure to give the booster at the proper time could result in an incompletely protected adult animal, even if it is vaccinated every year thereafter.

Proper Handling of Vaccines

The best vaccine program will fail if the product is damaged by improper handling. For example, if the label says to store a vaccine at 35 to 45 degrees F, the vaccine should be refrigerated. Vaccines

should not be allowed to freeze, nor should they be stored in direct sunlight.

Most modified live vaccines must be reconstituted by adding sterile water to a dehydrated cake in a separate sterile vial. Once the water is added, the vaccine organisms are fragile and will be live for only a short time. As a rule, only reconstitute enough vaccine to be used within 30 to 45 minutes. Use a cooler or other climate-controlled storage container to protect reconstituted vaccines from extremes of cold, heat, and sunlight.

Do not mix different vaccines together in one syringe or combine other injectable drugs into the same syringe with vaccines. Although this method has been advocated as a method of reducing the number of injections, it will inactivate vaccines because of incompatibilities with the other compounds.

Treatment and Drug Handling

Even with superior herd/flock management, some animals will become sick or injured. The decision to treat sick or injured animals should be based on specific criteria:

- Will the animal return to a healthy, productive state without treatment?
- Will treatment return the animal to a healthy, productive state?
- What treatment best fits the herd and disease management?
- Should the animal be sold?
- Should the animal be euthanized?

Storing, Handling, and Using Drugs Correctly

Drug performance declines if the expiration date has passed, if the storage temperature is too hot or cold, or if the drugs have been improperly exposed to air or light. All the information you need to properly store, handle, and administer any animal health product should be available on FDA-approved drug labels or on a veterinarian's prescription. Following are general guidelines:

- Check the expiration date on the label.
- Do not save partially used bottles of vaccines. They will not

be effective for later use and may be contaminated.

- Some drugs, and most vaccines, need to be refrigerated but not frozen. Keep an accurate thermometer in your refrigerator to monitor the temperature.
- Use disposable syringes. Use clean needles to draw contents from multi-dose bottles. Change needles at least every 10 to 15 animals to minimize disease spread and drug contamination. Do not store medication in syringes, as they cannot be labeled easily.
- Avoid exposing vaccines and other medicines to direct sunlight. This may degrade the product. Use an insulated cooler for storing syringes and drugs while working on animals to avoid sunlight and maintain the proper temperature.
- Collect used needles in a rigid plastic container. Dispose of them by returning them to your veterinarian. Destroy disposable syringes so they cannot be reused or misused.
- Read FDA-approved product labels and veterinary prescriptions. Some drugs and vaccine containers require incineration before disposal. Used needles, scalpels, etc., are

considered medical waste and must be handled and disposed of in accordance with the laws that govern them.

- Consult your local veterinarian regarding any questions on proper use of medications.

Biosecurity

A biosecurity plan is an innovative approach to managing the risk of disease introduction and spread on your farm. It is designed to help livestock producers identify disease risks and manage them through practical measures for common, everyday infectious diseases, as well as new or unexpected diseases. An effective biosecurity plan manages disease by evaluating and addressing the primary routes of disease transmission, therefore controlling several diseases at one time.

There are five primary routes of disease transmission:

1. Aerosol transmission occurs when disease agents contained in droplets pass through the air from one animal to another. Close proximity of infected and susceptible animals is typically required for aerosol transmission.

2. Direct contact transmission occurs when a susceptible animal directly touches an infected animal through its open wounds, mucous membranes, blood, saliva, nose-to-nose contact, rubbing, or biting.
3. Fomite transmission occurs when a disease pathogen is carried or spread from one animal to another by an inanimate object (such as boots, buckets, and milking and grooming equipment). Vehicles, trailers, and even humans can be considered fomites and can spread disease through traffic transmission.
4. Oral transmission occurs when an animal licks or chews on contaminated environmental objects or consumes contaminated feed or water.
5. Vector-borne transmission involves the spread of disease through an insect. Ticks and mosquitoes are biological vectors, commonly spreading disease after becoming infected from a diseased animal and injecting the disease agent into another animal. Flies are common mechanical vectors of disease, as they carry the disease agent on their bodies and pass it from one animal to another.

A biosecurity plan involves multiple components but results in practical measures for implementation. The first step is assessing the risk areas on a livestock facility based on the possible routes of disease transmission. After identifying risk areas, prioritize disease management measures and implement them. The following are examples of biosecurity practices that will greatly minimize the risk of disease introduction and transmission:

- Do not intentionally commingle animals from different herds.
- Provide a buffer between adjoining herds so that no fence-line contact is available.
- Isolate new herd additions for 4 to 6 weeks and have your veterinarian test for appropriate diseases before allowing new animals to commingle with your herd. Identify isolation areas prior to purchase.
- Isolate animals returning from livestock shows.
- Post signs indicating that a biosecurity plan is in effect on your farm.
- Educate all visitors about the biosecurity plan in effect on your farm.

- Ensure that all visitors are dressed appropriately. Provide coveralls and boots, or make sure visitors are wearing clothing free from contact with other livestock.
- Recognize that you are also a source of contamination for your herd. If you are around other livestock, shower and change clothes before working with your animals.
- Clean and disinfect your truck and trailer after hauling livestock. Anyone hauling livestock for you should do the same.
- Clean and disinfect other equipment as necessary.
- Apply appropriate insect control.



Reproductive Management

General Small Ruminant Breeding

The profitability of goat and sheep operations is largely reliant on successful reproduction programs. The number of kids and lambs raised and weaned successfully ultimately determine the profitability of the operation.

Small ruminants are generally seasonal breeders, with the onset resulting from decreased daylight. Most breeding occurs in the late summer through early winter. In Alabama, the breeding season is from August through December.

It is possible to alter the breeding season by keeping the animals indoors and utilizing artificial lighting. Does have an estrus cycle of 18 to 22 days, and they display estrus for 24 to 48 hours. Ewes have an average cycle length of 17 days, with most being between 14 and

20 days. They display estrus for 24 to 36 hours. The gestation period is 5 months, and twins are common, though single and triplet births are not rare.

Common management practices in dairy operations have the doe/ewe milking for 10 months following parturition. They are then held dry for 2 months prior to the next lactation.

Kids and lambs may enter into the breeding colony at 5 to 10 months of age, depending on breed, as long as they have reached approximately 60 to 70 percent of mature body weight and are in good condition. The most important aspect is the body weight with respect to breed. Breeding too early can negatively impact their reproductive lifespan and milk-producing abilities. Overfeeding to achieve a larger body weight earlier also has negative consequences to reproductive lifespan and milk-producing ability and should be avoided.

Bucklings and rams are generally fertile by 5 months of age or earlier. In some breeds, puberty is reached at a young age; it is therefore important to separate doe/ewe and buck/rams at an early age.

Body Condition

Nutritional inputs are both critical and manageable with regard to reproduction. The body condition of the doe/ewe greatly influences many reproductive aspects:

- puberty onset
- conception rate at first estrus
- time to return to cyclicity following parturition
- vigor of offspring

The goal should be for does and ewes to maintain good body condition throughout the breeding season. Poor nutrition during the late stages of development can have consequences on the subsequent milk production following parturition.

Estrus Detection

Estrus is the period of time when does and ewes are receptive to males. Estrus detection is important to facilitating hand or pen mating and identifying potential repeat breeders or noncyclers. Goats and sheep are seasonal polyestrus, meaning they cycle multiple times during the breeding season.

Heat detection can be achieved using a teaser buck, the herd sire, or by the producer. A teaser ram/buck is a surgically altered buck unable to successfully fertilize the females. Teasers are particularly attractive, as they can induce heat when introduced to females.

A producer that is well advised of the physical signs of estrus can also be an ideal detection method, as doing so provides direct management of the estrus female.

Note: Standing heat is not considered a reliable heat sign as it is in cattle, and estrus signs are less obvious in ewes.

Signs of a doe/ewe in heat include the following:

- paying attention to or seeking out the buck/ram
- decreased appetite
- increased restless behavior
- frequent urination
- increased vocalization
- mounting and/or allowing mounting with other females
- a swollen vulva with the presence of mucus (clear during early estrus, thicker and opaque later is estrus)

The presence of a male in a neighboring pen will stimulate more obvious signs of estrus. When a buck or ram is introduced to a group of females, he stimulates the onset of estrus. Even during the nonbreeding season, some females will display estrus and ovulate due to the male effect. The key to success with this system is housing the males and females apart prior to putting them together.

Estrus observation should be avoided at feeding or milking, as signs may not be as obvious. Detection should take place at least twice daily, separated by 12 hours. Estrus lasts from 12 to 48 hours, and ovulation occurs 24 to 36 hours after the onset of estrus.

Because goats and sheep are seasonal breeders, it can be advantageous to utilize reproductive technologies to ensure a year-round milk supply. If a natural breeding program is utilized, you may have little or no milk being produced during January and February.

Breeding Systems

It is critical to decide on a breeding system that fits your production plan. There are four main breeding systems commonly employed in the goat and sheep industry:

1. **Hand mating.** This method involves selecting the buck/

ram for the doe/ewe and mating them. This method has the advantage of allowing the exact breeding date to be recorded. It is, however, quite labor intensive, requiring the manager to accurately identify the doe/ewe in heat and facilitate the mating.

2. **Pen breeding.** In pen breeding, the buck/ram is put in a pen of does/ewes to facilitate their mating. This method relies on the male to detect females in heat. It is significantly less labor intensive when compared to hand breeding. Pen breeding has the disadvantage of resulting in a less certain day of breeding record. Also, if more than one female comes into heat on the same day, the male may single out one female and miss the others. There may also be the requirement of follow-up pregnancy ultrasounds to determine the female's due date. Additionally, the age of the male must be taken into account when determining breeding densities. A yearling male should be placed with 10 to 25 females, while a more mature male can be placed with 15 to 40 females.

3. **Artificial insemination (AI).** Artificial insemination offers the advantage of introducing superior genetics cost effectively. There are, however, a limited number of technicians with

small ruminant AI experience; thus, the farm manager often must acquire this skill. AI also requires large investments of time in order to carefully and accurately detect estrus. It is suggested that producers start off with a manageable number of females and work toward whole-herd usage. Currently, the most reliable results in goats and sheep are obtained by inseminating transcervically with fresh semen.

4. **Out-of-season breeding.** Several methods have shown to be effective in breeding goats out of season. The most reliable, though costly, method involves using artificial lighting. Males and females must be housed separately indoors to allow control of light exposure. During the winter months, both are exposed to at least 20 hours of light for 60 days. When considering lighting, it is important that the light is bright at the eye level. Goats are then moved to natural lighting for 45 days, after which the buck is put with the does for breeding. This generally produces a single shortened estrus. It is important to keep the buck to doe ratio high, and pen breeding should be used. One buck per fifteen does provides ample time to ensure does are bred. If successful, 60 percent or more females should cycle out of season.

Of equal importance to reproduction are the bucks and rams. To ensure prevention of production losses due to infertility, a breeding soundness exam should be performed on the male 30 to 60 days prior to the breeding season. Evaluation should include a physical exam, reproductive tract exam, and semen analysis. Consult your veterinarian regarding the options for breeding soundness exams.

Pregnancy and Kidding

Pregnancy diagnosis in small ruminants should be done to ensure the breeding season is not missed. Gestation is 150 days, and the use of an ultrasound allows pregnancy diagnosis 32 days post-breeding. Otherwise, it is difficult to determine pregnancy until approaching parturition.

It is important to keep in mind that a positive pregnancy at 32 days post-breeding could still be lost, as small ruminants are more prone to abortion. The pregnant female should have a 45- to 60-day dry period prior to kidding. Additional observation as kidding and lambing approaches will aid in successful parturition. (See table 3 to help determine gestation.)

Lambing and kidding generally occurs between 147 to 155 days post-conception. Eight to 12 hours prior to birth, signs including udder development and loosening around the vulva will be observable. The doe/ewe will also lie down and stand up multiple times. Females should be given a clean, dry place to birth at this time.

Unless labor is prolonged, females should be largely left alone during parturition. Generally, parturition should be completed within 2 hours following the appearance of the water sac. Kids and lambs present head first, leading with the front feet. Posterior presentation (leading with the hind feet) can occur and result in more difficult birthing. If the doe or ewe appears to be having difficulty, call your veterinarian for assistance.

Raising Kids and Lambs

Offspring should be on their feet and nursing a short time after birth. For dairy goats, it is important not to let the kids nurse directly (disease prevention) but instead to feed them heat-treated colostrum and then pasteurized milk.

Neonatal survival is greatly improved by ensuring a good amount of colostrum is consumed as soon as possible after birth. It is important that the kid/lamb receives a first feeding of colostrum within the first 8 hours following birth. In a dairy operation, the first and second milkings should not be placed in the tank, as they will contain colostrum, and should be used primarily to feed the kids/lambs.

If offspring are raised with the mother, they will consume small amounts of milk multiple times a day. When utilizing does for milk production, weaned kids should be raised using a similar approach. Kids should be fed about four times per day for the first couple of days and then twice daily.

Natural weaning and milk weaning can occur at 6 to 8 weeks and should be based on the amount of grain/forage and water the kids are consuming. Offer grain from 2 weeks of age onward. Remember to separate males and females at an early age.

Abortion Causes and Prevention

Abortion in goats and sheep can be a common clinical problem. To determine and correct the cause, good reproductive records are invaluable. Signs that there might be an issue include a repeat breeding rate higher than 10 percent across the herd; does/ewes that do not birth on the correct date after having a positive pregnancy test; preterm fetus and/or placentas found; and kids/lambs born at term but are weak or stillborn.

Enzootic abortion, caused by chlamydial (goat and sheep) or campylobacter (sheep) infection, can lead to pregnancy loss. There are still many other infectious agents that can lead to abortions.

When dealing with abortion issues within a herd, diagnostic investigation is particularly important. Collecting expelled fetuses and placentas for diagnosis will help to ensure that the outbreak can be properly managed. Consult your veterinarian regarding preventative measures including designing a vaccine schedule.

Summary

There are a variety of reproductive management practices that can produce healthy, viable offspring able to contribute to the herd. Base your selection on the efficient use of available resources. Manageable aspects of reproduction include age, environment, and nutrition. Stress and disease-causing organisms often lead to a high infant mortality rate. Cleanliness, proper nutritional management, and a good health management plan can help to prevent production losses.

Table 3. Gestation for Kids and Lambs*

Aug Jan	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	Sep
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Sep Feb	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	-	-	-	Oct
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	-	-	-	
Oct Mar	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	Nov
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Nov Apr	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	-	Dec
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	-	
Dec May	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	Jan
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Jan Jun	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	-	Feb
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	-	
Feb Jul	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	1	2	3	4	5	Mar
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	

Mar Aug	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	Apr
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Apr Sep	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	-	May
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	-	
May Oct	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	Jun
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Jun Nov	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	-	Jul
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	-	
Jul Dec	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	Aug
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	

*Find the breeding date in the upper line. Look below to find the lambing or kidding date. Numbers based on a 148-day gestation period.

Source: Sheep Pocket Guide As-989, North Dakota Extension Service, Fargo, North Dakota

Parasite Control

Parasitism is widely accepted as the most significant impediment to raising goats and sheep in the southeastern United States and abroad. Reduced production, preventative/veterinary treatment costs, and deaths in the herd lead to substantial economic deficits in operations.

This problem is compounded in the Southeast because of the climatic conditions that allow nematode populations to flourish. The barber pole worm, *Haemonchus contortus*, is arguably the gastrointestinal nematode that causes the most harm in goats and sheep. This parasite has a high reproductive potential, and all life stages feed on blood. As a result, anemia, anorexia, weakness, loss of production (growth and milk), and death can occur.

Other internal parasites that have negative effects on young animals include coccidia (protozoa). External parasitism in the form of lice, mites, and ticks can also contribute to significant loss of production. Some external parasites can be disease vectors in goats and sheep. Clinical signs of parasitism include the following:

- rough hair coat
- bottle jaw (edema under jaw)
- pale mucous membranes in lower eyelid
- unpelleted feces
- listlessness
- weight loss

Control Strategies

- Implement genetic selection from animals within the herd or flock that have a natural resistance.
- Graze cattle or horses with goats/sheep on the same pasture. Cattle and horses do not tend to share the same gastrointestinal parasites as goats/sheep. Instead, they serve as dead-end hosts for many GI parasites of goats and sheep.
- Allow periods of pasture rest of 60 days between grazing periods.

- Graze taller forages (greater than 2 inches), as most parasite larvae will be picked up closer to the base of the grass.
- Plant tannin-rich forages, such as *Sericea lespedeza*, birdsfoot trefoil, and chicory, for animals to graze. Tannins have been shown to decrease total fecal egg counts and decrease hatchability of those eggs.
- Provide areas of browse (especially with goats) to decrease the amount of parasite eggs that are consumed from grazing forages.
- Harvest hay off of pastures to decrease the overall worm burden.
- Maintain a low stocking density (8 to 10 animals/acre).
- Avoid grazing of clean pastures (that is, no animals on this area for the past 6 to 12 months) after deworming to decrease resistance among on-farm populations of parasites.
- Provide excellent nutrition all year to support the immune system.

FAMACHA Scoring

Goats and sheep are very susceptible to internal parasites. The most prevalent parasite is *Haemonchus contortus*, barber pole worm, which can lead to fatal cases of anemia. The FAMACHA scoring card was developed to determine the levels of anemia in small ruminants. The card scores animals on a scale of 1 to 5, where 1 is not anemic and 5 is fatally anemic.

With a score of 1, the undersides of the eyelids appear bright red to dark pink; this indicates that the animal does not require deworming at time of testing. A score of 4 or 5 reveals the undersides of the eyelids as pale pink or white; this sign of anemia further indicates the necessity of deworming the animal.

In the past, it was recommended to producers that an aggressive preventative deworming treatment be applied to maintain livestock health. But this approach runs the risk of building a resistance to all classes of deworming drugs. With the use of the FAMACHA card, producers are encouraged to deworm only those animals that require treatment.

When diagnosing livestock, keep in mind that an animal may be anemic for a reason other than parasite infestation. This is why training in the use of the FAMACHA card is required. Remember, FAMACHA is used only as a diagnostic tool for barber pole worm infestations.

For more information on FAMACHA and to order cards, go to www.wormx.info/famacha.

Smart Drenching

This is a series of techniques that should be employed on all operations to be more effective with available anthelmintics. This system helps to slow parasite resistance within the resident population. The following methods make up this system:

- Deworm only those animals that dictate the need through use of FAMACHA and fecal egg counts. Withhold feed for 12 to 24 hours to allow for better absorption of the dewormer.
- Dose properly by getting an accurate weight of the animal. Goats metabolize drugs more rapidly than sheep. For most

dewormers, a double sheep or cattle dose should be applied (levamisole dosed at 1.5 times sheep dose for goats).

- Apply all dewormers over the base of the tongue with a drenching gun or tip.
- Apply two different classes of anthelmintics simultaneously if resistance has been documented or suspected on the operation.
- Administer a second dose of a benzimidazole 12 hours after the first dose to enhance the efficacy of this class of anthelmintic.

Summary

Production losses to internal and external parasites are a major problem facing most goat and sheep operations. The development of resistance to commercially available anthelmintics and the lack of new products on the market compound these losses. Every operation must manage parasites and fight to slow resistance in worm populations. Please consult your veterinarian to develop a parasite management plan for your operation.

Common Diseases of Dairy Goats and Sheep

Abortion

Many things, including toxic agents, congenital abnormalities, and infectious diseases, can cause abortions. The most common infectious microorganisms that cause abortions in goats and sheep are the following:

- chlamydiosis (*Chlamydia psittaci*)
- query or Queensland (Q) fever (*Coxiella burnetii*)
- listeriosis (*Listeria monocytogenes*)
- leptospirosis (*Leptospira* spp)
- toxoplasmosis (*Toxoplasma gondii*)
- brucellosis (*Brucella melitensis*)

- neosporosi (*Neospora caninum*)
- mycoplasma sp
- vibriosis of campylobacteriosis (*Campylobacter fetus* ssp *intestinalis*)

Many of the infectious causes of abortion in goats and sheep are zoonotic, meaning they can also cause disease in humans. The use of protective clothing and latex gloves or plastic arm sleeves is recommended anytime aborted tissues are handled or assistance is provided during kidding or lambing.

Diagnosis is based on history of the herd/flock and clinical signs. Aborted fetuses and fresh placenta should be packed on ice, marked with correct identification of the doe/ewe, and sent to a diagnostic laboratory for identification of the infectious agent.

Treatment and prevention depends on the cause of abortion.

Follow these guidelines when abortion occurs on your goat or sheep dairy:

- Inform your veterinarian immediately for help conducting a thorough investigation.

- Wear protective clothing and latex gloves or plastic sleeves to prevent zoonotic infection. Incinerate the gloves afterward to prevent environmental contamination.
- Isolate the animal from the herd and keep it in a quarantine pen for further examination.
- Collect the placenta and fetus and keep them refrigerated or on ice. Do not freeze. Your veterinarian may want to examine these tissues and send them to a diagnostic laboratory for isolation and identification of the infectious agent.

Bacterial Pneumonia

The most frequent causes of respiratory infection and death of dairy goats and sheep are *Pasteurella multocida* or *Mannheimia haemolytica* (previously called *Pasteurella haemolytica*). These bacteria are commonly found in the upper respiratory tract of healthy animals.

Signs of pneumonia include the following:

- fever with temperature of 104 degrees F (40 degrees C) to 106 degrees F (41 degrees C)

- moist, painful cough and dyspnea (difficulty in breathing), along with nasal and ocular mucopurulent discharge. Listening to the lungs with a stethoscope may reveal crackling sounds.
- anorexia or loss of appetite
- lethargy

Diagnosis is based on clinical signs and herd history. If the animal dies, a necropsy may help to identify the exact cause of the pneumonia.

Treatment involves antibiotic therapy as prescribed by your veterinarian. Keep sick animals in a dry, well-ventilated location away from the rest of the herd.

Prevention and control involves vaccination and proper herd management.

Caprine Arthritis Encephalitis (CAE)

Caprine arthritis encephalitis is caused by a virus classified as a small ruminant lentivirus (SRLV) of the family Retroviridae. The

virus negatively impacts the well-being of infected animals and the economy of the goat and sheep industry in many countries of the world, including the United States. CAE is primarily prevalent in dairy goat breeds but has been diagnosed in meat goats and sheep as well.

The primary mode of transmission for CAE is through the consumption of colostrum and milk from infected does/ewes. Blood from open wounds or on contaminated instruments, such as needles, dehorers, etc., is regarded as the second most common mode of transmission. Contact transmission between adult goats is considered to be rare, except during lactation.

CAE normally displays a slow, chronic progression over months or years. Some signs of CAE include chronic polyarthritis (inflammation of the joints), mastitis, and interstitial pneumonia.

Paralysis due to the encephalitis and myelitis (inflammation of central nervous system) tends to be more common in kids between 2 and 6 months of age.

Diagnosis is based on herd health history and laboratory tests, such as ELISA (enzyme-linked immunosorbent assay).

There is no cure for CAE. Treatment consists of supportive therapy. Prognosis for the encephalitic form is poor. Infected animals that recover will carry the virus for life.

Prevention and control includes the following:

- Cull CAE-positive animals from the herd.
- Avoid purchasing breeding stock from an unknown source.
- Test existing stock and new animals for CAE before introducing them to the herd.
- Remove kids born of CAE-positive does from their mothers immediately at birth. Feed them heat-treated colostrum and pasteurized milk until weaning.
- Maintain a closed herd.

Caseous Lymphadenitis (CL)

The bacteria *Corynebacterium pseudotuberculosis* causes CL and is prevalent in all countries throughout the world, including the United States. Goats and sheep are infected by contact with the pus of an infected animal or ingestion of feed and water contaminated by *Corynebacterium pseudotuberculosis*.

Signs of CL include external and internal abscesses. CL abscesses typically contain pasty, thick, yellow-green pus with a foul odor.

Diagnosis is based on clinical signs detected by physical examination. The CL abscesses range from firm to soft swelling, and some are well-defined with rounded shapes on the surface of the animal's body. Blood tests are also available.

There is no cure for caseous lymphadenitis. Abscesses are sometimes carefully drained to prevent ruptures and further contamination of healthy animals and premises.

Prevention and control includes the following:

- Cull infected animals from the herd to help reduce the risk of CL infection.
- Avoid purchasing animals from farms with a history of CL, and do not purchase animals with visible abscesses or abscess scars.
- Examine males before introducing them to the female herd. A male with erupted abscesses can contaminate the females.
- Use a clean needle with each animal to prevent the spread of *C. pseudotuberculosis* from asymptomatic carriers to noninfected animals.

- Always disinfect equipment, such as ear taggers, tattooing needles, hoof trimmers, or wool shears, that might break the skin of animals when used. Shearing equipment is of special concern, as a hidden abscess might be ruptured during shearing.
- Consider maintaining a closed herd.

Coccidiosis

Coccidiosis is a costly parasitic livestock disease affecting goats and sheep. *Eimeria* species, also called coccidian species, are protozoa naturally found in the soil that cause coccidiosis. Coccidia are host-specific, meaning the species of coccidia that affect one species of animals is different than the species that affects another. For example, the coccidia that affect chickens are different than the coccidia that affect goats.

Ingesting oocytes when grazing can infect goats and sheep, as can drinking water contaminated with goat or sheep feces. Once ingested, oocytes penetrate the cells lining the intestine causing inflammation and destruction of intestinal cells.

Stress is a predisposing factor in kids/lambs during the post-weaning period. Animals may die suddenly during this phase without any warning. Outbreaks can occur during stressful conditions, such as after shipping or farm relocation.

Symptoms of coccidiosis include the following:

- watery diarrhea with or without mucus or blood
- constipation
- lack of appetite accompanied by fever
- dehydration as a result of diarrhea
- weakness
- emaciation caused by weight loss
- sudden death
- hemorrhaging or ulcerations in the intestinal wall

Diagnosis is based on herd health history, clinical signs, and microscopic fecal examination.

Treatment options include drenching with a coccidiostat recommended by your veterinarian, or administering the coccidiostat in the drinking water. In cases involving severely dehydrated animals, intravenous (IV) fluid therapy may be needed until the animal is rehydrated.

Prevention and control includes the following:

- Improve management and hygiene of facilities, pastures, pens, and feeding and water sources.
- Minimize weaning stress. If needed, creep feed to adjust the kids to a new diet prior to weaning.
- Ask your veterinarian about using a medicated feed containing a coccidiostat, such as monensin, lasalocid, or decoquinate.
- Avoid keeping animals in moist areas without direct sunlight.
- Anticipate possible outbreaks during severe weather and post-weaning.

Contagious Ecthyma (Orf/Sore Mouth)

Orf is caused by a parapoxvirus. This is also a zoonotic disease, which means that it is easily transmitted from animals to humans. Goats and sheep contract sore mouth by direct contact with the virus.

Susceptible animals usually develop the first signs of the disease 2 to 5 days after exposure, and symptoms typically persist for 1 to 2 weeks. Outbreaks of sore mouth are most frequent following stressful events, such as weaning, transportation, or relocation.

The primary symptom is blisters that develop into wet scabs on the lips, nose, ears, or eyelids. Nursing kids/lambs can transmit the virus to their dam, resulting in lesions on the teats and udder. The lesions can be extremely painful to the point of preventing sick animals from eating.

Initial diagnosis is based on the characteristics and location of the lesions. A definitive diagnosis is based on virus isolation and an immunologic test.

Contagious ecthyma usually resolves on its own without treatment. In severe cases, the use of antibiotics may be recommended by your veterinarian to combat secondary bacterial infections.

Prevention and control includes the following:

- Minimize transportation stress.
- Always quarantine new animals for 6 weeks before introducing them to the rest of the herd.
- Separate sick animals in a pen for treatment and observation in the case of an outbreak.
- Always feed and treat sick animals after feeding the rest of the herd.
- Always wear gloves when handling infected animals.
- Avoid the consumption of milk from does/ewes that present lesions on the teats and udder.
- Vaccinate only in certain situations following specific guidelines from your veterinarian.

- Isolate recently vaccinated animals from unvaccinated animals. Since the vaccine contains a modified live virus, humans should use care when administering the vaccine to avoid the risk of infecting themselves.

Enterotoxemia (Overeating Disease)

Enterotoxemia, also known as overeating or pulpy kidney disease, is a condition caused by the absorption of a large amount of toxins produced by *Clostridium perfringens* types C and D in the intestines.

These bacteria are found in the soil and as part of the normal microflora in the gastrointestinal tract of a healthy goats and sheep. Under certain conditions, these bacteria can rapidly reproduce in the animals, producing large quantities of toxins.

Symptoms most frequently occur in young kids/lambs and include the following:

- loss of appetite
- abdominal discomfort, shown by kicking at the belly and arching the back

- profuse diarrhea with or without blood
- fever
- lethargy
- sudden death

Diagnosis is based on clinical signs and history of sudden death that can be confirmed by necropsy.

Treatment includes the following:

- Administer C and D antitoxin according to the manufacturer's recommendation. Kids are normally treated with 5 mL of C and D antitoxin subcutaneously.
- Administer penicillin.
- Administer an oral antacid.
- Administer anti-bloating medication.
- Reduce pain by administering an anti-inflammatory, such as flunixin meglumine (as prescribed by a veterinarian).
- Administer thiamin (vitamin B1) intramuscularly.
- Replace fluids intravenously.

- Administer probiotics after treatment with antibiotics to encourage repopulation of the microflora in the rumen and intestinal tract.

Vaccination of all animals in the herd against *Clostridium perfringens* types C and D is generally effective in preventing enterotoxemia.

Foot Rot and Foot Scald

Foot rot is a contagious disease of the hooves of goats and sheep. It is primarily caused by *Dichelobacter nodosus* and *Fusobacterium necrophorum* that can be found in the feces of goats and sheep and in contaminated soil.

Foot scald or interdigital dermatitis, is an inflammation between the toes caused by *F. necrophorum*. Outbreaks occur most often during a persistent rainy season with high temperatures, when animals walk across wet pastures and muddy soil. If not treated, animals can become permanently infected.

The signs of foot rot include limping, holding limbs above the ground, grazing on knees, reluctance to walk, pus and a foul odor with hoof deformity, and loss of appetite. Goats and sheep

with chronic foot rot show loss of body condition, infertility, and decreased production of milk. Foot scald is characterized by interdigital inflammation. The skin between the toes is pink to white in color, raw, moist, and very sensitive to the touch.

Treatment includes the following:

- Isolate affected animals for treatment and trim hooves.
- Treat the feet with a footbath solution of 16 percent copper sulfate or zinc sulfate. Animals must stand in the zinc or copper sulfate solution to allow time for absorption into the hoof wall. Lameness is generally resolved within a couple of days after treatment.
- Administer antibiotic therapy if recommended by your veterinarian.
- Keep treated animals in a dry environment for 24 hours after treatment. Hooves should be trimmed as needed to expose the infected tissue to oxygen.
- Maintain clean pens and barns.

Prevention and control includes the following:

- Cull highly susceptible animals and enhance selective breeding for resistance to foot rot.
- Trim hooves as needed.
- Check animals for foot lesions before purchasing.
- Quarantine new animals for 6 weeks after they arrive at the farm.
- Give animals a footbath upon purchasing and returning from shows, and prior to their re-entry or entry into the herd.
- Vaccinate sheep as a preventative tool for foot rot. The United States Food and Drug Administration (FDA) does not approve this vaccine for use in goats.

Haemonchosis

Haemonchosis caused by *Haemonchus contortus*, also known as the barber pole worm, is the number one health threat to goats and sheep worldwide. *Haemonchus contortus* is a nematode parasite that causes anemia, diarrhea, dehydration, lower growth rates, markedly reduced reproductive performance, and higher rates of illness and death.

Goats and sheep become infected upon ingesting infective larvae while grazing. The larvae burrow into the mucosal (internal layer) of the stomach and begin feeding on the red blood cells of the animal within a few hours.

Symptoms of haemonchosis include the following:

- diarrhea
- dehydration
- anemia
- white mucous membranes
- rough hair coat, lethargy, and incoordination
- fluid accumulation in submandibular tissues (bottle jaw), abdomen, thoracic cavity, and gut wall
- significantly reduced growth and reproductive performance

Diagnosis is based on microscopic fecal examination. Anemia (reduction of red blood cells) can be easily detected using the FAMACHA system by examining the color of the goat's lower eyelids and comparing it to a color-coded chart. These two methods are complementary and can be incorporated in the farm management as

a tool to identify parasite drug resistance and to select for resilience.

Treatment involves use of commercially available anthelmintics. Treatment should be limited to animals with higher worm burdens. Alternative methods of prevention and control must be considered to mitigate parasite drug resistance.

Prevention and control includes the following:

- Purchase animals from known sources.
- Keep stocking rates low.
- Cull highly susceptible animals in herds and flocks.
- Check breeding stock prior to breeding, kidding, and weaning to identify animals that need to be treated or culled.
- Provide clean water and adequate minerals.
- Use gravel or concrete in feedlot areas to break the worm life cycle and to prevent reinfestation.
- Consider pasture rotation.
- Provide high-quality hay and feed off of the ground to avoid contamination by feces.
- Incorporate browse plant species to goat herds when possible.

- Try a mixed-species grazing program using cattle and goats.
- Alternate the pasture with a short-cycle crop, such as chicory, when possible.
- Incorporate plants with anthelmintic properties, including plants rich in condensed tannin (such as *Sericea lespedeza*), in the diet of dairy goats and sheep. These can be made available for grazing as hay or as pellets.
- Select animals for worm resistance or resilience.

Johne's Disease (Paratuberculosis)

Johne's disease is a chronic enteritis (inflammation of the intestine) of ruminants caused by the bacteria *Mycobacterium avium* subspecies paratuberculosis (MAP). MAP can infect goats, sheep, cattle, bison, rabbits, deer, and other wild animals though fecal contamination of feed and water.

Johne's disease is a chronic condition that can be dormant for years without causing any symptoms. Infected goats and sheep may contaminate pastures for years before showing any clinical signs of the disease.

As Johne's disease progresses, infected animals show progressive weight loss (despite a good appetite), bottle jaw, lethargy, diarrhea in some cases, decreased milk production, enlargement of regional lymph nodes, and death.

Diagnosis can be difficult. It is most effectively diagnosed based on a combination of herd health history and diagnostic tests, such as ELISA and/or fecal culture and PCR.

There is no effective treatment for Johne's disease. There is no vaccine available. The best prevention and control is to test existing breeding stock and suspicious animals in the herd. Cull positive animals and avoid purchasing breeding stock from unknown sources.

For more information about prevention and control of Johne's disease, visit the American Dairy Goat Association website at <http://adga.org/johnes-disease> or the Johne's Information Center at <https://johnes.org/goats/diagnosis.html>.

Keratoconjunctivitis (Pinkeye)

In goats and sheep, the microorganisms *Mycoplasma conjunctivae* and *chlamydia* species primarily cause pinkeye. Outbreaks frequently occur when new animals are introduced to the herd, are transported or relocated, or when animals are experiencing severe stress in harsh weather. Infection can be easily disseminated in the herd by contact with sick animals.

Symptoms include the following:

- squinting
- watery, red, swollen eyes
- cloudiness in normally clear parts of the eyes
- wound-like ulcers in the eyes in severe cases
- yellow or green pus draining from the eyes and drying into crusts

Pinkeye can cause temporary blindness, weight loss, and decreased performance. Severe untreated cases can result in permanent blindness.

Diagnosis is based on clinical signs and by culture or isolation of the microorganisms from eye secretions. Swabs from infected animals should be sent to a diagnostic laboratory for isolation and identification of a causative agent.

Treatment includes the following:

- Immediately isolate sick animals from the herd.
- Flush eyes with sterile saline.
- Contact your veterinarian immediately. Antibiotics prescribed by your veterinarian can be very effective in treating pinkeye in goats and sheep when used early in the course of the disease.
- Prevent contamination of the entire herd by feeding and treating sick animals after feeding healthy animals.
- Always wear latex gloves when treating sick animals. Provide clear water and good feed to sick animals. Sick animals can be temporarily blinded and may not be able to easily reach food and water.
- Control flies to prevent the disease from spreading.
- Consult your veterinarian for product usage and appropriate milk and meat withdrawal periods.

Prevention and control includes the following:

- Examine animals for pinkeye prior to purchase.
- Minimize transportation stress.
- Quarantine newly purchased animals to avoid the possibility of introducing sick animals into the herd.
- Control flies.

Listeriosis (Circling Disease)

Listeriosis is a life-threatening disease of goats and sheep caused by the bacteria *Listeria monocytogenes*. Goats and sheep are infected by ingestion of spoiled forages and feed contaminated by *L. monocytogenes*.

The encephalitic form (inflammation of the brain) has a high mortality rate. Infected goats and sheep show progressive neuromuscular incoordination; animals circle in the same direction and experience seizures, facial nerve paralysis (usually on one side), ear droop, salivation, impaired swallowing, and death. The septicemic form occurs less frequently in goats and sheep, but it involves diarrhea, abortion, and death.

Diagnosis is based on clinical signs. Treatment involves antibiotics, anti-inflammatories, and supportive therapy such as administration of intravenous fluid and electrolytes.

To help prevent listeriosis, discard spoiled feed and hay. In the case of abortion, isolate aborting does/ewes and send aborted fetuses and placentas to a diagnostic laboratory for isolation of the causative agent.

Mycoplasmosis

Mycoplasmosis, also known as contagious agalactiae (CA), is one of the most costly diseases for the dairy goat and sheep industry. It is caused by any of the following four agents: *Mycoplasma agalactiae*, *M. mycoides* subspecies *capri*, *M. capricolum* subspecies *capricolum*, and *M. putrefaciens*.

Herds and flocks become infected through the introduction of a carrier animal. Once established in a herd/flock, young kids/lambs become infected while suckling. Adult animals are infected via milker's hands, milking machines, or possibly by bedding. Other routes of transmission may include aerosols of infective exudates over short distances, and ingestion of contaminated water.

Asymptomatic carriers can exist and make control efforts difficult.

The three major symptoms of CA are mastitis, arthritis, and keratoconjunctivitis. Infected goats and sheep can have severe lameness as a result of the polyarthritis, hot swollen joints, weight loss, and fever.

Some animals develop diarrhea and increased respiratory rates. Adult does/ewes may have mastitis, cough and shortness of breath, runny nose, loss of appetite, weakness, keratoconjunctivitis, and abortion. Infected herd morbidity can reach up to 90 percent and mortality up to 30 percent.

Initial diagnosis is based on herd health history and confirmed via laboratory tests, such as culture and isolation of mycoplasma from the milk of infected does/ewes, ELISA, and PCR.

Treatment measures include supportive therapy as well as culling infected animals and systematically pasteurizing the milk fed to kids/lambs. Veterinarians also may prescribe antibiotics. The prognosis for complete recovery, however, is guarded.

Prevention and control includes the following:

- Avoid purchasing breeding stock from an unknown source.
- Test recently purchased animals for mycoplasma before introducing them to the herd, and cull positive animals.
- Test milk for mycoplasma and cull positive animals.
- In infected herds, separate kids/lambs from the mother soon after birth. Feed colostrum from healthy does/ewes and pasteurized milk or milk replacer.
- Improve hygienic conditions in the milking parlor and sanitize milking machines.
- Keep kids/lambs separated from adults.
- Keep a closed herd.
- Apply biosecurity measures.

Polioencephalomalacia (Deficiency of Thiamine/ Vitamin B1)

Polioencephalomalacia (PEM), commonly referred to in livestock as polio, is a common metabolic disorder characterized by neuromuscular alterations of goats and sheep that are thiamine deficient. Despite the name, this is an entirely different condition than human polio. Adults and young animals are equally at high risk for developing the disorder.

Polio is usually seen in animals that are under higher nutritional management conditions, such as feedlots, animals on lush pasture supplemented with highly concentrated rations, animals under stress or on prolonged treatment with amprolium, or those who experience sudden dietary changes.

Symptoms include the following:

- convulsions that can occur in 2- to 5-minute intervals
- dullness and lethargy
- incoordination

- increased aggression
- muscle tremors or contractions
- temporary blindness that can last 2 to 3 weeks
- increased body temperature, pulse, and respiration rates
- opisthotonos (abnormal posturing where the head is thrown backward accompanied by rigidity)
- severe arching of the back
- teeth grinding
- nystagmus (rapid involuntary movement of the eyeballs)
- death

Diagnosis is based on clinical signs, herd management, and laboratory analysis. Animals that are treated early in the course of the disease will show improvement within minutes to a few hours following a slow intravenous administration of thiamine. Contact your veterinarian for specific treatment recommendations.

Prevention and control measures include the following:

- Monitor sulfur intake in both water and dry matter. Check sulfur content in water sources and forages. High sulfur intake can result in polio.

- Provide feed with thiamine levels of 3 to 10 mg/kg of feed.
- Provide sufficient levels of roughage through good-quality pasture or hay as part of the diet.
- Monitor animals after you have administered drugs such as amprolium.

Pregnancy Toxemia (Ketosis)

Pregnancy toxemia is a metabolic disorder. Susceptibility increases 1 to 3 weeks from kidding or lambing in older, fat does/ewes carrying multiple fetuses. Pregnancy toxemia is associated with prepartum mortality.

In cases where there is insufficient nutritional energy intake during late pregnancy, does and ewes burn fatty tissue as an alternative source of energy to facilitate glucose availability to the fetuses, for milk production, and for the dam's maintenance.

Utilization of some internal fatty tissue during pregnancy is not harmful. Excessive utilization of stored fats, however, will result in the overproduction of toxic byproducts or ketone bodies that are then released into the blood circulation. This causes an increase in hepatic fat accumulation (fatty liver) that in turn harms both the liver and kidneys.

Symptoms include the following:

- little or no appetite
- lethargy or sluggishness
- muscular imbalance or poor coordination, known as ataxia. Affected animals often lie down and in many cases are not be able to rise again.
- grinding of teeth
- blindness
- coma or even death

Diagnosis is based on herd history and clinical signs. The amount of ketone bodies can be determined by using commercial quantitative tests. Prognosis is given based on the levels of ketone bodies, dehydration, and hepatic and renal failure that occur.

Treatment with propylene glycol, or an alternative appropriate energy supplement, can be successful if animals are treated early in the course of the disease. Administration of sodium bicarbonate solution intravenously or orally is also commonly used to treat ketoacidosis. Contact your veterinarian for specific treatment recommendations.

If possible, consider an ultrasound to determine the number of viable fetuses the doe or ewe is carrying. If the fetuses are dead, then a fetotomy, which is the removal of dead fetal tissues and placenta, may be recommended. Consider the induction of labor in dams that are close to kidding or lambing. Consult your local veterinarian if a cesarean section is needed. Consider administering vitamin B complex intramuscularly and probiotics orally. Treatment should be discontinued when the doe/ewe presents signs of improvement.

Good feeding management is needed throughout pregnancy, but especially during the later stages of pregnancy. During the last 6 weeks of gestation, consider supplying concentrated rations with ionophores to increase the ruminal utilization of volatile fatty acids, which in turn will be used in the production of energy. Also avoid stress and sudden dietary changes during late pregnancy.

For more information about specific diseases of dairy goats and sheep, refer to the Alabama Cooperative Extension System website at www.aces.edu.

Dairy Goat and Sheep Nutrition and Forages

Nutrient requirements differ based on age, stage of production, weight, breed type, and the environment. In order to maintain milk production and health, goats and sheep must be fed a balanced diet.

In the Southeast, forages make up the majority of the daily diet of these animals. Dairy goats and sheep can consume between 3 and 5 percent of their body weight per day in forage dry matter. Provide a free-choice mineral supplement containing salt and trace minerals to help meet dietary requirements of goats and sheep on forage-based diets.

The nutritional needs of dairy goats and sheep increase for animals that are growing, in late pregnancy, or lactating. During lactation, supplementation with additional nutrients may be needed to sustain production. Energy is especially important for milk yield,

while protein is needed for milk quality. Grain or co-product mixtures contain additional energy and protein, as well as provide minerals and vitamins.

In order to meet a high level of milk production, 1 pound of grain-based mixture on average is needed for every 3 pounds of milk produced.

Table 4. Energy and Protein Dietary Requirements of Goats/Sheep in Various Stages of Production

Stage of Production	Total Digestible Nutrients %	Crude Protein %
Growing doe/ewe kid/lamb, 45 lb	56	8.8
Yearling doe/ewe, 90 lb (last trimester)	56	10
3-year-old doe/ewe, 110 lb	69	11.7
Dairy doe/ewe, 150 lb (milking 1 gal per day, 4% BF)	71	11.6

Table 5. Average Milk Production of Various Dairy Goat Breeds

Breed Type ¹	Average Milk Production (Lb per Lactation Period)	Expected Milk Fat %	Expected Milk Protein %
Alpine	2,260	3.4	2.9
La Mancha	2,100	4.0	3.2
Nubian	1,820	4.9	3.7
Saanen	2,146	3.9	2.9
Toggenburg	2,575	3.3	2.9
Oberhasli	2,115	3.2	2.7
East Friesian ²	1,000	5.6	4.8

1. The first six breeds listed are the most common breed types used in the US; DHIR, 2010.
2. Sheep production based on a 230-day lactation

Nutrition Management Keys

Pasture

Goats and sheep prefer browsing or consuming wood plants and shrubs. But goats are also grazers and will graze grasses, legumes, and weeds in a pasture in the absence or low presence of woody plants. Table 6 provides a select list of the most common forages used in Alabama. Forages provide the basis for goat and sheep diets.

Table 6. Common Forages for Goats and Sheep in Alabama

Cool-Season Grasses	Warm-Season Grasses	Legumes
<div>Perennials</div> <div>tall fescue</div> <div>orchardgrass</div> <div>Annuals</div> <div>oats</div> <div>rye</div> <div>ryegrass</div> <div>wheat</div>	<div>Perennials</div> <div>bahiagrass</div> <div>bermudagrass</div> <div>dallisgrass</div> <div>Annuals</div> <div>crabgrass</div> <div>browntop millet</div> <div>pearl millet</div>	<div>Perennials</div> <div>white clover</div> <div>Annuals</div> <div>arrowleaf clover</div> <div>ball clover</div> <div>crimson clover</div> <div>common vetch</div> <div>hairy vetch</div>

Hay

Test hay for quality (energy and crude protein values) by contacting the Soil Testing Laboratory at Auburn University (aces.edu/anr/soillab). Refer to Collecting Forage Samples for Laboratory Analysis (Extension publication ANR-2224) for information on how to collect a representative sample.

Conducting a forage analysis is the only way to know the nutritional value of the hay being used in your operation. This information can then be compared with the nutrient requirements of the animals being fed to determine if there are deficiencies. If the forage alone is inadequate to meet the animal's nutritional requirement, a supplementation plan can be developed to address this need.

Grain

Supplemental grain may be needed to help dairy goats/sheep meet production goals. Start does/ewes on a supplement 1 month before kidding/lambing. The dam should consume between 1 and 2 pounds of grain by parturition. This provides supplemental nutrients to the doe/ewe during a time of increasing nutrient needs. After

kidding/lambing, supplementation may need to be increased to support a high level of milk production. One pound of supplement per 3 pounds of milk produced is a good rule to follow.

When choosing supplements, look for those that contain at least 65 percent total digestible nutrients and 12 percent crude protein to have an adequate balance of energy and protein. Higher levels of each may be needed to achieve certain production goals.

Table 7 shows the level of protein supplement that is needed based on the expected quality of forage (pasture or hay) in the diet.

Water

Provide access to cool, clean water for dairy goats/sheep. Refer to Drinking Water for Livestock (Extension publication ANR-2381) for additional information on managing clean water resources. Water consumption of dairy goats/sheep is up to 3 times their total daily dry matter intake. Goats drink about 0.8 gallons of water for every 1 gallon of milk produced. Goats/sheep will drink more water during warmer weather and less in the cooler months of the year.

Goats/sheep will refuse contaminated or soiled water until forced to drink. This may serve as a potential source of coccidian and other parasites.

Table 7. Supplemental Protein Needs of Dairy Goats with Varying Forage Quality

% Protein in Forage (Animal Milk Production Level, Lb per Day)*	% Protein Needed in Supplemental Feed
≥ 15% CP	
5 lb/day	14
8 lb/day	12
12 to 15% CP	
5 lb/day	16
8 lb/day	14
≤ 10% CP	
5 lb/day	20
8 lb/day	18

*Adapted from Kieser, 2010, Feeding Dairy Goats, University of Minnesota Extension.

Feeding Dairy Goat Kids and Sheep Lambs

Goat kids/sheep lambs and yearlings have very specific needs when it comes to feeding and nutrition. If the nutritional program is managed properly, they can grow to become a valuable production asset on the farm.

Newborn Kids/Lambs

Once a doe has kidded or ewe has lambed, it is important that the new kid/lamb receive colostrum within the first 8 hours of birth. It is preferred that the kid/lamb receive colostrum within the first hour. If colostrum is not received, the newborn may not be protected from various diseases that can cause death.

After receiving colostrum, the milk feeding schedule becomes an important consideration. Table 8 describes the amount of milk needed per day and frequency of delivery based on increasing age of the animal.

Table 8. Milk Feeding Schedule of Dairy Goat Kids

Age*	Amount of Milk	Times to Feed Per Day
1 to 3 days	4 oz (1/2 cup)	4 or 5
4 to 14 days	8 to 12 oz	3 or 4
2 weeks to 3 months	16 oz	2 or 3
3 to 4 months	16 oz	2

*Source: Feeding and Housing Dairy Goats (1993)

In young, growing kids/lambs, scours or diarrhea may be a problem. It is critical to catch this early to prevent dehydration and potential illness or death. If diarrhea is a problem, try the following mixture:

- 1 can beef consommé
- 1 package fruit pectin (Sure-Jell)
- 1 teaspoon lite salt
- 2 teaspoons baking soda
- 2 quarts water

Directions: Make sure the solution is thoroughly mixed. Mix a fresh mixture daily and feed in place of milk. Double the rate you were feeding compared to milk. Feed as soon as you notice diarrhea. Use for 1½ or 2 days and then return to the regular milk diet.

Weaning and Management of Growing Kids/Lambs

At the age of 3 to 5 weeks, allow access to creep feed. This will aid in the process of weaning, as well as stimulate rumen function. Providing creep feed with a coccidiostat is a great way to combat coccidian.

Growing kids/lambs require higher amounts of protein in their diets than mature does/ewes. At 4 to 6 months of age, rations similar to the milking herd may be fed to kids.

One-half pound of grain per day, along with good-quality hay (10 to 12 percent CP), should provide a sufficient growth rate. A poor-quality hay (less than 10 percent CP) will require an increased amount of grain at 1 to 1½ pounds of grain/day to meet the same level of requirement. Purchase hay of known quality to minimize supplemental feeding requirements.

Feeding Colostrum to Kids and Lambs

The ingestion of colostrum is paramount to the survival of newborn kids/lambs. In addition to being an excellent source of energy, protein, and other nutrients, colostrum contains maternal antibodies that will help to protect the newborn kids/lambs from infectious diseases.

The key to successful colostrum management can be summarized with the three Qs: quantity, quality, and quickly.

Quantity

The specific quantity of colostrum needed will depend on the amount of antibodies in the colostrum. A general rule is that each kid/lamb should receive at least 10 percent of its body weight in colostrum. For example, a 4 kg (9 lb) kid should ingest at least 400 mL (13.5 oz) of colostrum soon after birth. Consumption above and beyond 10 percent of body weight is beneficial and encouraged.

Quality

To help promote the production of high-quality colostrum, ensure that the doe/ewe is on a proper plane of nutrition throughout gestation—particularly during the last month before delivery when she is beginning to make colostrum. The doe/ewe should also be current on vaccinations. The colostrum first produced by the doe/ewe will be of the highest quality; colostrum quality decreases if the doe/ewe leaks milk before kidding and as time passes after parturition.

Quickly

The young's ability to absorb antibodies from colostrum decreases rapidly after birth and essentially ceases by 20 to 24 hours of age. Kids/lambs should receive at least 50 percent of the quantity of colostrum to be consumed within 2 hours of being born, with the remainder ideally being fed within 6 to 8 hours of birth.

Feeding Management

The most certain method to ensure timely intake of a sufficient amount of colostrum is to hand milk the doe/ewe and bottle feed the kids/lambs. If this is not feasible and nursing of the dam is preferred, the kids/lambs should be monitored at parturition to ensure that they rise and nurse quickly. Assistance may be provided as needed.

If the kids/lambs fail to nurse or drink sufficiently from the bottle, colostrum can be administered through a stomach tube. Placement of a stomach tube should be performed by, or under the supervision of, a veterinarian. The tube should be flexible and of relatively small diameter to pass easily into the stomach. These tubes often can be obtained from your veterinarian or local farm supply store.

If the doe/ewe does not have adequate colostrum to support her young, commercial colostrum replacers are available at most farm supply stores. Colostrum replacers are generally sold in powdered form and will need to be reconstituted according to the label directions before administration to the kids/lambs. Whether using natural colostrum or colostrum replacer, the key to successful colostrum management is to give a sufficient quantity of high-quality colostrum quickly after birth.



Milk Care

Prevention and Treatment of Disease

Mastitis

Mastitis is an inflammation of the mammary gland (udder). The most common infectious causes of mastitis in goats and sheep are *Staphylococcus aureus*, *Staphylococcus caprae*, *Streptococcus agalactiae*, *Streptococcus uberis*, *Streptococcus dysgalactia*, *Mycoplasma capricolum*, *Mycoplasma agalactiae*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Clostridium* species, and caprine arthritis-encephalitis virus (CAEV).

Mastitis can result from yeast infection and occasionally from other infectious organisms. The infectious agent enters through the milk canal and multiplies. Some microorganisms release toxins. The mammary tissue becomes inflamed as a result of these infections and toxins.

In the acute form of mastitis, the animal often has a fever above

105 degrees F and an accelerated pulse, lethargy, and poor appetite. The mammary gland becomes hard, swollen, red, hot, and sensitive to touch. Milk secretions are watery and yellow, with flakes and clotting that contain blood and/or pus.

The chronic form of mastitis occurs as a persistent and incurable infection. The udder may have hard lumps as a result of bacteria forming colonies, and lack of milk production may occur.

With the subclinical form of mastitis, there are no visible signs to indicate the presence of mastitis. The subclinical form can eventually develop into the chronic clinical form of mastitis.

Diagnosis is based on clinical signs and herd history, microbiological milk culture, somatic cell count (SCC), or an enzyme-linked immunosorbent assay (ELISA).

Treatment should be based on the results of microbiological milk culture and your veterinarian's recommendations. Always adhere to milk withdrawal periods following treatment.

Prevention and control measures include the following:

- Improve hygiene of the barn, milking practices, and equipment used for milking.

- Provide a clean environment with minimal stress for the dairy herd. Dairy goats should be dehorned to avoid accidents and trauma to mammary glands.
- Disinfect kidding and lambing pens following the daily removal of bedding.
- Prevent foot rot and foot scald, since foot infection has been linked to mastitis.
- Treat wounds and drain abscesses properly; particularly watch for caseous lymphadenitis abscess in the udder.
- Follow proper milking protocol (see “Milking Protocol”).
- Cull chronically infected females from the herd.
- Purchase animals from a known source.
- Stop milking the affected half to dry off a mammary gland. The lack of mechanical stimulation will cause the half to dry off. This procedure helps to reduce treatment costs and increase the efficacy of the drugs used for treatment.
- Isolate infected females from the herd for treatment to prevent transmission to other animals.
- Watch for does/ewes that have aborted. Some of the same microorganisms that cause abortion can cause mastitis.

Judicious Use of Antibiotics

Antibiotics are medications used to treat bacterial infections. A top priority of food animal producers is to maintain the health and well-being of their animals. Treating sick animals appropriately with antibiotics promotes animal and human health and well-being.

Antibiotics are safe to use in dairy goats and sheep if they are used properly. Antibiotics go through a stringent FDA approval process for safety and efficacy. By law, no meat or milk products sold in the United States are allowed to contain antibiotic residues that violate FDA standards.

One way to avoid drug residues in food animal products is to strictly adhere to meat and milk withdrawal times. A withdrawal time is the minimum number of days required between the last antibiotic treatment and the day that meat or milk from the treated animal can enter the human food supply.

Withdrawal times ensure that antibiotic residues are no longer present when meat or milk products from that animal enter the food supply. Everyone that administers antibiotics to animals is required by law to adhere to all withdrawal periods.

Contact your veterinarian if you have questions regarding the use of antibiotics on your farm.

Key points regarding the judicious use of antibiotics include the following:

- Prevent problems and disease by practicing good animal husbandry (nutrition, hygiene, low-stress handling, vaccinations, deworming, etc.). Antibiotics should never be used in place of good husbandry.
- Adhere to all antibiotic label directions, unless you are following a written prescription from your veterinarian. This includes treating for the recommended time period and adhering to meat and milk withdrawal periods.
- Follow all FDA-approved labels or veterinary prescriptions with respect to antibiotic storage, administration, and record keeping.
- Avoid using antibiotics that are important to human medicine.
- Use a narrow spectrum of antibiotics. Combination antibiotic therapy is discouraged. In other words, use a medication that is FDA-labeled or veterinary-prescribed to treat the specific condition present. Do not use more than one antibiotic at a time.

- Treat as few animals as possible, but always strive to maintain healthy animals.
- Limit antibiotic use to treatment or control of disease.

Milking Protocol

1. Use gloves.

Anyone who handles a lactating animal's teats should wear gloves at all times.

Wearing gloves prevents transmission of pathogens to the animal, including both contagious and environmental pathogens. Wearing gloves also prevents humans from contracting certain diseases that could be transmitted through the milking process.

2. Pre-dip the teats.

Use a separate clean and dry cloth or single-use paper towel to clean the teats of each individual animal. A damp paper towel or damp cloth can be used to aid in removal of dirt and feces that have

dried on the teats. It is imperative that the teats are both clean and dry prior to stripping. Clean the teats by removing all visible dirt and debris from the entire length and circumference of each teat.

Each teat should be stripped 4 to 6 times each. Use a strip cup to look at the milk coming from the teat. If there is any discoloration or change in consistency of the milk, the animal needs to be examined further for mastitis.

The teats should then be dipped or sprayed with a germicidal product. Completely cover the bottom two-thirds of the teat and allow 15 to 30 seconds of contact time. Use a non-return reservoir on the dip cup. If any contamination to the dip cup and dipping reservoir occurs, wash it out before using it again.

Following dipping, each teat should be thoroughly dried with a single-use paper towel or laundered cloth towel to remove the germicidal product, pathogens, and organic debris from the teat end.

Note: An additional advantage of preparing teats for milking includes stimulating milk letdown. Milk letdown increases the speed of the milking process and helps to ensure that the maximum amount of available milk is removed from the udder, while minimizing trauma to the sensitive teat tissues.

3. Monitor the milking procedure.

The milking unit should be attached within 1 or 2 minutes of finishing the pre-dipping procedure.

During milking, monitor the milk flow to make sure that overmilking or undermilking of the udder does not occur. Overmilking of the udder occurs when the milking unit hangs on the udder too long; it results in vacuum irritation and injury to the teat end.

Monitor for slipping of the liner (inflation) on the teat end and units that fall off the udder. A squawking sound indicates that the liner has slipped from the teats and needs adjusting. To prevent undermilking, feel the udder to make sure that it is fully milked prior to letting an animal return to the herd.

4. Post-dip the teat.

After milking, post-dipping is important to prevent contagious udder pathogens *Staph. aureus* and *Strep. agalactiae*.

To post-dip an animal, remove the milking unit, feel the udder to ensure it is fully milked, and then spray or dip the teat opening with an approved germicidal product. Do not rinse off the post-dip.

Post-dip usually includes emollients to help prevent drying of the teat ends.

Following dipping, animals should stand up for approximately 1 hour to allow for keratin plug formation in the teat end to prevent pathogens from entrance to the streak canal.

Remember, having an effective SOP for milking protocols will ensure that animals are milked in an efficient manner without resulting in mastitis or elevated bacterial counts.

Value-Added Products Using Goat and Sheep Milk

Whether dairy goats and sheep are raised for commercial or personal intent, eventually there will be a surplus of milk that can be further processed into value-added products. This milk can be used fresh or frozen for later use. The potential value-added products come in the form of consumables, skin care, or utility products. Any of these endeavors can provide enjoyment, gifts, sellable products, and additional revenues.

Converting dairy milk into consumables may necessitate food safety inspections of milking, further processing facilities, and potentially product inspection. Consumable products intended for sale to the public must meet extensive legal, licensing, and inspection requirements. In most cases, skin care and utility products only require appropriate labeling and business licensing, not inspection.

Many value-added products can be marketed directly from the farm at farmer's markets, public events, or retail shops. They can also be sold wholesale for further retail at gift shops, consignment stores, and hotels. Marketing such products via social media and websites can be done rather inexpensively, while still reaching an extensive audience.

There is a multitude of information available online on how to produce such products. Some of the best learning experiences will come from interaction with similar entrepreneurs, producer groups, or outreach trainings.

Labeling

When it comes to product labeling for consumable products, consult your state health department, a product attorney, and online resources before marketing your product. Rules and requirements will vary from state to state.

For skin care products, consult a producer's group or association, online resources, and product attorneys. Because the product is not being consumed, the regulations are less strict. An entrepreneur should be judicious in meeting all reasonable requirements for product labeling to be protected from lawsuits or nuisance complaints.

For utility products, there are no labeling requirements if the product is being used at home or on the producer's farm. In this case, the product should be labeled for issues of personal and family safety. Consult your state health department for labeling requirements for this type of product if you plan to sell it to the public.

Dairy Product Production

Converting milk into consumables, skin care, or utility products requires the use of a reactionary agent or chemical process to further process the milk into another form. .

Consumables

Options in this category include cheeses (aged/hard or soft-spread), container milk, ice cream, kefir, and yogurt.

For making cheese, rennet is added. It contains an enzyme that converts raw milk into aged/hard cheese or soft-spread cheese. For making yogurt or kefir, a healthy bacterium is added to milk to convert it into a semi-liquid stage. Milk is often pasteurized through a heating and cooling process.

Skin care

Options in this category include lip balm (container or tube), lotion (liquid or solid), soaps (liquid or solid), and shampoo (liquid or solid).

To make soap and shampoo in liquid or solid form, you must mix oils, fats, liquids, and caustic chemicals to cause a chemical reaction called saponification.

Potassium hydroxide (for liquid soap) or sodium hydroxide (for solid soap) mixed with fats and oils will result in saponification and formation of beautiful handmade soap or shampoo. Producers must be cautious handling these chemicals, as both are very caustic and require special handling, equipment, and processing. The production difference between soap and shampoo is the addition of vitamin E, silk protein, or other hair-enhancing ingredients to shampoo.

Making lotion requires a modified version of wax that emulsifies oils and liquids into a viscous state that can vary from lotion to crème. Making lotion using liquid milk necessitates the use of a natural or synthetic preservative to prevent the goat milk from souring or spoiling.

Making lip balm requires the use of wax, oils, an emulsifying agent, and powdered goat milk. Liquid goat milk will not work when making a solid form of lip balm.

Utility Products

Options in this category include livestock milk as milk replacer and paint (whitewash paint).

To make a utility product, such as whitewash paint, you must curdle milk with vinegar and lime, and then add pigment to the milk curds before mixing it to create paint. The paint is nontoxic and provides a soft, long-lasting finish and an antique appearance.

Goat or sheep milk can also be used as a livestock feed source and does not require further processing. It can be used to feed kids and lambs, young and growing pigs, calves, equine and other livestock, and all orphaned animals. The milk has a high nutritional value and is easily digested by other livestock species.

Resource Assessment

An evaluation of labor, equipment, finances, facilities, and time constraints is necessary to determine which enterprise is most appropriate for each personal situation.

Whether milking two or a hundred animals, each part of the industry—from processing to marketing—requires time and effort. Diligence and hard work throughout can generate great profit.

Youth Resources

Dairy Goat and Sheep Showmanship

Using techniques established by Harvey Considine and George Trimberger, who have authored numerous books on showing and showmanship, when competing in showmanship can be a rewarding experience. Before participating in any show, a showman must consult with the rules committee of the event. Most shows will have a rulebook available by mail or online.

Following are guidelines to help you achieve success in the show ring:

Before the Show

- When entering the ring, move in a clockwise direction and as directed by the judge and ring steward.

- Walk facing forward on your animal's left side with your right hand on the chain or collar.
- If you have a long chain, do not coil it around your hand or allow it to touch the ground.
- Lead your animal slowly, keeping 3 to 4 feet between you and the animal-showman pair ahead of you.
- Keep your eyes on the judge at all times. Only look away to set up your animal.
- Keep your animal between the judge and yourself.
- If the judge indicates to stop your animal, do so promptly.

In the Ring

- When entering the ring, move in a clockwise direction and as directed by the judge and ring steward.
- Walk facing forward on your animal's left side with your right hand on the chain or collar.
- If you have a long chain, do not coil it around your hand or allow it to touch the ground.

- Lead your animal slowly, keeping 3 to 4 feet between you and the animal-showman pair ahead of you.
- Keep your eyes on the judge at all times. Only look away to set up your animal.
- Keep your animal between the judge and yourself.
- If the judge indicates to stop your animal, do so promptly.

Setup

There are two common methods in setting up a dairy goat/sheep:

1. If you can move your animal by lifting its legs, reach the hind legs and set them up correctly (squarely). Follow with the front legs. This method is the easiest and quickest.
2. For a showman with a larger animal, this method is preferred. The showman must put pressure on the point of the shoulder to move the animal backward. Once the animal is in the correct position, the pressure is relieved to avoid distracting other participants. This method has the advantage in that the showman stays balanced, keeps more control of the animal, and gives an overall more graceful presentation.

With practice and patience, you can become a good showman. Contact your local Extension 4-H agent or FFA advisor for more information.

Alabama Dairy Goat Judging

Before beginning to judge dairy goats, judges should become familiar with the anatomy of the dairy goat and the ADGA scorecard. The scorecard is available online at ADGA.org. Learning and using these terms is essential in judging.

Judging Guidelines

- Stick with your first impression of an animal, unless further inspection gives good reason to change.
- Observe the animal from the front to evaluate the width of chest and from the rear to evaluate sharpness of withers, spring of rib, width of rump, width of rear udder, and amount of udder cleft.
- Use the scorecard to evaluate points from each trait.
- Observe walking animals for ease of movement.

- Always arrive to a judging contest before the registration time begins. This will allow you to register, obtain a list of the classes, and fill in your name, your contestant number, and the class number and name on each of your judging cards.
- Make sure you have a spiral notebook and several pencils to make notes on each class as you judge.
- Keep in mind that classes are usually comprised of four animals. You will normally have 12 minutes to place a placing's class and 15 minutes to place a reasons or questions class.
- Consult your group leader for the class name, number, and type. Before you start, you need to know if you are judging a placings, reasons, or questions class.
- Keep the length of oral reasons to 1½ to 2 minutes. Contestants need to learn early in their judging careers to give oral reasons without referring to their notes. Beginning contestants should start with a shorter, more concise set of reasons that they feel comfortable giving without referring to notes. As they gain experience and confidence, the reasons can be expanded.
- Keep mindful of time. You are generally allowed 15 minutes to judge a reasons class. This does not always allow a lot of time to take notes. Develop abbreviations for traits. Do not write out entire sentences or phrases, as this takes too long.
- Be accurate. Accuracy is critical when giving reasons. Generalizing or giving reasons that are untrue will deduct points more quickly than other factors.
- Speak clearly and loudly enough to be easily understood. Speaking in a bold voice conveys to the audience that you are confident in your placing. It is difficult to be convincing if you speak softly and are unsure.
- Make eye contact with the official. To help establish good eye contact, practice giving reasons to an empty chair. Once you are comfortable, move on to giving reasons to a mirror, and finally video yourself giving reasons. You are your biggest critic. If you can maintain eye contact with yourself, it becomes easier to keep eye contact with the official.

Resources

American Dairy Goat Association, adga.org

American Consortium for Small Ruminant Parasite Control, www.wormx.info/famacha

Dairy Records Management Systems, North Carolina State University, Raleigh, NC

Langston University, Goat Research Center, Dairy Herd Improvement Lab

Sheep101.info





www.aces.edu