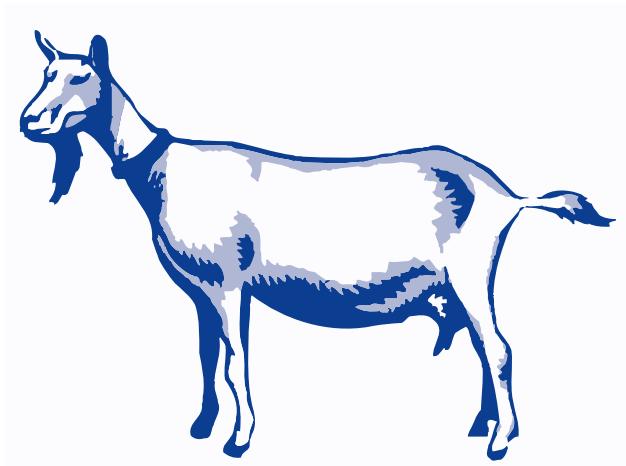


Animal Care Series:

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CARE PRACTICES

University of California

Cooperative Extension

FOREWORD

Goat Care Practices is one of a series of University of California publications addressing the issues of animal care relating to food and other products produced in California. This publication is the result of a joint effort among the University of California Cooperative Extension, goat industry representatives, and members of the Department of Animal Science and the School of Veterinary Medicine, University of California, Davis.

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Published by the University of California, Davis; First Edition, May 2000.

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INTRODUCTION

Proper animal care has evolved from decades of practical experience and scientific research. Researchers continue to investigate and enhance animal care under a variety of traditional and alternative management systems. Goat care and management depend on the animal's age, health, nutrition and pregnancy status, as well as production needs, the environment, and facilities. The young kid has needs for basic care very different from the older, mature goat. Thus, managers must be aware of the individual needs and provide for these. Proper care practices that ensure animal well-being may be the most efficient in terms of production. If certain management practices conflict with animal well-being, it will be to the producer's long term advantage to adopt practices that put animal welfare ahead of short-term financial savings.

The goals of the publication are to explain why, when, and how specific practices are used in goat production systems in California to support animal well-being, and not to set forth or suggest specific guidelines for production practices. This publication may assist producers in evaluating husbandry practices and offer practices that are safe, ethical, and cost efficient. Variations from suggested care practices in this publication are acceptable. Continued research is essential to provide additional information about the basic needs of goats under different or alternative management systems. As new, scientifically-based techniques and practices become available to producers, management should integrate these methods into existing systems.

This publication includes a description of the goat industry in California, with its diverse use of goats in agriculture and recreation. The chapters address specific components of management including facilities, nutrition, health, buck care, transportation, and acceptable euthanasia methods. The **Glossary** and **Index** are included to assist the reader with specific terminology and location of information within this publication.

GOAT INDUSTRY IN CALIFORNIA

Goats are bred and maintained for a multitude of purposes including milk and milk products, meat, brush control, mohair, cashmere, skins for leather, commercial antibody production, packing, and companionship. Worldwide, there are more than 460 million goats producing 4.5 million tons of milk and 1.2 million tons of meat. As browsers, goats utilize land too rough in terrain for sheep and cattle. Goat milk is more easily digested than cow milk, and is valued for the elderly, sick, infants, and those with allergic reactions to cow milk. Many goats provide multiple uses, for example producing milk for home consumption and offspring for meat, or, in

the case of fiber goats, brush control and meat production in addition to mohair or cashmere.

According to the USDA, there were an estimated 15,780 milk goats and 3,617 Angora goats in California in 1997. This estimate is probably low since there are no estimates of the number of meat goats, brush goats, goats used for antibody production or medical research, or those used for packing. California is the leading state in breed registrations. Of the goats enrolled with the California Dairy Herd Improvement Association in 1998, the average herd size consisted of 25 does.

GOAT HOUSING

Introduction

Goats do not require elaborate housing. They are generally hardy animals that tolerate hot and cold weather well as long as they are provided with simple shelter to protect from rain or snow in winter and from heat in summer. They are extremely inquisitive, playful, and sure-footed animals that have a strong propensity to climb. These attributes should be considered when planning for their housing or confinement. Fencing to keep goats in and predators out is the most challenging aspect of goat housing.

Types of Housing

There are several housing systems for goats. The type of housing needed depends on local weather conditions, resources available, and whether the animals are being raised for milk, meat, fiber or as companion animals. There are two main housing types, which include confinement (intensive) and loose, dry lot or pasture systems (extensive). A combination of housing types is employed on some farms. Any system will require the ability to separate groups of animals. The housing should allow groups of milking does, dry (non-lactating) does, newborn kids, growing kids, and bucks to be housed apart from each other.

Confinement housing

In most of California, weather conditions are mild so that totally confined housing is not warranted. Housing goats in individual stalls inside of barns is labor intensive and expensive to maintain. There

are advantages to total confinement housing such as individual care and feeding, but for the most part the disadvantages prevail. Proper ventilation and sanitation are difficult to achieve. If necessary, newborns can be confined in clean, freshly bedded plywood boxes or some type of containment out of the weather. Otherwise, loose, group housing is preferred. In the event that total confinement or tie-stall type housing is deemed necessary, specifications for stall design, space per animal, ventilation, insulation and other recommendations can be found in the Extension Goat Handbook's section on Management/Housing.

Loose or dry lot housing

Dry lots predominate in California regardless of whether these dairies house cows or goats. Animals housed in groups on dry lots have the freedom to move about and get plenty of exercise, building and maintenance costs are low, and manure handling is simplified relative to confinement housing. It is common for goats to be housed in old, modified dairy cow facilities, which can be suitable for large numbers of goats.

Corral surfaces of packed dirt should have some slope to allow for drainage. Goats, like sheep, have an aversion to walking in wet, or muddy areas. Water draining from corral surfaces must be diverted to a holding tank or sump, and contained on the owner's property. The Federal Clean Water Act provides that no person may release any pollutant, which includes animal waste and related material, into waters that originate outside of and pass

over, across, or through the facility or come into direct contact with confined animals.

The corral size should allow for a minimum of 25 to 30 sq. ft per doe or for 100 sq. ft per buck. Shelter from rain can simply be a pole-type cattle shade. At least 15 sq. ft per doe, or 40 sq. ft for each buck should be allowed under the shade. Height of the shade in corrals should enable a tractor-scraping to drive under it for regular cleaning. During winter or in rainy months, mounded, dry bedding should be provided under the roofed area. Examples of bedding materials suitable for goats include straw, wood shavings, rice hulls, sand, and almond shells. No bedding is required in warm, dry weather; it will only attract flies.

For younger animals, more protection in winter may be desired. A modified wooden calf's hutch that is closed in the back may be used for several newborn goat kids. Pens for small groups of growing kids with the dimensions of approximately 8 feet wide by 16 feet long may include a roof over the back half of the pen. Plywood or metal panels may be utilized to close three sides in the back half to within 1 to 2 feet below the eaves. Finishing the walls to the eaves may cause ventilation problems. Ease of cleaning, containment, and protection from predators are the key elements to keep in mind when constructing goat shelters. Safety is also important. Goat kids are very curious, so areas that might cause strangulation or a broken leg must be eliminated. Lead based paint on old sheds that might be retrofitted from some other use to goat shelters can be dangerous.

Group feeding in dry lot conditions is labor efficient. "Boss" goats can sometimes monopolize the feed bunk and

chase less dominant goats away. This problem can be minimized by allowing adequate bunk space for all animals to eat at the same time. There are many ways to make or retrofit a feeding area. Many goat dairies use fence line feeders. Heavy wire, 16 foot long livestock panels with grid openings of 6 by 8 inch can serve as the fence and allow the goats to stick their heads through the openings to eat. Some panels have grids that are 2 by 8 inches at the bottom, increasing to 4 by 8 inches in the middle portion, and then to 6 by 8 inches at the top. These panels reduce the amount of hay that is pulled into the pen and wasted by having the smaller grid at the bottom. If the 4 by 8 inch holes about halfway up the panel are not large enough for mature goats to place their heads through comfortably to eat, then a section of horizontal wire between two 4 by 8 inch holes may be cut out to make an 8 by 8 inch opening that is about a foot from the ground.

A fenceline feeder can be made more like a manger by building a low (2 foot high) wall with wooden boards about two feet out from the fenceline. Calf or cow stanchions may be used for fenceline feeders for goats as long as there is not a high curb that interferes with their ability to eat. A length of rebar can be welded about 12-16 inches from the bottom of the stanchion opening to prevent the goats from pushing or walking through the stanchions. There are many imaginative retrofits that can work with a common sense approach to the animals' ability to eat comfortably and safely. For example, hay nets that are sometimes used for other species are not advisable for goats because goats can become ensnared in the netting and strangle themselves.

Water Troughs

Individual float-type livestock waterers mounted about 1 to 2 feet above the ground can be used, but larger capacity waterers may be needed for big groups of milking does. Cattle water troughs can work, but a 4 to 6 inch platform may need to be placed beside the trough to elevate the goats enough to drink comfortably. Clean, fifty gallon, plastic drums cut in half and filled manually are suitable as waterers containers. The same intact drum may be fitted with a float type valve. A small, rectangular hole is cut on one side for the valve about two thirds the way up the barrel. A larger rectangular hole for the goat to stick her head through to drink is cut about the same distance up the barrel on the opposite side. Automatic hog waterers can also be used successfully by goats. Where possible, it is best to have waterers under shade to keep drinking water cool in the summer months.

Fencing

Fencing is the biggest challenge in housing goats. It is generally agreed that fences for mature goats must be a minimum of 48 inches tall. Fences six feet tall are best for bucks. Goats are agile jumpers so fences shorter than this may not contain them. Goats also like to lean on, push against, and stand on fencing, particularly if someone is on the other side to pet them or offer treats! The main fencing types include livestock panels, woven wire, and electric.

Livestock panels constructed of heavy wire in a 6 by 8 inch grid is quality fencing for goats. The panels are usually 16 feet long and 52 inches high. Heights of 42 or 34 inches are also available with smaller

grids on the bottom which would be adequate for newborn goats or growing goats. The panels must be securely attached to fenceline posts and corner posts. The posts may be wood, pipe, or steel "T" posts. Livestock panels welded up against pipe and cable dairy cow corral fencing can turn a cow corral into a goat corral.

Woven wire is less expensive than livestock panels. It comes in various heights and mesh size. Smaller mesh will be required for newborn goats. Woven wire that is not 48 inches in height can be made higher by adding strands of barbed wire above the woven wire. It is important to make tight attachments to strong fence posts so that the goats can not push and bend the wire at ground level and then crawl under the fence.

Goats learn quickly to respect an electric fence. Woven plastic fence with electric wire or woven electric fence are suitable. There are many different fence chargers available including electric, battery, or solar powered. There are also several types of wire to use with the chargers. It probably takes at least 4 strands of tightly strung wire to keep the goats confined. It is important to keep weeds and other plant material away from the bottom strand to prevent the electricity in the fence from short circuiting. A proper ground device is essential.

Other types of fencing may work for certain situations. Plastic fencing is available, but goats may try to eat it. Wooden picket fencing, snow fencing, and cyclone fencing are successfully used for goats. Regardless of the fencing type, be sure to keep anything that the goats might climb or jump on away from the fence.

Otherwise they will learn to jump up on the object and then over the fence. Water troughs, feeders, old farm implements or anything that the goats can get up on may be their platform for escape!

Dairy Barns for Goats

Commercial goat dairies that market Grade A goat milk must meet the standards of the California Code of Regulations, Food and Agriculture Section 35781-35788, and must possess a permit to sell milk issued by the local milk inspection service. Facilities for milking does must be regularly inspected and meet all health and sanitation requirements. It is illegal to sell goat milk for human consumption without a permit.

Pipeline milking systems are in use on commercial goat dairies. Specifications for milking vacuum, pulsation, and milking

system performance standards are similar as for cow dairies. Bucket milkers are commonly used on farms where the number of milking does exceeds the ability of the owners to milk them all by hand. Many goat owners milk by hand with the doe restrained on a milking stand. In these situations, milk is either kept for home use and/or fed to goat kids or used to raise calves. A milking stand should restrain the doe comfortably and allow the person milking easy access to the udder to milk in a comfortable position. Avoid any hooks or handles on the stand where the doe's leg could become caught and injured. Regardless of the type of milking, the strictest attention must be paid to sanitation to ensure the quality and wholesomeness of the milk and to protect the doe against infection of the udder (mastitis) at milking time.

FEEDING AND NUTRITION

Introduction

Goats should be offered a balanced ration that meets the nutrient requirements outlined by the National Research Council's Nutrient Requirements for Goats (1981). These nutrients include energy, protein, fiber, vitamins, and minerals. Diets should be formulated to meet the metabolic demands such as growth, pregnancy, fiber production, or lactation. Feeding and watering equipment should be constructed and located so it is easily accessible by the animals, provides a safe environment, and the contamination of feed with excreta is minimal. Troughs, racks, and pails should be cleaned thoroughly when dirty.

Fresh, clean water should be provided at all times to all classes of goats. Water is an essential nutrient for metabolic activities such as digestion, nutrient transport, electrolyte balance, joint lubrication, body temperature control, rumen development and function, and waste excretion. Water should be free of particulate matter, pesticide residues and other toxic substances, and should have a low salt and bacterial content. This is especially important in hot summer months and promotes both water and feed intake.

Minerals are essential nutrients in all diets. If trace minerals are not a component of the grain mix, low-salt mineral blocks should be provided to prevent deficiencies. Goats will lick blocks to ingest the minerals.

Newborn Kids and Colostrum Management

Colostrum is the first milk produced by the doe prior to and during the first few days after kidding. Colostrum obtained from the first milking after kidding contains more protein, especially immunoglobulins, fat, minerals, and vitamins than milk produced in later lactation.

Immunoglobulins, or proteins produced by the doe's immune system, are secreted into the colostrum around the time of kidding. For approximately 4-6 weeks after birth, kids depend on the immunoglobulins absorbed from colostrum for protection from infectious agents in their environment. Specific immunoglobulins are produced in colostrum depending on the doe's environment and vaccination program. If kids are not suckling on their dams, colostrum will need to be provided within the first 24 hours of birth. Large immunoglobulin proteins are absorbed in the intestine of the newborn kid as intact proteins for passive immunity, but absorption declines within hours after birth. Within 24 hours intestinal closure occurs and the *majority* of intact proteins cannot be absorbed. Therefore kids should be fed a minimum of 4 ounces, but preferably 12-24 ounces, of high quality colostrum by bottle or esophageal tube within the first few hours after birth.

Because some immunoglobulins may be absorbed up to 72 hours following birth

and beneficial effects may occur in the lumen of the intestine, colostrum feeding can be continued for several days. If a doe leaks milk from her udder prior to kidding, much of the colostrum she has produced may be lost. Colostrum from "leaky" does should not be fed to newborn kids.

Proper selection, collection, storage and feeding of colostrum are essential to a successful kid-rearing program. Frozen colostrum is an alternative to feeding the dam=s fresh colostrum. Colostrum can be collected and frozen or refrigerated. Freezing does not destroy immunoglobulins, but does prevent bacterial growth and deterioration. Frozen colostrum can be thawed slowly in warm water. Temperatures over 111°F can denature immunoglobulin proteins. Thawed colostrum should be gently stirred to mix nutrients thoroughly.

Caprine arthritis encephalomyelitis (CAE) is caused by a virus that is widespread throughout goat herds in California. Symptoms in adults range from no observable signs to crippling arthritis. CAE can be transmitted to kids via their dam=s milk and colostrum. To help prevent the transmission of CAE through feeding, do not let the kid nurse its dam, and feed only heat-treated colostrum and pasteurized milk.

Milk Replacers for Young Kids

Feeding kids with milk from medicated does is not recommended. Milk from healthy does or milk replacer is fine. Milk replacers are powdered products that contain predominately dry milk ingredients. These products are mixed with water and formulated to provide proper nutrition for the growing kid. Milk replacers derived

from dairy products are the most easily digested. A milk replacer should contain a minimum of 20 percent crude protein and 20 percent fat on a dry matter basis. Acid detergent fiber should be a maximum of 1 percent. The milk replacer should dissolve readily in water and stay in solution. Always use clean fresh water for mixing replacers and follow manufacturers' instructions.

Growing Kids

Kids should be started on solid foods early to be ready for weaning beginning about 8 weeks of age. A grain mix for kids (kid starter) and good quality hay can be offered free choice when the kid is a few days old. The diet should contain all known nutrients necessary for normal growth and health. Kid starter should be palatable, easily digested, and high in digestible protein. Rations should allow for body weight gains between 0.3 to 0.5 pounds per day, depending upon the breed.

Kid starter should contain 16-18 percent crude protein. Cottonseed products should be omitted from kid starter diets. Cottonseed contains a component called gossypol, which is toxic to kids. Good quality alfalfa hay or high quality pasture is the best forage choice for kids, and should be soft stemmed and palatable with a crude protein of at least 20 percent and a total digestible nutrient content (TDN) of at least 54 percent on a dry matter basis.

Kids may be weaned as early as 8 weeks of age and when they are consuming approximately 1.5 pounds of grain per day. Milk feeding can be reduced to once a day to stimulate dry feed intake, and then discontinued entirely after several days.

After weaning, high quality forage feeding should continue as described above, but kids can gradually (4-6 weeks following weaning) switch to a 14 percent protein grain mix (no cottonseed products), similar to the diet for milking does. This feeding program can continue until breeding when the does are about 75 pounds.

Non-Lactating Does and Growing Yearling Does

Between breeding and kidding, does should be on a high forage diet, as long as their protein, energy, mineral, and other nutrient levels are met for their age and growth requirements. A few weeks prior to kidding, the does can be gradually reintroduced to grain feeding. This helps avoid a sudden shift from an all forage diet to a ration high in concentrates typical in early lactation. Feeding grain also increases rumen papillae length and reduces the incidence of ketosis. The amount of grain fed depends on the body condition of the doe and the quality of the forage being fed.

The total intake of calcium, phosphorous, and potassium during this time is critical. Does must be fed close to requirements to keep gut absorption active. Excessive mineral quantities will predispose the doe to metabolic disorders, such as milk fever. Metabolic disorders may lead to other health problems such as retained placenta, dystocia, or prolapsed uterus.

Kidding and Lactation

Rapid changes in diet at kidding should be avoided. If the doe is fed a total mixed ration, feeding long stem hay with it will help stimulate feed intake.

Digestive disorders can be prevented by limiting concentrates to a maximum of 60-65 percent of the ration. Although most does will lose body condition in early lactation, it is important to minimize *large* changes in body condition, and not allow does to become overly fat or thin. Either condition will predispose them to metabolic and reproductive problems. Feeding should be adjusted throughout lactation to adjust for changes in milk production and body condition.

Dry Does, Fiber Goats, and Bucks

At the end of lactation, does should be fed an all forage diet, which will provide the necessary nutrients for maintenance and fetal growth. As compared to the ration of the milking doe, reduction in both nutrient quality and quantity will help stop milk production. For adult dairy, meat, or fiber goats, maintaining body condition and health are the primary goals of a feeding program. Again, diets provided should meet the National Research Council's Nutrient Requirements for Goats (1981), appropriate for metabolic demands such as growth, fiber or milk production.

Browsing and Grazing

Goats are browsers and will readily eat woody plants and shrubs. If goats are turned out to browse, the area should be inspected first to be sure there are no toxic plants that will be a threat to the goats, or to humans via transmission of toxins in the milk. Depending on the quality and quantity of the browse available, diet supplementation may be necessary to meet the goat's minimum nutrient requirements.

If goats are located on pasture, the forage should be sampled and analyzed in a manner similar to hay testing to determine its nutritional value. This will vary depending on season, species composition, and grazing management. Again, depending on the quality and quantity of the pasture available, diet supplementation may be necessary to meet the goat's minimum nutrient requirements.

Agricultural By-Products

Many agricultural by-products can be highly nutritious, fed safely to ruminants, and an economical source of feed. If using by-products, an analysis of nutrient content should be obtained from the source, and the by-products should be free of bacteria, pesticides, naturally occurring toxins, or other harmful substances.

HEALTH CARE

Introduction

Producers should manage their goats to prevent or reduce the incidence of disease. Every producer should have a licensed veterinarian assist in the design and implementation of a herd health program. A herd health program addresses the prevention and treatment of disease, depending on the type of production system. Procedures such as vaccination, castration, shearing, disbudding (dehorning), and hoof trimming are normally performed by producers. Only qualified personnel should be used for these procedures. Licensed veterinarians should perform any invasive surgery or administer restricted vaccines.

Shearing

Angora goats are routinely shorn once a year to harvest the mohair fiber. However, shearing may be performed anytime it is necessary to remove severely matted or soiled fleeces. The mohair provides protection from rain and insulation from cold, so animals are usually shorn in the spring after the worst of cold weather has passed and before the heat of summer. If animals are shorn during inclement weather, adequate shelter and feed should be provided. It takes approximately 6 weeks following shearing for the coat to become fully protective again. Shearing of pregnant animals should be avoided during the last 6 weeks of gestation since the likelihood of abortions increases.

Shearing equipment should be properly maintained so that it cuts rather

than pulls fibers and does not heat up and cause the animal discomfort or burns. Any shearing wounds should be properly treated. If treatment for external parasites is needed, this is the optimum time to treat. Less chemical is needed and it is more effective because the fleece is removed.

Clipping

Dairy goat udders, abdomens, and inner thighs are routinely clipped when lactation begins as a sanitary measure to keep hair and other contaminants out of the milk. Clipping equipment should be properly maintained so that it cuts rather than pulls fibers and does not heat up and cause animal discomfort. Any clipping wounds should be properly treated.

Disbudding (Dehorning) & De-scenting

Angora goats' horns are not routinely removed since they provide some protection from predators. In contrast, dairy goats' horns are usually removed to prevent injury since the animals are managed in close quarters.

Horn buds should be removed before 10 days of age. Electrocautery is the usual method of removal. After this age, anesthetics should be administered and the horns removed under the supervision of a licensed veterinarian. The majority of the scent glands in male kids are located behind and adjacent to the horn buds and can be destroyed at the time of electrocautery of the horns buds.

Castration

A variety of procedures are used for castrating male kids. If rubber elastrator rings are used, the procedure should be done before the kids are 10 days old. If the cords are crushed with Burdizzo clamps, the procedure should be done before two months of age. Castration with a sharp knife should be performed before 2 months of age. If performed later, anesthetics should be administered and the testicles removed under the supervision of a veterinarian. Any method of castration increases the risk of tetanus. Protection from tetanus can be provided by vaccination of the doe before kidding with tetanus toxoid or by administering a tetanus antitoxin to the kids at the time of castration.

Hoof Trimming

Abrasive materials in the environment will often keep hooves properly shaped so that trimming is rarely needed. For confined goats on soft ground, hooves may need trimming every few months. The hooves should be trimmed any time the side wall extends past the sole of the foot such that the wall starts to curl under and form a flap over the sole of the hoof. Careful technique should avoid trimming too close and cause bleeding or tenderness.

Identification

A variety of means of identification are suitable for goats. Goats are routinely tattooed in the ear. The American Dairy Goat Association has a year coded system that is commonly used. Neck chains made of metal or plastic are commonly used on milking does. Numbered plastic or metal

tags can be inserted in the ear, using the appropriate applicator tool. Keeping the tags near the base of the ear will help prevent drooping of the ear. Disinfecting the applicator between animals decreases the risk of spreading diseases.

Although electronic microchips provide the maximum security in identification, these have limited management use since a hand-held reader is required to determine the animal number.

Parasite Control

Parasite problems, caused by internal worms and coccidia, vary widely by animal age, management system, and the feed and feeding system. Crowding, overgrazing, and poor sanitation will eventually increase the severity of parasitism. Symptoms shown will depend on the species of parasite and the numbers present. Signs of parasitism may vary from sudden death to diarrhea to subtle decreases in production efficiency (growth, milk production, and reproduction). Examination of fecal samples for relative numbers of parasite eggs is the most practical way to monitor the animal's parasite load. Poor growth and/or diarrhea in a number of animals are good indicators of the need for conducting fecal examinations. Effective deworming agents and coccidiostatic drugs are available. There is no sound scientific evidence to support the use of products like diatomaceous earth, brewer's yeast, or garlic for treatment of parasites. Since young animals are most susceptible to infection with parasites, deworming of does before or at kidding is often an effective control strategy. Coccidiostatic drugs are often fed before and after weaning to control coccidiosis in kids. Specific herd programs should be developed in consultation with a local veterinarian.

Vaccination

A number of different vaccines are available for use in goats but their appropriateness depends on the location and management of the animals. As a result, vaccination protocols should be developed in consultation with a local veterinarian. Goats are often vaccinated to protect against Overeating Disease (Enterotoxemia) caused by *Clostridium perfringens C or D* and Tetanus caused by *Clostridium tetani*, since they are quite susceptible to both diseases. Recent work suggests that goats require frequent Overeating boosters to maintain adequate protection. The use of other vaccines will depend upon local conditions as mentioned above.

Nutrient Supplementation

In areas that are severely selenium and/or copper deficient, appropriate supplementation may be required.

General Health

Goats should be observed regularly and any deviations from a normal state should be promptly investigated. Increased attention should be provided at the time of kidding in case does or kids need assistance. Healthy goats are normally bright-eyed and alert, gregarious, curious about their environment, move around easily, and have a glossy hair coat. Sick goats tend to separate themselves from their herd mates. A sick goat's coat may be rough and ruffled or the animal may be lame, refuse to eat, have diarrhea, have abnormal lumps on the body, spend a lot of time lying down, become thin, and cough. Prompt identification of the cause of sickness and

implementing a proper treatment plan will minimize the length of sickness and the loss of production while assisting in minimizing any potential transmission to other herd mates. Consult a licensed veterinarian for an accurate medical diagnosis and treatment plan.

Withdrawal Periods

Drug administration instructions and stated withdrawal times should be closely followed for the relatively few animal health products that are approved for use in goats. It is important to remember that withdrawal times start after the last treatment has been administered. Administration of drugs not approved for use in goats or administration of approved drugs but in a manner inconsistent with the label directions, falls in the category of "Extra Label Use of Drugs" and must be done under the supervision of a veterinarian, who will recommend appropriate withdrawal times. People are subjected to civil penalties who sell goat products, meat or milk with illegal levels of drugs present.

Grain Overload & Acidosis

These two diseases occur when goats ingest concentrated feeds, usually grains, in larger amounts than their rumen is accustomed to or can process in a timely manner. Keep feed amounts consistent, gradually introduce new feeds into the diet, and store feeds where goats cannot access them. Although vaccination for Overeating Disease (Enterotoxemia) will help protect against one aspect of the problem, it will not protect against any rumen damage caused by the rapidly fermenting grain and subsequent increase in rumen acidity. Animals afflicted with this condition require prompt treatment and veterinary advice should be sought.

Mastitis

Even with the best management, some does will develop mastitis. There currently are no intramammary infusions (lactating or dry treatment) approved for use in goats, so owners have to rely on the use of approved dairy cattle infusion products. When infusing goats, extreme caution must be exercised to prevent introduction of other bacteria into the udder. Milk withdrawal periods established for dairy cattle should be considered a minimum period for withdrawal in goats and determined by a licensed veterinarian.

Zoonotic Diseases

The majority of diseases that affect goats, do not affect humans. However, proper sanitation and hand washing should always be practiced whenever treating or handling goats. There are a few diseases, however, that can also affect humans. These zoonotic diseases include: Q-fever, Vibriosis, Toxoplasmosis, Chlamydiosis, Ringworm, Soremouth, and Caseous Lymphadenitis. Pregnant women are more

susceptible to a number of these and as a routine precaution should not assist with delivery of kids or handle aborting does.

Sanitation

Good sanitation practices will go a long way toward preventing disease in both goats and humans. These practices include:

- a) Wash hands (10 second minimum) always after handling or treating goats and again before eating or drinking;
- b) Keep goat, bird, cat, and dog feces out of feed and water;
- c) Conduct effective rodent control programs;
- d) Immediately isolate and treat sick goats; and
- e) Isolate newly arrived goats until their health status is known.

BUCK MANAGEMENT

Introduction

Bucks are an important part of the breeding herd. However, their care requires additional housing and consideration of seasonal odors and behaviors that may require more secure fencing and careful handling practices. Bucks not planned for use in breeding programs should be castrated early in life. Many small family and youth goat herd owners choose to use the breeding services of bucks in other herds or practice artificial insemination instead of keeping bucks on their premises for breeding a small number of does.

Young Buck Management

Bucks, especially the Swiss breeds, have more rapid development of the horn buds than doe kids. Therefore, to prevent horn or scur (horn regrowth) development, buck kids should be disbudded when horn buds are distinctly palpable, often within the first few days of life. Horn buds quickly develop a ridge of horn tissue in addition to the round horn bud of the female. All developing horn tissue must be cauterized if horn growth is to be prevented on these breeds. Horns are commonly left intact on meat and fiber breeds managed under range conditions, and removed on dairy breeds and other goats managed in confinement.

Buck kids should be separated from doe kids at weaning (or earlier if sexual behavior is observed) to prevent unexpected breedings. Bucks may be housed separately or in groups, but attention should be paid to grouping bucks such that the young or less dominant bucks receive adequate feed and

are not injured by the more dominant bucks.

Nutritional Considerations for Bucks

Bucks require a balanced diet similar to that of the non-lactating doe. However, they are at risk of urinary tract obstruction (urolithiasis) under dietary conditions which may promote the formation of urinary tract stones (calculi) or a decreased water intake. The type of stone formed varies by diet and mineral status of the region. A nutritionist should be consulted to recommend a diet balanced in calcium and phosphorous. Bucks fed entirely alfalfa hay or excessive concentrates (grain) are at higher risk of urolithiasis. Salt intake should be maximized to prevent the formation of urinary calculi. Free-choice, loose salt should be provided at all times; salt intake will be higher when salt is offered loose as opposed to blocks. Commercial diets may be available that provide urinary acidifiers. A nutritionist should be consulted to select the best diet for bucks in a given region and management condition.

Buck Health Care

Routine hoof trimming, vaccination, deworming, and external parasite control for bucks should be planned on the same schedule as for does. Prevention of acute and chronic diseases such as caseous lymphadenitis (abscesses), caprine arthritis-encephalitis (CAE) and Johne's disease will promote a long and productive life for the buck. Often routine health care practices for the buck are overlooked when health care for the doe is scheduled around kidding events.

For bucks with long hair coats (as needed by breed), routine clipping in warm weather will prevent heat stress and maximize fertility of the buck. Clipping also removes matted hair and assists in evaluating body condition.

Routine semen evaluation and examination of the reproductive tract to detect swelling or other abnormalities are recommended to assure fertility of the buck. The prepuce (sheath) should be examined for inflammation and ulceration (pizzle rot), which can be treated with topical antiseptics and may require reduction in protein in the diet that favors the growth of urea-splitting bacteria. Severe swelling may lead to discomfort and impair breeding and should be examined by a veterinarian for additional treatment.

Management Considerations During the Breeding Season

Bucks should enter the breeding season in peak body condition, since they normally show an increase in physical activity and a decrease in feed intake during the breeding season. It may be difficult to assess body condition visually in bucks with long hair coats, so bucks should be routinely handled to determine the degree of fleshing

and their nutrition adjusted accordingly.

Increased odors from scent glands and urine spraying behavior are normal aspects of seasonal buck activity. Urine spraying of the face and front legs may result in hair loss and skin lesions, which spontaneously resolve after the breeding season.

Bucks often become more aggressive during the breeding season. Care should be taken to socialize bucks early in life and provide adequate facilities and equipment to safely handle bucks during the breeding season. Secure fencing is needed to prevent unexpected matings. Normally gentle bucks may show increased aggression or difficulty in handling during the breeding season; this requires greater attention while handling bucks for breeding.

Depending on whether bucks are being used under confinement or range conditions, bucks may be hand-mated to individual does or bred to does in groups. Breeding records are necessary to monitor fertility and document pedigree in herds with selected breeding programs.

HANDLING AND TRANSPORT

Introduction

A certain percentage of goats may be sold or culled and leave the herd each year. Animals may be culled due to low milk production, infertility, disease, lameness, or injury. Culled animals may be destined for processing, auctions, or relocated to other farms.

Goats form a distinct social order and stable social groups. Mixing different stable groups will lead to fighting as a new social structure is reestablished. Some animals may be persistently and severely bullied. Whenever animals are moved or handled, their social grouping should be maintained. If this is not possible, then care should be taken to prevent excessive fighting when new animals are introduced. Adding several goats to an established group is generally less stressful and more successful than the addition of an individual animal.

When animals are sold, every effort should be taken to minimize stress during handling and transportation. Transportation is inherently stressful, so keep handling and transport time to a minimum. Rough handling is never acceptable. Interim holding facilities, such as sale yards, should provide adequate feed, water, and shelter for the animals.

Any medicated animals destined for processing must conform to the legal meat and milk withdrawal times specified on the product label or by the veterinarian's prescription. The use of animal medications by producers in a manner inconsistent with the manufacturer's or veterinarian's

prescription is prohibited by law. Violative levels of any residue in the meat or other tissues of slaughter animals will result in condemnation of the carcass and penalties for the livestock owner.

Occasionally animals may be euthanized or die on the farm. These animals must be disposed of in accordance with local laws, and most are transported to a rendering facility. Some local ordinances require that carcasses be at least 100 feet from the roadside while awaiting pick-up. It is advisable to use "blinds," hay bales, or other barriers to keep carcasses from public view while awaiting pick-up.

Animal Handling

Goats are highly social animals and should be maintained in groups to minimize stress. Goats are generally gregarious, inquisitive, and agile. Goats have long memories of both positive and negative experiences. These animals are responsive to handling by humans, and adapt well to routines. Whenever possible, goats should be habituated slowly to new routines. It is important that all handling experiences are as positive as possible. Handling animals in a manner that excites or provokes them can result in harm to the animal and/or personnel.

Rough handling will lead to vocalization (bleating) and resistance. If goats balk, avoid pressuring them, they will move ahead in their own time without too much delay. There is a tendency for some bucks to turn and fight rather than run away when pursued or threatened.

Handlers should be aware that goats may be aggressive and inflict injury with their hooves or horns.

Goats have panoramic vision, except for small area directly behind them. Therefore, animals should be approached from a direction other than the rear. If there is no alternative, a low, quiet voice will indicate to the animal that someone is approaching and will help prevent startling.

In the wild, goats live in extended family groups and changes in activity are led by dominant does. This behavior can be used to aid the movement of animals. By leading a few does in the desired direction, others will usually follow. Bucks are best handled in groups with wethers or bucks of a similar size. Do not house or transport small or younger animals with mature bucks during the breeding season, as they can be severely dominated. When moving animals to and from holding pens and loading ramps, handlers should act calmly with a minimum of excitement and noise. Animals should not be forced to move faster than a walk. If pushed too hard, fleeing goats will dodge about and escape pursuit using agility and quick maneuvering. A group can easily become scattered. Separation from the group can cause distress and animals should be allowed to regroup as soon as possible.

Properly designed facilities provide for ease of movement, safety for personnel, and minimum stress to the animal. Abusive handling only tends to make goats more excited and prone to harming themselves or others. Extremely excited animals can have elevated levels of stress hormones, such as cortisol that may increase susceptibility to disease or cause abortion in pregnant animals.

Animal Transportation

Goats, especially feral goats, are susceptible to stress when transported. Pneumonia, dehydration, starvation, abortion, and death can result if handlers and transporters are not conscientious in planning and conducting transportation.

Owners or their agents have the responsibility to select and present for transportation only healthy and fit animals. Personnel involved in loading, transporting, and unloading goats should be trained in techniques that avoid stress and trauma to the animals. Animal handling, the duration of transport, climatic conditions, and the vehicle design will all contribute to the overall level of stress in the animals. Trips should be planned to minimize transport time, and avoid extreme temperatures. Both proper ventilation in hot weather and the avoidance of wind chill during cold weather are essential. In summer, trucks must be kept moving to prevent heat from building up inside the trailer. Precautions, such as shade, ventilation, and availability of water should be considered when handling and transporting animals on hot days. Animals in late gestation should be transported only when necessary, and with extreme care, to protect both the doe and fetus. Drivers should avoid sudden starts and stops, erratic speed, and direction changes to prevent animals from colliding and falling.

The transport container should be designed for animals and be free of obstacles that could injure an animal. Doors, gates, and passageways should be designed to allow ease of passage and maintained to avoid hazards. Truck floor space should be allotted so that all animals can stand in a normal position. The floor should be clean, dry, and

non-slip. Internal partitions are useful in maintaining animals in smaller, more uniform, and more familiar groups. Exhaust fumes should not enter the trailers. Vehicles should be equipped with mirrors or inspection ports for load observation. During long trips, the animals should be checked for signs of distress within the first 20 miles and periodically thereafter. Long trips should be planned to allow for ample consumption of feed and water. Animals should not be transported for longer than 24 hours without offloading stops for rest, food and water. When offloading occurs, animals should be given a minimal rest period of 2 hours. Groupings should remain intact to minimize stress. Lactating does should be milked at 12 hour intervals.

Non-Ambulatory Animals

A non-ambulatory animal is one that is incapable of standing or walking without assistance. These animals are often referred to as "downer" or "disabled" animals. Some non-ambulatory animals regain mobility with appropriate care. Others will not respond to treatment and will require euthanasia. California Penal Code Section 599f prohibits stockyards, auctions, and non-federally inspected processing plants from buying, selling, or receiving non-ambulatory animals. It requires that non-federally inspected processing plants, stockyards, and auctions take immediate action to humanely euthanize or remove the non-ambulatory animal from the premises and prohibits the dragging or pushing of the animals.

Every livestock operation will occasionally have to handle animals that are acutely diseased or injured and unable to walk. Handling sick and non-ambulatory animals must be done with a minimum of force and trauma. Non-ambulatory animals

should be protected from direct sunlight, rain, and extreme temperatures. Provisions for feeding, watering, and milking the animal will be necessary.

Handling non-ambulatory animals requires special equipment to assure the animal is not harmed while being moved. Equipment, such as sleds and pallets, is available to safely lift and carry non-ambulatory animals to another location or to a truck for transport.

If the proper equipment is not available, the animal should not be moved. Either the proper equipment should be obtained, or the animal should be euthanized. Diseased or non-ambulatory animals destined for a rendering plant must be euthanized prior to pickup. (For more detailed information see Livestock Conservation Institute, 1992.)

Saleyard and Packing Plant(Abattoir) Handling

Saleyards and packing plants are essential components of the livestock business. Animals in a saleyard are destined for processing or sold singly or in groups to other owners. The saleyard serves as a gathering place for the marketing of animals. These facilities should be designed and maintained so they do not cause injury to animals during loading, unloading, or handling. There should be no sharp edges or projections, and walkways should have non-slip surfaces. Solid sides on loading ramps, alleyways, and in crowd pens will facilitate animal movement.

Animals should be penned according to size, age, and physical characteristics (e.g., horns). Although familiar groups of polled and horned animals may be penned and transported together, care should be taken to

monitor and protect the polled animals. Overcrowding must not occur.

Animals destined for sale or processing should not be treated any differently from animals on a farm. Proper care of animals destined for sale is vital to ensure the animals' future productivity or meat quality at the final destination. Educating employees in proper animal handling practices is essential. Knowledge of basic behavior including the animal's senses of sight, hearing, and smell will facilitate proper handling.

As a general rule, animals should not be without feed or water for more than 24 hours including the time spent traveling and yarding. For immature or pregnant animals, the intervals should be shorter. Watering intervals should also be shorter during hot weather. Sick and diseased animals should be segregated and must not be placed in dead animal holding areas. Ill or injured animals should be separated and receive appropriate medical attention. Any terminally ill or fatally injured animals should be euthanized without delay.

EUTHANASIA OF GOATS ON THE FARM

Introduction

Occasionally it is necessary to euthanize an animal due to illness or injury. Under these conditions, the objective is to provide a swift and humane death, thus quickly relieving the pain and suffering of the animal. Euthanasia is defined as "the act of inducing humane death in an animal." The procedure should be done in a manner that will minimize any stress and anxiety experienced by the animal prior to unconsciousness. Stress can be minimized by proper technical proficiency of the person performing the euthanasia. Correctly done, euthanasia will minimize pain and distress in animals, assure safety of the personnel, and protect other animals and people. In most cases the farm veterinarian will be involved in the decision making process and the euthanasia of the individual animal.

When an animal is euthanized, the first step is to produce rapid unconsciousness. This is followed by respiratory and/or cardiac arrest, and ultimately the total loss of brain function. Several common methods of euthanasia are utilized. Chemical euthanasia using injectable barbiturate is offered by veterinarians, while the physical methods of gunshot and penetrating captive bolt gun may be performed by other trained personnel.

Chemical Methods

Acceptable methods of chemical euthanasia involve intravenous injection of barbituric acid derivatives, which depress the central nervous system leading to unconsciousness, respiratory and/or cardiac arrest. Only individuals licensed by the Drug Enforcement Agency have legal access to barbiturate products. Animals euthanized by barbiturate injection should not be used for human consumption or left in locations where animals may gain access to them.

Physical Methods

The use of a firearm is a physical method that is inexpensive and does not require human contact with the animal. There is potential for ricochet, so strict firearm safety must be observed. All local laws and ordinances pertaining to the use of firearms must be strictly followed. A .22-caliber rifle is sufficient for goats of all sizes. The use of a hollow-point or soft-nose bullets is recommended to increase tissue destruction and decrease ricochet.

A penetrating captive bolt kills by concussion and physical destruction of the brain. Adequate restraint is necessary to properly place the gun firmly against the animal's head at the point of impact. It is important to follow the manufacturer's

recommendations on the selection of the cartridge strength appropriate for the size of the animal.

Non-penetrating, captive bolt guns will stun and not kill the animal. This method must be followed by exsanguination (or another method) to assure rapid death while the animal is unconscious.

Confirmation of Death

Following euthanasia, the animal will collapse and may experience a short period (less than 20 seconds) of intense

muscle contraction. Next, poorly coordinated kicking or paddling movements may occur and be followed by a period of relaxation. The pupils of the eyes should be fully dilated. The animal's vital signs must be monitored for 5 minutes to confirm death. Death is confirmed by the lack of rhythmic breathing, heartbeat, and a corneal reflex. The corneal reflex can be observed by touching the surface of the eye; no blinking or eye movement should occur. An additional euthanasia procedure may be required if there is evidence of any vital signs.

GLOSSARY

Buck	Uncastrated male goat of any age.
Colostrum	Milk produced after kidding by the doe prior to and during the first milking, which contains the immunoglobulins.
Dehorning	Procedure to remove the horns or terminate horn growth permanently.
Doe	A sexually mature female goat.
Drying Off	End of lactation when the milking is terminated and udder is allowed time to regenerate milk-producing tissue.
Dystocia	Difficult birth.
Estrous cycle	Length of time from one period of estrus to the beginning of the next; averages 18 to 23 days.
Estrus	The period of sexual receptivity in the doe.
Fleece	Mohair or cashmere shorn from the goat.
Gestation	The time between conception and kidding.
Gossypol	A toxic component in cottonseed.
Kidding	The act of giving birth by a doe.
Lactation	The period between kidding and drying off when the doe produces milk.
Mastitis	Inflammation of the mammary gland.
Parasite	An organism that lives a portion of its life cycle in or on the host.
Parturition	The process of giving birth, kidding.
Pathogen	Biologic agent (i.e., bacteria, virus, nematode, protozoa) that produces disease or illness.
Roughage	Feeds high in fiber content and low in energy and protein digestibility.
Rumen	The large fermentation compartment of the ruminant's stomach whereby bacteria and protozoa break down fibrous plant material and other feedstuffs, and synthesize essential proteins and vitamins.
Ruminant	Animals, such as cattle and goats, that ruminate and digest cellulose.
Total Mixed Ration	Complete ration consisting of concentrate, roughage, and supplements necessary to meet the daily nutrient and energy nutritional requirements of the goat.
Vaccine	Suspension of attenuated or killed microbes or toxins administered to induce active immunity.
Wether	Castrated male goat of any age.

APPENDIX 1

Body Temperature	39-39.8° C or 102-103° F
Heart Rate	70-130 beats/minute
Respiratory Rate	12-20 breaths/minute
Life Span	Record maximum 23 years; usually 8-12 years
Breeding Life (commercial)	5-8 years
Adult Weight	Varies widely with breed
Length of Estrous Cycle	18-23 days in season (most breeds fall breeders)
Type of Ovulation	Spontaneous
Length of Gestation	144-157 days
Type of Placentation	Cotyledonary epitheliochorial
Birth Weight	Varies with breed (2.2 to 4.2 kg for full size breeds)
Number of Young	1-5, twins most common
Type of Young	Precocial
Passive Immunity	All via colostrum
Weaning Age	Varies with management (may be as early as 4-6 weeks)
Age at Sexual Maturity	4-12 months
Character of Urine	Yellow, clear, pH 7-8, specific gravity 1.015 to 1.035
Character of Feces	Firm dark pellets 0.5-1.0 cm in diameter; softer on lush pasture

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