

Meat Goat Herd Health – Procedures and Prevention

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Unit Objective

After completion of this module of instruction the producer should be able to distinguish between healthy and unhealthy goats when observing goats daily and make decisions regarding treatment of individual animals or the entire goat herd. The producer should be able to read and use the medication tables for withdrawal time and develop an individual farm planning calendar for meat goat herd health. The producer should be able to score a minimum of 85% on the module test.

Specific Objectives

After completion of this instructional module the producer should be able to:

1. State the goal of a herd health program.
2. Identify types of information that should be kept on each goat.
3. Identify factors that can affect herd health.
4. Identify things to look for during the daily observation of the goat herd for health related issues.
5. State factors to consider when dealing with a potential disease outbreak.
6. State the number of days that a new animal shall be quarantined after arriving at the goat farm.
7. State factors a producer should consider when transporting goats across state lines.
8. Identify the goat's normal range of rectal temperature.
9. Identify the goat's normal range of pulse or heart rate.
10. Identify the goat's normal range of respiration.
11. Distinguish between healthy and unhealthy goats by examining the mucous membranes.
12. State the purpose/function of drenching and/or dosing.
13. State the purpose of a balling gun.
14. Match injection needle gauge size to the age/size of the goat.
15. Match the injection methods to the definition.
16. Identify the different types of castration.
17. Distinguish between a cysts and abscesses.
18. State the meaning when an abscess comes to a "head".
19. State safety precautions a producer should take when lancing an abscess.
20. State the purpose of a fecal egg count.
21. State the number of goats a producer should collect fecal counts from based on the size of the goat herd.
22. Identify worming procedures to follow when fecal counts are 2,000 eggs per gram of feces and 1,000 eggs per gram of feces are found.
23. Match the goat's normal range for goat physiological parameters.

24. State the meaning of extra-label drug use.
25. Identify three conditions when a producer may use an extra-label drug.
26. State why producers should restrict access to drugs.
27. Respond to acceptable and unacceptable management practices related to goat herd health at different production stages.
28. State the purpose of the herd health calendar.

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Introduction

The goal of a herd health program is to improve the goat herd's productivity through general husbandry, nutrition, parasite control, vaccination, and environmental management. An understanding of various management practices and common diseases on the farm is necessary to accomplish this goal. An effective herd health program is an essential part of a successful goat management program. Good feeding and breeding will not result in maximum production if goats are not kept in good health. Conversely, good nutrition and herd management will greatly reduce the complexity and cost of the herd health program.



Herd health programs are always described in very general terms and then modified to fit individual herds. The exact makeup of any program depends on the herd size, purpose of having the herd, and the production goals of the owner. For the most part; goats are managed as small groups of five to a hundred animals per herd. There are relatively very few large commercial goat herds with numbers above 500 head in the United States. Large herds may have problems associated with

high density of animals and continuous turn over. Small herds tend to have higher nonproductive/productive ratios than do larger herds. This is because small herd owners often keep animals that would normally be culled in large commercial herds. Often, the net result is the maintenance of animals with chronic illnesses that may serve as reservoirs of disease.

Since each herd is different, each owner should work with his/her veterinarian to create an individual herd health plan. Keep good records for each animal regarding medications, vaccinations, dewormers, diseases, breeding, culling etc., and use this information to plan your herd health program. Preventive medicine is usually less expensive than treating the disease as the highest economic returns are realized when disease problems are at a minimum. Many diseases have similar symptoms and a producer should work with a veterinarian familiar with common goat diseases. A veterinarian familiar with goats has the training and experience needed to provide diagnosis and recommend animal health products used in goats to treat these conditions.

General Herd Health Considerations

An obvious key to a successful meat goat operation is having a healthy, productive herd. Herd health can be affected by a number of factors including genetics, environment, nutrition, and management, among others. The purchase of healthy animals and the provision of a healthy environment with proper nutrition, sanitation, biosecurity measures, and preventative health care are necessary in establishing and maintaining a healthy herd. However, goats can be affected by a variety of diseases and no matter how diligently one follows a strict herd health regime, from time to time animals will become ill.

The onus of detecting sick animals or animals undergoing nutritional or other stress falls on the owner or caretaker and can only be accomplished by daily observation. The producer should

observe unrestrained animals in order to learn how his animals look and behave in a normal manner. This includes general appearance and movement, normal behavior patterns, fecal consistency, eating behavior, teeth, body parts, etc. Any deviation from a goat's "normal" appearance and behavior should be cause for concern and further investigation. When an animal does become ill, it is important to identify that particular animal with the aim of trying to determine what course of action should be taken.



When illness does occur consider that it may be a herd health problem rather than an individual animal problem. This is because goats tend to stay close to one another which can promote the spread of any infectious condition. The following steps can assist you in dealing with a potential disease outbreak.

- Isolate any affected animals.
- Determine if the condition is a single occurrence or the start of a bigger problem.
- Check all animals carefully to identify sick ones.
- Contact your veterinarian to limit loss. It is important to have a prior relationship with a veterinarian. If a veterinarian understands your operation he/she can be of help in preventing problems as well as treating diseases.

If death occurs, submit the goat to your local veterinarian for a post-mortem exam or take appropriate tissues from the animal for diagnosis at a state or other laboratory facility. A post-mortem exam may be more useful in determining the cause of a disease than examining live animals. The results of such an exam may yield an accurate disease diagnosis and allow for proper treatment to begin immediately. It is important to keep the body of a dead animal cool with ice or refrigeration until the examination can be performed. Freezing the carcass will make microscopic evaluation impossible.

Begin with Healthy Animals

To minimize the incidence of disease, it is important that only healthy animals are introduced into the herd. This begins at the time of purchase. Producers should buy only from reputable sources to minimize the chance of buying diseased animals. If animals are purchased at an auction, one can usually expect problems. New purchases should be quarantined for at least 30 days. This allows any diseases that are lingering to express themselves; provides time for new animals to adapt before being exposed to new herd mates; and gives time for the owner to deworm, administer vaccinations, etc., according to his/her established herd health protocol. Depending on the type of operation, testing for any of several disease entities may be advisable. A producer's quarantine protocol along with other procedures to minimize the risk of introducing diseases into the herd should be listed in the farm's biosecurity plan. See the "Biosecurity for Meat Goat Producers" chapter for more information on potential threats and recommended biosecurity plan components.

If animals are moved across state lines, a certificate of veterinary inspection (health paper) is required. This is a common procedure and should not be difficult to obtain. State requirements vary. To view your state's requirements log on to <http://www.aphis.usda.gov/vs/sregs>. Be sure to allow plenty of time to obtain the certificate as some states may require testing that may take several days.

Basic Herd Health Equipment and Supplies

It is best to plan ahead and prepare a basic herd health kit before the need to use it arises. Many of the items included will be used in the preventative care conducted as a part of a comprehensive herd health program and, thus, should already be on the farm. The following list is by no means exhaustive and should be used as a guide for a beginning health kit. As you consult with your veterinarian on a herd health program and annual herd health calendar, the items needed to maintain herd health will become apparent.

Basic herd health supplies

General Health Kit

- Thermometer
- Record book
- Alcohol
- Balling gun and(or) capsule forceps for oral dosing of bolus medication
- Dewormers (anthelmintics)
- Antibacterials/antibiotics (penicillin and tetracycline are most commonly used)
- Biologicals (Tetanus antitoxin, Tetanus toxoid, *C. perfringens* toxoid, *C. perfringens* antitoxin.
- Deworming or drench gun
- Injectables (vitamin A, D, & E, vitamin B complex, BoSe, etc.)
- Syringes and needles of various sizes and gauges
- Sharp's container for used needles such as an old soda bottle
- Ear tagger and tags
- Wound dressing

Kidding Kit

- Iodine (7% tincture) for dipping navels after they are trimmed. Empty film canisters (2/3 full) are handy to prevent spilling or contaminating the main bottle. Spray bottles and teat dip containers can also be used.
- Betadine Scrub® (Povidone iodine) or Nolvasan Scrub® (Chlorhexidine). Disinfectant soap used to disinfect skin or vulva of goat and hands of people. Squeeze bottles are handy for dispensing.
- Nolvasan® solution. Use diluted to disinfect scissors and other equipment.
- Betadine Solution®. Use diluted to disinfect skin, wounds and tissue.
- Obstetrical sleeves and sterile lubricant.
- Paper towels for washing off doe, and for hands.
- Exam gloves
- Newspapers for insulation and sanitation.
- Cloth towels to clean off newborn kids.

- Clean bottle (20 oz. soda bottle) and nipple to feed colostrum.
- Red rubber feeding tube (12 to 14 French) or similar flexible plastic tube, with 60 ml catheter tip syringe or funnel to feed colostrum to weak kids.
- Heat lamps, heating pad, or other means to warm chilled kids
- Body socks or warming box for chilled or weak kids
- Frozen colostrum or source of synthetic colostrum
- Quality milk replacer

Normal Range for Goat Physiological Parameters

Temperature, rectal	103 – 104° F (39 – 40° C)
Heart rate	70 – 90 beats per minute
Respiration	12 – 20 per minute
Rumen movements	1 – 2 per minute
Puberty	4 – 10 months
Estrous cycle	21 days
Estrus (standing heat)	12 – 48 hours
Gestation	150 days

Common Herd Health Procedures

In the normal course of herd health management it will be necessary to perform different herd health procedures. Some of these procedures are performed to collect information on an animal's condition that can be relayed to a veterinarian. Others are needed in the course of disease prevention or treatment. A producer should only attempt those procedures in which they feel comfortable and sufficiently proficient so that no harm can come to the animal. If there is any doubt, consult a veterinarian. The most common procedures done by producers are listed below with a brief explanation of correct methods.

Taking temperature – rectally

The first procedure usually performed on an animal suspected to be ill is to take its temperature. In goats, this is performed rectally. Either a digital or mercury thermometer can be used. Plastic digital thermometers do not break and may be considered as safer to use than a mercury thermometer. A small amount of lubricant may be put on the thermometer and it should be inserted with a twisting motion. A normal goat's temperature should be 103 - 104°F (39 - 40°C).



Pulse or heart rate



There are several places on the goat where the pulse or heartbeat can be felt and measured. Heartbeat can be felt by placing one's fingertips between the ribs behind the elbow. Pulse can be measured using the femoral artery on the inside of the rear leg roughly 1/3 of the way down. Pulse may also be detected by placing the index and middle fingers on the artery located below and slightly inside of the jaw roughly two-thirds to the rear of the muzzle. A normal range is 70 to 90 beats per minute.

Respiration

Respiration is detected by watching movement of the flank or chest. A normal range is 12 to 20 per minute.

Rumen movements

Adequate rumen function is essential for a goat's health. One sign of adequate function is regular ruminal movement. This can be detected by placing the hand on the left flank of the animal. If the rumen feels soft and water-filled this should be noted and reported to your veterinarian. Rumen contractions should be easily felt and should occur 1-2 times per minute.



Checking mucous membranes



Paleness of the mucous membranes in the mouth (gums), vagina and prepuce can be an indicator that the animal is in hypovolemic shock, meaning that there is a decrease in the blood volume circulating in the animal. The color of the conjunctiva around the eyes can be an indicator of anemia that could be caused by a heavy internal parasite burden. Roll down the lower eyelid to look at the color. A pale, whitish color indicates anemia. This color can be scored using the FAMACHA system which is described in the section on Parasites of Goats. Remember that irritation of any

type causes membranes to turn red. This means that an anemic goat with pinkeye may still have red membranes.

Drenching and dosing

Drenching or dosing an animal entails the oral administration of a liquid. The obvious goal of this procedure is to ensure that the animal swallows the full amount given. Grasp the animal under the jaw to raise its head. Raising the head of the animal will assist in ensuring the liquid is swallowed. A finger or thumb can be put into the mouth where there are no teeth (goats lack canine teeth as do all ruminants) to assist in opening the mouth for the drenching equipment. Generally a bottle with a tube over the end or a drenching gun is used. Liquids should be given slowly to allow time for the animal to swallow. Dewormers must be given using appropriate drenching equipment ensuring that they are given over the back of the tongue and swallowed.



Tubing an animal

In some cases it may be necessary to pass a tube down the mouth directly into the stomach in order to administer a large volume of a liquid. This could also be used to feed a young animal incapable of nursing or to either sample rumen contents or insert rumen contents into an animal having severe digestive problems. The size of the tube passed should be appropriate for the animal's size. Generally, a $\frac{1}{2}$ to $\frac{3}{4}$ inch (1 to 2 cm) diameter tube should be used for adult goats. A short metal or PVC pipe (speculum) larger in diameter than the tube to be inserted is placed in the mouth to prevent the goat from biting or chewing the plastic tube. Some people prefer to use a "Harp" speculum instead. The hard-sided tube or speculum is inserted into the mouth of the goat and holds their mouth open while you pass the tube. The plastic tube is then passed down the throat and into the stomach. Administer liquids slowly. Have a veterinarian or person trained in this technique instruct you before attempting it the first time.

The procedure for tubing a neonatal kid is similar to that for adult animals with a few distinctions. For kids, one does not need to use a PVC tube or speculum. The size tube used is smaller for baby goats (12 to 14 French or roughly $\frac{1}{4}$ inch inner diameter). The tube should be flexible without any hard edges to harm the kid's mouth or throat. Hold the kid's mouth open and pass the tube gently over the hump or base of the tongue at the back of the mouth and into the stomach.

There are some precautions to take in tubing an animal to ensure that liquids are not inadvertently administered into the lung. The first precaution is to always hold the goat's head in its normal flexed position. If you extend the head and throat, your tube has a straight shot down the trachea. When doing this, preferably have the goat



standing. As the tube is inserted, watch and feel the throat area. The tube needs to enter the esophagus and not the trachea or windpipe. The esophagus is a smooth, flexible tube leading to the stomach and one can feel or see the stomach tube sliding downwards. The trachea is a rigid tube and the stomach tube can neither be seen nor felt from outside the animal. When the tube is in the esophagus, feel the bottom of the neck. You should feel “two tubes.” One will be the trachea and the other will be the rigid tube inside the esophagus.

Another check can be done while midway down the trachea/esophagus is to suck on the end of the tube. If you are in the esophagus, it will collapse on the tube and you will create a vacuum. Alternatively, blow in the tube and you will see a bolus of air go down the esophagus. If using a stethoscope applied to the goat’s rumen on the left side of the body, you will hear air bubbling. Sucking on the tube while it is in the rigid walled trachea will not create a vacuum. One can also check for the smell of rumen fluid to ensure correct placement. To ensure proper depth of penetration, place the tube along the outside of the animal stretching from the mouth to the last rib, a point that would be inside the stomach, and put a mark on the tube. Use this as a guide when inserting the tube. Never rely on the goat coughing as a guide to proper tube placement. It is not a reliable test.

Bolus administration - “Balling”

A “balling gun” is used to administration tablets or boluses to an animal. A balling gun has a holder for the tablet in the end and a plunger to expel the tablet into the throat. Large boluses should be lubricated with



vegetable or mineral oil for easier swallowing. Pass the balling gun over the hump of the tongue and press the plunger while holding and tilting the goat’s head upwards. Ensure the tablet is swallowed by holding the mouth shut. Stroking the throat can also elicit a swallowing reflex.

Be very gentle in placing the balling gun into the mouth and expelling the pill. The tissues of the throat are very delicate and pills and guns have sharp edges. This can result in serious damage to your goat or minimally a goat with a very sore throat that will not eat. Newer model balling guns have soft plastic heads that reduce the potential for injury.

Paste administration

Dewormers, rumen pastes, and the like may come in a tube and are given through the use of an instrument resembling a caulking gun. Hold the animal as described for “balling,” insert the end of the tube into the mouth and squeeze the handle the correct number of “clicks” to deliver an appropriate dose. Again, holding the goat’s mouth shut will assist in swallowing.



Giving injections

Administering drugs via injection is a common herd health procedure routinely practiced by almost all producers. Following proper guidelines for each type of injection and using proper equipment will ensure that injections are done correctly and inflict minimum stress on an animal. Proper sanitation will ensure that you don't inject bacteria into your goat and cause an infection. Dirty needles and syringes should never be used. Using needles and syringes on multiple animals can transmit disease. After making six to ten injections with a needle it will be dull and should be changed and disposed of properly.

Needle selection

Proper injection technique includes selection of an appropriate size syringe and needle. Syringes should have volume markers that would ensure administration of the correct amount of drug. Needle gauge should be considered as it relates to injection type and thickness or viscosity of drug. In general, 18 to 20 gauge needles (as gauge number increases, needle diameter decreases) are sufficient.



Recommended needle sizes and lengths used in goats

<i>Age</i>	<i>Gauge</i>	<i>Needle length</i>	
		<i>Intramuscular injection</i>	<i>Subcutaneous injection</i>
< 4 weeks old	20	½ inch	½ inch
4 to 16 weeks	20	5/8 to ¾ inch	½ inch
4 to 6 months	20	1 inch	½ inch
> 6 months	18 to 20	1 inch	½ inch

Proper injection sites

Live animals are considered unprocessed food, especially if those goats are intended for slaughter and later used in the food chain. Injection site lesions should be a major product quality concern for goat producers raising goats for meat. Injection-site defects are lesions or scars found in cuts of meat that result from tissue irritation caused by the administration of intramuscular or sometimes subcutaneous injections. In addition to the scarred tissue, tenderness of the meat is also significantly reduced in the affected area surrounding the site. Proper injection sites are described for each type of injection described.

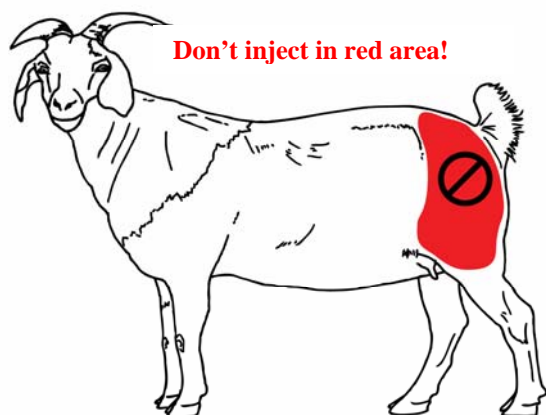
Common injection methods

The three most common injection methods are subcutaneous (SQ, under the skin), intramuscular (IM, in the muscle), and intravenous (IV, into a blood vessel, usually the jugular vein). Subcutaneous injections are the easiest to give and intravenous the most difficult. Whenever a drug or vaccine lists SQ as an option for injection use the SQ route. Only experienced personnel should attempt to give an intravenous injection and professional assistance should be used in most instances. Intravenous injections provide the fastest absorption of a drug by the animal while subcutaneous the slowest.

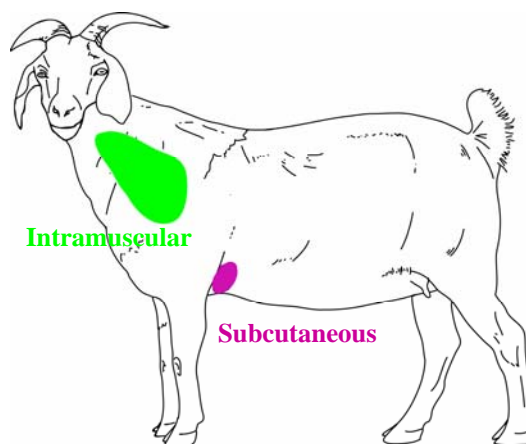
Subcutaneous injections

To inject subcutaneously, pull up a pinch of skin making a tent. Insert the needle into the tent taking care not to pierce through the other side. Depress the plunger slowly. Injecting with the needle pointing towards the ground will lessen the likelihood of the material leaking out of the hole left by the needle. Massage the injected area. If administering large amounts of a drug, over 3 milliliters (ml or cc), it is best to divide the dose among two or more sites not giving more than 2 or 3 cc per site. The preferred site for SQ injections is the skin just behind the elbow, although they can also be given in the triangular area in front of the shoulders between the top and bottom of the shoulder blade and corner of the jaw. Vaccines often cause swellings or “knots” and a knot behind the elbow indicates an injection site whereas a knot in the neck in front of the shoulder could possibly be confused with a caseous lymphadenitis abscess.





Drawings by K. Williams.



Proper sites for intramuscular and subcutaneous injections.

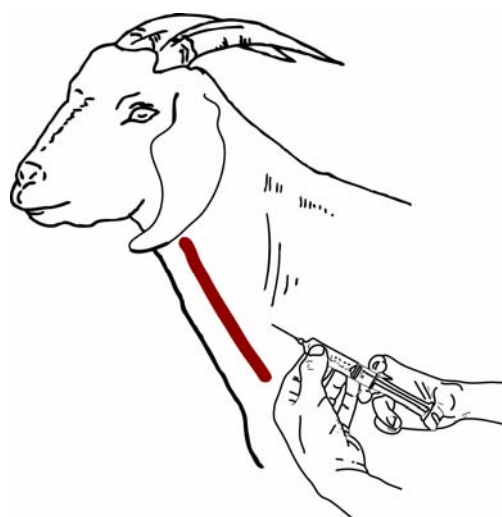
Intramuscular

An intramuscular injection calls for the needle to be inserted into a muscle. Intramuscular injections are commonly given in the triangular area of the neck, in front of the shoulder. Do not give intramuscular injections in the loin or hind leg of goats that are used for meat purposes to prevent injection site blemishes from occurring that lowers the value of the meat. Volume given in the muscle should not be more than 3 ml per site.

After inserting the needle, pull back on the plunger slightly to make sure a blood vessel has not been penetrated. Administer the drug slowly. If a blood vessel has been pierced, the needle can be withdrawn slightly, repositioned, and checked again. Never give an injection near the spine to prevent accidentally causing nerve damage.

Intravenous

An intravenous injection requires skill to locate a vein, usually the jugular vein in the neck, insert the needle, and ensure that the needle remains in the vessel while the drug is given. Prior to attempting this, it is best to receive training from a veterinarian. Animals may react quickly to drugs given in this fashion due to rapid absorption. Very few drugs need to be given intravenously; however, blood samples often need to be collected and the technique is the same. The easiest approach is to have someone straddle the goat to hold it securely. The holder will elevate the goat's head up and to the side. If you have clippers, clip all of the hair off the bottom third of the neck. Feel for the trachea on the neck and move towards the top of the neck. The area between the trachea and the muscles of the neck is the "jugular groove" and is where the jugular vein lies. Put pressure at the bottom of the groove and you will see the



*Proper site for intravenous injection.
Drawing by K. Williams.*

groove swell from your finger up to the jaw of the goat. The vein is now filled with blood. Using an 18 to 20 gauge needle, direct it at an angle of 45 degrees then stab through the skin. Pull back on your syringe and see if there is blood present. If not, adjust the depth (deeper or more shallow) or move up or down the side of the groove until blood is obtained.

When you are injecting drugs IV, it is important to ensure that all of the drug enters the vein. Give the drug slowly. The jugular vein will take the administered drug straight to the heart and at high concentrations many drugs can cause problems with the heart. IV drugs given around the vein instead of in the vein can cause an irritation or inflammation of the vein.

Minor Surgical Procedures

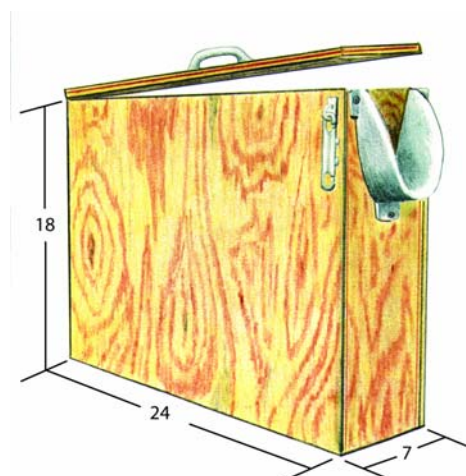
Castration

Males not wanted as replacement bucks should be castrated. Castration can be done by various means as early as between 2 to 4 weeks of age. There are several methods of castration and the method selected will depend upon the age of the animal. The most common methods are elastrator band, Burdizzo® or other clamp, or surgical methods. General sanitation and vaccination precautions should be followed. Additional information on castration procedures can be found in the Meat Goat Management chapter.

Some producers may delay castration until bucks are 2 to 3 months of age. This may lessen the incidence of urinary calculi or bladder stones (see the Goat Diseases chapter) in animals on a high grain or concentrate diet. Also, remember that intact bucks have high levels of testosterone which acts as a growth promotant and stimulates the production of lean muscle mass. Many goat meat consumers that eat young goats do not care if the meat comes from intact or castrated males. There are some ethnic markets that actually prefer meat from mature bucks. Know the market in your area. The point being that if it is not necessary to castrate goats for marketing purposes, then don't. However for breeding purposes realize that some bucks are fertile and ready to breed by 3 months of age and unwanted males should be castrated or separated from fertile females. In most climates, photoperiod effects keep this from being a practical problem until kids are 9 to 12 months of age. In general, castration at an early age is the normal practice to reduce shock to the animal. Older animals should receive some type of anesthesia prior to castration and a veterinarian consulted.

Dehorning

Most meat goat producers will elect not to dehorn their goats. If the decision is made to raise goats without horns then kids should be disbudded in the first two weeks of life. Buck kid horns grow faster than doe horns. Some large single buck kids should be disbudded within the first week after birth. Disbudding a buck kid is the true test of proficiency of the person doing the dehorning and many fail, judging by the number of scurs seen on adult bucks. If you try to disbud a buck kid whose horn base is wider than a regular disbudding iron,



*Dimensions of a disbudding box in inches.
Drawing by K. Williams.*

you will get regrowth of the horn in a crown outside the burned area. If you try to disbud a small kid with a wide calf dehorner, you may get regrowth of the horn from the center of the ring. If one person is doing the job, a disbudding box offers the best and safest restraining device. Approximate dimensions are given the accompanying illustration.

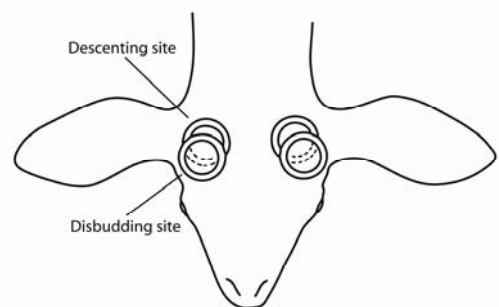
The use of a local anesthetic is commonly advocated; however, the actual technique is not easy and the baby goat will scream while being held in preparation for a ring block or a cornual nerve block. One week old kids are small animals and cannot be given large doses of lidocaine or toxicity will result. A one week old kid should get no more than 1 cc total of lidocaine. One technique used is to dilute the lidocaine with distilled water allowing a larger volume to be injected into the locations shown below. Have a veterinarian administer the anesthetic or train you in the procedure.



Drawing by K. Williams.

Veterinarians typically use systemic anesthetics to anesthetize the goat for dehorning. The commonly used drugs are xylazine (Rompun) and ketamine (Vetalar). These can only be administered by a veterinarian.

The disbudding equipment most commonly used is an electric-heated metal rod with a hollowed-out end. Newer cordless, butane gas powered dehorner are available. Some disbudding irons have problems in maintaining a constant temperature, and it is extremely important to match temperature and time. Under-burning of the horn bud will result in scurs while over-burning will lead to brain damage or death. The horn buds can generally be felt in young kids to ensure proper location to burn. After the disbudding iron is hot, apply it firmly over the horn area and rock it around slowly for 3.5 to 4 seconds. Remove the iron and repeat if necessary and do the other side. Evaluate the success of the procedure by its appearance. The goal is to have the area look like "chrome tanned leather". Black color represents burned hair and is indicative of inadequate burning. Clipping the site prior to burning will eliminate the problem of burned hair. Scent glands are located near the base of the horn and descenting could be done at the same time if desired. Inject the kids with 150 IU tetanus antitoxin. Although the risk of tetanus after disbudding is not great, it is a good practice to administer tetanus antitoxin.



Drawing by K. Williams.

An alternate disbudding method is the use of a caustic paste. The hair around the horn bud should be clipped and the paste applied. A ring of petroleum jelly around the horn bud may help prevent the paste from burning other skin tissue. Caustic paste sounds more benign than burning horn tissue; however, the paste has a bad habit of causing chemical burns on other parts of the goat or on his/her pen mates. To use caustic paste make sure that the kid is kept by itself

so that it doesn't rub the chemical on the udder of its mother or the faces of its friends (not practical with most meat goat kids) and that it is kept out of the rain so that rain water doesn't wash the chemical into the goat's eyes.

Lancing abscesses

Goats get a variety of swellings or "knots" at various locations on their bodies. Some of these are cysts (fluid filled structures) and some of these are abscesses (pus filled structures). There is a disease of goats called caseous lymphadenitis (CL) that causes abscess in the lymph nodes of goats. See the section on infectious diseases of goats for more details.



CL abscess on right jaw.

One way of speeding the healing of an abscessed goat and of containing all of the infectious material from the abscesses is to lance it. This is usually a very simple and safe procedure. The first thing to do is be patient.

Wait until the abscess comes to a "head." This is when the abscess is attached to the skin and the hair has begun to come off at the top of the abscess. The center of the abscess will soften. At this point, there are no vital blood vessels or other structures between the pus in the abscess and the outside of the goat.

Since pus is infectious to other animals and humans, wear gloves when performing this procedure. Remove any remaining hair from the region. Scrub the area with disinfectant soap (Betadine Scrub®) and restrain the goat. If this is done correctly it is not a painful procedure for the goat. Take a pinch of skin in the center of the abscess with your gloved hand or a surgical tool (such as a towel clamp) and stab a scalpel or sharp, sterilized knife blade deeply into the abscess and cut out a circle of skin. Just slashing the abscess may allow the cut to seal over before the abscess has healed from the inside out. There will be some white, or greenish white, odorless pus come out of hole created in the abscess. Catch it in a disposable bag and dispose of it where other goats can't get into it. Caseous lymphadenitis is a contagious disease. It is also a zoonotic disease, meaning it can be transmitted to humans, so wear gloves and sanitize your hands and equipment used after this procedure.

After lancing the abscess flush the area with diluted Betadine Solution® (10:1, 10 parts water to 1 part solution) to flush out any residual pus or bacteria. Make sure you keep the goat away from other goats until the lesion has completely healed.

Procedure for Counting Fecal Eggs

Conducting a fecal egg count is an easy method for determining the severity of internal parasite infection in a goat. The procedure is simple but does require some special pieces of equipment. However, once all of the required items have been acquired, very little time is needed to count fecal eggs and the information provided to a producer can be very valuable in making health and management decisions. Further, once the procedure has been mastered, it is possible for a

producer to test the effectiveness of the dewormer (anthelmintic), whether conventional or alternative, being used through performing a fecal egg count reduction test.

The fecal egg counting procedure described here is a modified version of the McMaster technique. The principle of the procedure is that fecal eggs excreted in the manure will be separated from the manure so that they can be counted. This is accomplished through the use of a flotation solution, a special microscope slide, and a microscope.

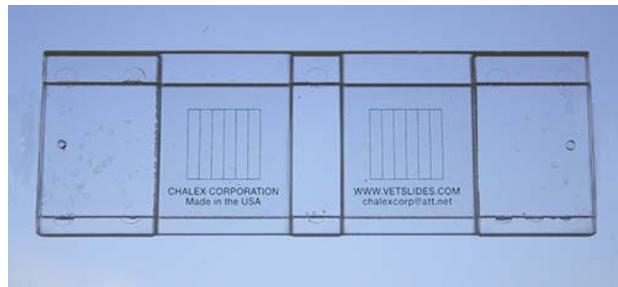
Equipment needed

The equipment needed to conduct a fecal egg count includes:

- Microscope having a 10X objective and 10X wide field (WF) eyepiece. A mechanical stage allowing ease of movement of the slide is preferable.
- McMaster slide, the special slide in which the fecal eggs are counted. These are available from Chalex Corporation phone 425-391-1169 or WWW.vetslides.com.



Suitable microscope.



McMaster fecal egg counting slide.

- Thirty cc syringe
- Three cc syringe with the end cut off **or**
- Balance or scale that weighs accurately to 0.1 grams
- Teaspoon/tongue depressor/popsicle stick/spatula
- Eyedropper
- Small dish, such as a salsa dish
- Tea strainer



Basic equipment needed to conduct fecal egg counts using a scale.

Flotation solutions

One of the following flotation solutions having a specific gravity of 1.20 needed to float eggs must be made or purchased.

- Add 1 1/4 cup sugar to 1 cup water and mix (easiest to mix) *or*
- 34% solution of zinc sulfate (used for footbath) *or*
- Saturated sodium nitrate solution (28%, fertilizer) *or*
- Saturated solution of salt, rock salt or uniodized salt (requires heating and a lot of stirring) *or*
- Fecasol or generic fecal float solution available for \$5-10./gal from a veterinary supply store

Collecting fecal samples

For most producers, it is unrealistic to expect that every goat will be sampled and tested. The following suggestions may serve as guidelines for the number of goats needed to be sampled and tested.

- If the herd consists of fewer than 8 goats, sample all goats.
- For herds up to 50 in number, sample 8 to 12 goats.
- For herds up to 100, sample 15 to 20 goats.
- If goats are sampled several times during the year to monitor fecal eggs, it is best if the same animals are being sampled.

The fecal samples collected must be fresh. This can be accomplished in two ways. A producer can watch his/her goats and collect fresh pellets after defecation or the producer can put on an examination glove, lubricate with water and tease five to six pellets from the rectum. In either case, the pellets should be stored in a ziplock bag and animal number recorded. Pellets can be stored in the refrigerator or on ice for 3 to 4 days but should not be frozen. However, it is best to conduct the test directly after collecting the fecal samples.

Procedure

1. Fill the 30 cc syringe to exactly 28 cc with the flotation solution.
2. Add the 28 cc to the small dish.



28 cc (ml) of flotation solution.

3. Add the correct amount of feces in one of two ways. If using a balance, weigh 2 grams of feces. It may be necessary to break a pellet to get within 0.1 grams of 2.0 grams. If a balance is not available, refer to the following section on an ***alternative procedure for measuring 2 grams of feces.***



2.0 grams of feces are weighed.

4. Place 2.0 grams of feces into the tea strainer sitting in the small dish with the flotation solution.
5. Use a spoon or other tool to crush and break up feces forming a slurry. This usually takes roughly 2 minutes.



The 2 grams of feces placed in the tea-strainer in a small dish.



A teaspoon is used to mash the feces forming a slurry.

6. Lift the tea strainer out of small dish and discard the fecal residue.



Remove the tea-strainer and fecal residue.

7. Stir the solution in the dish 8 times with a spoon using a back-and-forth motion. Then use an eyedropper to fill one chamber of the McMaster slide.



Stir the solution 8 times with a back-and-forth motion.

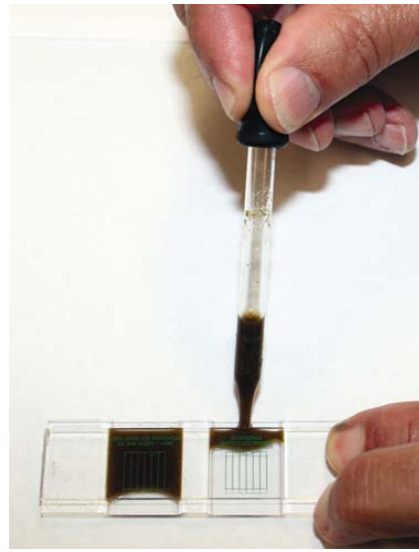


Fill an eyedropper with fecal solution.

8. Repeat the above step and fill the other chamber of the slide.



Fill one side of the slide.



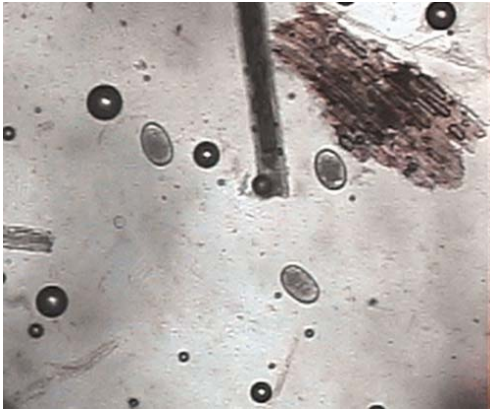
Repeat the procedure to fill the second side.

9. Allow slide to sit 5 minutes.
10. Look at the slide under microscope. Focusing on air bubbles trapped in the slide will give proper focus.
11. Orient the slide to begin in one corner of the marked lanes. The slide has two squares each of which is marked off into 6 lanes. Begin in the corner of one square and start counting up one lane, ensuring that both marked sides of the lane are visible. Move the slide over to the next lane and count down. Repeat this procedure until all 6 lanes are counted.

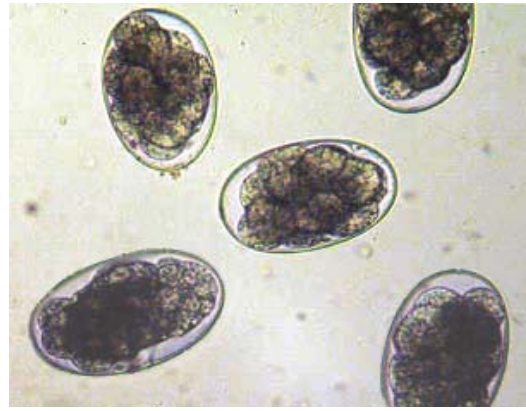


Corner of the McMaster counting chambers.

12. The eggs of interest will appear oval and similar to rounded-end footballs in shape.
13. While it is possible to identify tapeworm eggs and coccidia, the eggs of most interest are the oval shaped roundworm eggs. These should be counted.



Haemonchus contortus (barberpole worm) eggs.



Close-up of eggs.

14. Count all eggs in 6 lanes in one chamber or half of the slide then repeat on the other half.
15. Total the number of eggs from both squares. (The number of eggs in each square should be similar. If this is not the case, the slides may need to be reloaded and recounted.)
16. Multiply that number by 50 to calculate eggs per gram feces.

Some general recommendations for deworming are to deworm dry does and bucks when 2,000 eggs per gram of feces are found. All other animals should be dewormed when having 1,000 eggs per gram of feces. After deworming, do not return animals to contaminated pastures.

An alternative procedure for measuring 2 grams of feces

An alternative procedure for measuring 2 grams of feces uses a 3 cc syringe with the tip cut off instead of a scale.



Basic equipment needed to conduct a fecal egg count using a cut off 3 cc syringe.



Use a sharp knife to cut the tip of a 3 cc syringe.

Mash feces into the 3 cc syringe that has had the end cut off. Form a solid column of feces in the syringe.



Fill the cut syringe to the 3 cc mark with feces.

To pack the syringe and get rid of air spaces, place the syringe upside down and press on the plunger.



Packing the syringe.

After packing the syringe, depress the plunger to the 2 cc mark and cut off the excess fecal material.



Cut off excess fecal material past the 2 cc mark.



The syringe with 2 cc of feces should look like this.

Push the remaining 2 cc of feces into the tea-strainer sitting in the small dish with the flotation solution. The remaining steps are identical to the procedure using fecal pellets.



Push the 2 cc of feces into the strainer and continue with the procedure as above for fecal pellets.

Conducting a fecal egg count reduction test

The problem of internal parasites developing resistance to dewormers is growing throughout the world. To determine the effectiveness of an anthelmintic, conventional or alternative, used on farm, a fecal egg count reduction test (FECRT) can be performed. The FECRT will assist the producer in determining the percentage of reduction of internal parasite eggs due to the anthelmintic treatment.

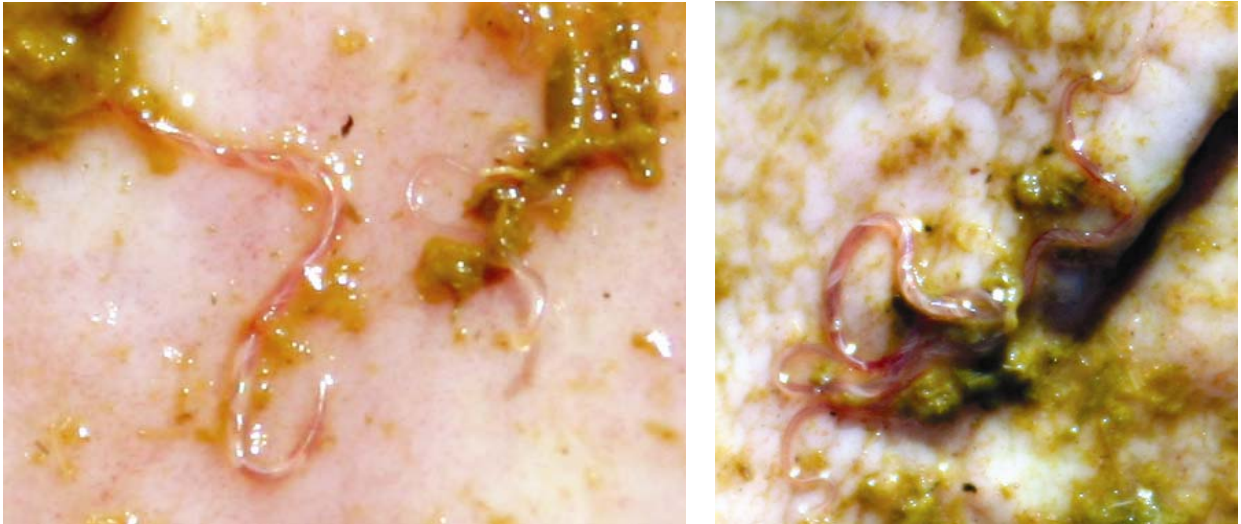
The steps in conducting a FECRT are as follows:

1. Use a minimum of 12 - 24 animals depending upon herd size.
2. Divide the animals into a control and a treatment group.
3. Collect fecal samples from all animals.
4. Deworm the treatment group animals based upon liveweight.
5. Conduct fecal egg counts on all collected samples (Time 1).
6. Between 7 and 10 days after deworming, collect fecal samples from all animals in both

- groups (Time 2).
7. Conduct fecal egg counts on all samples.
 8. Calculate the percentage reduction in fecal eggs as follows:

$$\text{FECR (\% reduction)} = \left(1 - \frac{T_2}{C_2} \right) \times 100$$

Where T_2 is the average fecal egg count of all treatment animals at Time 2 and C_2 is the average fecal egg count of all control animals at Time 2. A reduction of less than 95% is evidence of anthelmintic resistance. If the fecal egg count reduction is less than 65%, the dewormer is not effective.



Haemonchus contortus (barberpole) worms in the abomasum of a goat. Note the red and white stripes similar to a barberpole.

Goat Guideline for Anthelmintic Dosages (internal parasite dewormers) July 2006

****Important --- Please read notes below before using this chart****

Animal Weight		Oral dosing. <i>Note: 1 ml = 1 cc</i>						Subcutaneous injection
		Valbazen Albendazole ¹	SafeGuard Fenbendazole ²	Ivomec Ivermectin ³	Levasole Levamisole ⁴	Cyductin Pour on Moxidectin ⁵	Cyductin Drench Moxidectin ⁶	Cyductin *Injectable* Moxidectin ⁷
		20 mg/kg 2 ml/ 25 lb	10 mg/kg 1.1 ml/ 25 lb	0.4 mg/kg 6 ml/ 25 lb	12 mg/kg 3 ml/ 25 lb	0.5 mg/kg 1.1 ml/25 lb	0.3 mg/kg 3.4 ml/25 lb	0.2 mg/kg 1 ml/ 110 lb
20	9.1	1.6	0.9	4.8	2.4	0.9	2.7	0.2
25	11.4	2.0	1.1	6.0	3.0	1.1	3.4	0.2
30	13.6	2.4	1.4	7.2	3.6	1.4	4.1	0.3
35	15.9	2.8	1.6	8.4	4.2	1.6	4.8	0.3
40	18.2	3.2	1.8	9.6	4.8	1.8	5.4	0.4
45	20.5	3.6	2.1	10.8	5.4	2.1	6.1	0.4
50	22.7	4.0	2.3	12.0	6.0	2.3	6.8	0.5
55	25.0	4.4	2.5	13.2	6.6	2.5	7.5	0.5
60	27.3	4.8	2.7	14.4	7.2	2.7	8.2	0.5
65	29.5	5.2	3.0	15.6	7.8	3.0	8.8	0.6
70	31.8	5.6	3.2	16.8	8.4	3.2	9.5	0.6
75	34.1	6.0	3.4	18.0	9.0	3.4	10.2	0.7
80	36.4	6.4	3.6	19.2	9.6	3.6	10.9	0.7
85	38.6	6.8	3.9	20.4	10.2	3.9	11.6	0.8
90	40.9	7.2	4.1	21.6	10.8	4.1	12.2	0.8
95	43.2	7.6	4.3	22.8	11.4	4.3	12.9	0.9
100	45.5	8.0	4.6	24.0	12.0	4.6	13.6	0.9
105	47.7	8.4	4.8	25.2	12.6	4.8	14.3	1.0
110	50.0	8.8	5.0	26.4	13.2	5.0	15.0	1.0
115	52.3	9.2	5.2	27.6	13.8	5.2	15.6	1.0
120	54.5	9.6	5.5	28.8	14.4	5.5	16.3	1.1
125	56.8	10.0	5.7	30.0	15.0	5.7	17.0	1.1
130	59.1	10.4	5.9	31.2	15.6	5.9	17.7	1.2
140	63.6	11.2	6.4	33.6	16.8	6.4	19.0	1.3
150	68.2	12.0	6.8	36.0	18.0	6.8	20.4	1.4

¹**Valbazen** Suspension (11.36 % or 113.6 mg/ml): *Do NOT use in pregnant does in the first trimester of pregnancy.* Meat withdrawal time is 9 days and 7 days for milk (FARAD).

²**Safe-Guard/ Panacur** Suspension (10% or 100 mg/ml): Approved in goats at 5 mg/kg with meat withdrawal time of 6 days and no withdrawal period for milk. Although the label dose in goats is 5 mg/kg, it is generally recognized that 10 mg/kg dosage is required for good efficacy. At 10 mg/kg dosage, meat withdrawal is 16 days and 4 days for milk (FARAD).

³**Ivomec Sheep Drench** (0.08% or 0.8 mg/ml): Protect from light. Coughing may occur during and following drenching. Meat withdrawal time is 14 days (FARAD).

⁴**Levasole Soluble Drench Powder (Sheep)**: Oral solution ONLY. To prepare use 1 packet (13 gm/11.7 gm active ingredient) dissolved in 262 ml [8.9 oz.] water (44.7 mg/ml) {or 52 gram packet dissolved in 1048 ml water [35.4 oz.].} NOTE: This is different dilution from the label directions for administration. Meat withdrawal time is 4 days (FARAD).

⁵**Cydectin Pour on for cattle** (0.5% or 5 mg/ml): Meat withdrawal time is 23 days. *Not for use in lactating dairy goats.*

⁶**Cydectin Drench for sheep** (.1% or 1 mg/ml): Meat withdrawal time is 14 days. *Not for use in lactating dairy goats.*

⁷**Cydectin Injectable for cattle** (1% or 10mg/ml): GIVE SQ. Meat withdrawal time is 30 days. *Not for use in lactating dairy goats.*

NOTE for Guideline for Anthelmintic Dosages in Goats

The attached chart was developed by Ray M. Kaplan, DVM, PhD (University of Georgia) and modified by Patty Scharko DVM, MPH (University of Kentucky.) and Lionel Dawson DVM, PhD. (Oklahoma State University). It is provided as a possible guideline for anthelmintic (deworming) dosages for goats. Producers should consult their veterinarian for advice on their specific management situation for determining dosages for their herd. *With the exception of fenbendazole administered at the 5 mg/kg dose, these drugs are not approved by the Food and Drug Administration (FDA) for use in goats, and when used in goats are considered extra-label use (fenbendazole at the recommended dose rate of 10 mg/kg is considered extra-label usage). The FDA regards extra-label use of drugs as an exclusive privilege of the veterinary profession and is only permitted when a bona fide veterinarian-client-patient relationship exists and an appropriate medical diagnosis has been made. The chart is intended to serve as guideline for improving accuracy when dosing goats with an anthelmintic, but these drugs should be used in goats only when appropriate veterinary advice has been received.*

Drug resistance in parasites of goats is extremely common. The effectiveness of an anthelmintic should always be tested before being used by performing a FECRT (Fecal Egg Count Reduction test) or larval development (DrenchRite) assay if available.

*** The current recommendation is to use the Cydectin cattle **injectable** formulation and **NOT** the **pour-on** formulation (orally) or the sheep oral drench. When administered by subcutaneous injection, moxidectin provides improved drug levels as compared to when administered orally.*

Extra-Label Drug Use

There are few drugs for use in goats that have Food and Drug Administration (FDA) approval. Administering any drug not specifically labeled for use in goats or any product, either prescription or over the counter, that is not used as directed on the label is considered “Extra-label” or “off-label” drug use. Only veterinarians may prescribe or use products “off-label” or “Extra-label” provided they have a valid veterinarian - client - patient relationship (VCPR) with the producer.

The issue of “extra label” use also applies to feed medications not approved for use in goats. While extra-label use of medications in or on animal feed is prohibited, in 2001 the FDA provided guidance on extra-label use of medicated feeds in minor species such as goats. In brief, extra-label use of medicated feed in minor species is limited to treatment of animals whose health is suffering or is threatened or whose death may result from failure to treat. If medicated feed is to be used in a food producing minor species, the product used must be approved for use in a food producing major species. The FDA discourages use of medicated feed in an extra-label manner for improving rates of weight gain, feed efficiency, or other production purposes.

Most goat producers are unaware that they do NOT have “extra-label” drug use privileges. Only veterinarians who have established a VCPR with a particular client may prescribe or use drugs in an extra-label manner on that client’s animals if the animal health is threatened and suffering or death may result from failure to treat. To establish a VCPR, the veterinarian should have visited the farm, and have a thorough knowledge of the management of these animals, or has recently seen the animal to be treated. Once a VCPR has been established, the veterinarian may use drugs in an extra-label manner provided that the client has agreed to follow his or her recommendations.

Three conditions of extra-label drug use

1. The veterinarian has examined the animal(s) in question recently and has made a diagnosis and a determination that products with proper labeling will not work in this instance.
2. The client has been instructed by the veterinarian in the proper use and administration of the product, a withdrawal period has been determined, and the client is willing to follow the instructions given by the veterinarian.
3. The veterinarian is available to respond to any adverse reaction or follow up examination and treatment that may occur to the animal due to the administration of the drug or failure of the drug to work.

FDA criteria for using pharmaceuticals extra-label

The FDA has also established five criteria that must be met before any drug may be used in a food-producing animal in a manner different from that product's label.

1. The veterinarian must first examine the animal and assumes responsibility for making clinical decisions regarding the health and treatment of the animal within the guidelines of a VCPR. Often a goat owner will not have the animal examined by a veterinarian, but will telephone a veterinarian, who may never have visited the farm, with a list of symptoms and ask for a recommended treatment. This does not qualify as VCPR!
2. The second criterion requires that the veterinarian determine there is no marketed drug specifically labeled to treat the diagnosed condition, or that the recommended dosage on the label for that product is clinically ineffective. Since there are few drugs labeled for use in goats, it is not difficult to determine whether or not there is a legally licensed product available.
3. The third criterion requires that the individual animals to be treated are clearly identified, and that accurate records be maintained regarding the treatment of those specific individuals. If there is no permanent identification such as an ear tag, notch, or tattoo, the owner must make some effort to identify the treated animals with a visible temporary mark by using temporary tags or paint. If possible, these animals should be isolated. Records on animals and treatment must be kept for future reference to avoid any drug residues in the meat or milk.
4. The fourth criterion requires that a significantly extended time period be assigned for drug withdrawal prior to marketing meat or milk from treated animals when pharmaceuticals are used in an extra-label manner. The owner must keep accurate records of the treatment, namely the person treating this animal, date, route of administration, product used and a proper withdrawal period. Proper withdrawal period can be obtained from your veterinarian. Most goat owners casually treat their animals and do not keep proper records of animals treated, drugs used or proper withdrawal period for that product. If no information is available to establish a withdrawal time, then the treated animal or animal products such as milk and meat are permanently barred from the human food chain.
5. The last criterion details the information that must be listed on the drug dispensed for extra-label use. The label should include the name and address of the veterinarian, the established name of the drug(s), and the specific directions for use including: dosage, routes of administration, frequency of treatment, duration of therapy, cautionary statements, and the withdrawal time for any food that might be derived from the treated animal.

Ten Drug Use Tips

1. Read the label carefully - labeling directions change frequently.
2. Use drugs only in animal species listed on the label - drugs used in other species may cause adverse reactions, illegal residues, and possible animal deaths.
3. Use the proper dose for the species and size of animal to be treated - overdosing can cause illegal residues.
4. Calculate pre-slaughter drug withdrawal times accurately - determine pre-slaughter withdrawal and milk discard times from the latest drug administration.
5. Use the correct route of administration - giving drugs incorrectly can lead to drug ineffectiveness, adverse reactions, illegal residues, and possible animal deaths.
6. Do not "double dose" - use of the same drug in the feed and by injection can cause illegal residues.
7. Select needle size and injection sites carefully, if injections are necessary - misuse can lead to tissue damage, reduced effectiveness, and/or illegal residues.
8. Allow proper withdrawal times for feed containing drugs - during the withdrawal time ensure that storage bins and feed are completely free of medicated feed and feed only drug-free feed or illegal residues may result.
9. Keep accurate records of drugs used and animals dosed - poor records can be costly if drug residue violations occur.
10. Seek the advice of your veterinarian - your records will allow him/her to provide safer and more effective treatment and save you money by preventing illegal residues.



For a complete explanation of all the precautions you need to take in using any particular drug or feed medication, first consult the drug label or feed tag. If you have any questions about the proper use of any drugs, see your veterinarian.

Medications Commonly Used in Goats and Approximate Withdrawal Times

The following tables list medications commonly used in goats with their dosages and estimated withdrawal times (WDT). These tables are adapted with permission from the author Dr. Seyedmehdi Mobini of Fort Valley State University, Fort Valley, GA, from a paper that appeared in the proceedings of the Georgia Veterinary Medical Association Food Animal Conference in 2003. These recommendations were formulated by Dr. Mobini through a review of the literature in the United States and foreign countries, recommendations of the Food Animal Residue Avoidance Databank (FARAD), and personal experience. For many of the drugs mentioned, FARAD has calculated a Withdrawal Interval (WDI) to distinguish from the regulatory and approved WDT. The WDI is based on foreign drug approvals or extrapolations based on available tissue residue and/or related pharmacokinetic data on these drugs. In some cases, there is insufficient or no pharmacokinetic data from which FARAD can derive a WDI for goats. In those instances, FARAD has relied on sheep or cattle data and then added a scientifically-based time period to extend beyond the approved WDT to ensure safety as well as compliance with the Animal Medicinal Drug Use and Clarification Act of 1994 (AMDUCA).

Finally, the reader should be aware that there are several drugs which may be approved for specific species at a specific dose and route of administration, but are **PROHIBITED FROM EXTRA-LABEL USE** in any major or minor food animal species. These include **Fluoroquinolones/Enrofloxacin (Baytril)** and **Phenylbutazone (Dairy)**. Other drugs are **PROHIBITED FOR USE UNDER ANY CONDITION IN ANY ANIMAL THAT WILL BE USED FOR HUMAN FOOD**. These drugs are: **Dipyrone, Clenbuterol, Nitrofurazones, Nitrofurans (Furacin), Nitroimidazole (Metronidazole, Dimetridazole, Iprnidazole), Diethylstilbesterol, Glycopeptides (Vancomycin) and Chloramphenicol.**

Medications Commonly Used in Goats and Approximate Withdrawal Times

Dr. Seyedmehdi Mobini, Georgia Small Ruminant Research & Extension Center, Fort Valley State University, Fort Valley, GA

The drugs listed in this table are commonly used in goats. There are only a few drugs *approved* by the FDA to be used in goats. **Use of drugs listed as “extra-label” is legal only if prescribed by your veterinarian in the context of a valid client-patient relationship.** The withdrawal times for various drugs were compiled from different sources. The listed dosages and withdrawal times, as well as drug status and legality of use, is subject to change. Your veterinarian will prescribe the latest, most up-to-date drugs, dosages, and provide the correct withdrawal period. ***Consult your veterinarian before beginning any treatment.***

I. Antibiotics:	Brand Name	Approval	Dosage	Route	Frequency	Withdrawal Time	
						Meat	Milk
Ceftiofur	Naxcel®	APPROVED	0.5-1 mg/lb	IM	Once a day	0 days	0 days
Neomycin	Biosol® and other products	APPROVED	5 mg/lb	PO	Twice a day	3 days	NA
Amoxicillin	Amoxi-inject®	extra-label	5 mg/lb	SQ	Once a day	26 days	120 hrs.
Ampicillin	Polyflex®	extra-label	5 mg/lb	SQ	Once a day	10 days	72 hrs.
Benzathine Pen G	Pen BP-48®	extra-label	20,000 IU/lb	SQ	Every 48 hours	30 days	NA
Erythromycin	Erythro-200®	extra-label	1 mg/lb	SQ	Once a day	5 days	96 hrs.
Florfenicol	Nuflor®	extra-label	9 mg/lb	IM	Every 48 hours	28 days	120 hours
Oxytetracycline	LA-200®	extra-label	9 mg/lb	SQ	Every 48 hours	29 days	144 hrs
Procaine Pen. G	Crysticillin®	extra-label	10,000-20,000 IU/lb	SQ	Once a day	16-21 days	120 hours
Sulfadimethoxine	Albon®	extra-label	25 mg/lb Day 1, 12.5 mg/lb Days 2 - 5	PO	Once a day	12 days	5 days
EXTRA-LABEL USE IS PROHIBITED IN LACTATING DAIRY COWS. DO NOT USE IN LACTATING DAIRY DOES.							
Tylosin	Tylan®-200	extra-label	10 mg/lb	IM	Once a day	30 days	96 hrs.
Chloramphenicol	Chloramphenicol	EXTRA-LABEL USE IS PROHIBITED					
Enrofloxacin	Baytril® 100	EXTRA-LABEL USE IS PROHIBITED					
Furacin, nitrofurantoin	Furox®	EXTRA-LABEL USE IS PROHIBITED					
Gentamicin	Gentocin®	DO NOT USE					
Tilmicosin	Micotil®	DO NOT USE – TOXIC TO GOATS					
II. Anti-inflammatory Drugs:	Brand Name	Approval	Dosage	Route	Frequency	Withdrawal Time	
						Meat	Milk
Aspirin	Aspirin	extra-label	100 mg/kg	PO	Once a day	1 day	24 hours.
Flunixin meglumine	Banamine®	extra-label	1.1-2.2mg/kg	IV or IM	Once a day	10 days	72 hours
Phenylbutazone	Bute	extra-label	10-20 mg/kg	PO	Once a day	60 days	DNU
DO NOT USE IN LACTATING ANIMALS							
Dipyrone	Dipyrone	EXTRA-LABEL USE IS PROHIBITED					

III. Prevention of Coccidiosis:	Brand Name	Approval	Dosage	Withdrawal Time		
				Meat	Milk	
Decoquinate	Deccox®	APPROVED	13-91 gm/ton of feed	0 days	24 hours suggested minimum, DNU	
Monensin	Rumensin®	APPROVED	15-20 gms/ton of feed	0 days	96 hours suggested minimum, DNU	
Amprolium	Corid®	extra-label	25-50 mg/kg BW in feed or water	2 days	48 hours	
Lasalocid	Bovatec®	extra-label	20-30 gms/ton of feed	0 days	24 hours	
IV. Anthelmintics:	Brand Name	Approval	Dosage	Route	Withdrawal Time	
					Meat	Milk
1. Avermectins:						
Doramectin	Dectomax®	extra-label	0.3 mg/kg	SQ	56 days	40 days
Eprinomectin	Eprinex®	extra-label	0.5 mg/kg	PO	NA	NA
Ivermectin	Ivomec® Drench	extra-label	0.3 mg/kg	PO	14 days	9 days
Ivermectin	Ivomec® 1%	extra-label	0.3 mg/kg	SQ	56 days	50 days
Moxidectin	Quest®,	extra-label	0.5 mg/kg	PO	23 days	56 days
	Cydectin®	extra-label	0.3 mg/kg	PO	14 days	NA
	Cydectin® drench					
	Cydectin® Injectable	extra-label	0.2 mg/kg	SQ	30 days	DNU
2. Benzimidazoles:						
Albendazole	Valbazen®	extra-label	10 mg/kg	PO	7 days	120 hours
Fenbendazole	Panacur®/Safeguard®	APPROVED at 5mg/ Kg, extra-label as recommended	10 mg/kg	PO	14 days	120 hours
Oxfendazole	Synanthic®	extra-label	10 mg/kg	PO	14 days	120 hours
3. Cholinergic Agonists:						
Morantel Tartrate	Rumatel®	APPROVED	10 mg/kg	PO	30 days	0 days
Levamisole	Levasole®	extra-label	8 mg/kg	PO	10 days	4 days

V. Anesthetics and Tranquilizers	Brand Name	Approval	Dosage	Route	Withdrawal Time	
					Meat	Milk
Ketamine	Ketaset®	<i>extra-label</i>	5-10 mg/kg	IV or IM	3 days	48 hours
Lidocaine	Lidocaine	<i>extra-label</i>	Variable for local anesthesia use, 1% in goats	IV	1 day	24 hours
Thiamylal Na	Biotol	<i>extra-label</i>		IV	5 days	72 hours
Xylazine	Rompun®	<i>extra-label</i>	0.05-0.1 mg/kg	IV or IM	7 days	72 hours
Yohimbine	Yobin	<i>extra-label</i>	0.25 mg/kg	IV		
VI. Hormones:	Brand Name	Approval	Dosage	Route	Withdrawal Time	
					Meat	Milk
Cloprostenol	Estrumate®	<i>extra-label</i>	125 microgram	IM	0 days	0 days
Dexamethasone	Azium®	<i>extra-label</i>	20-25 mg	IM	14 days	4 days
Dinoprost	Lutalyse®	<i>extra-label</i>	5-10 mg	IM	1 day	24 hours
Oxytocin	Oxytocin	<i>extra-label</i>	10-20 IU	IM	0 days	0 days
VII. Electrolytes	Brand Name	Approval	Dosage	Route	Withdrawal Time	
					Meat	Milk
Calcium	Calcium borogluconate	<i>extra-label</i>	60 to 100 ml of 20 to 25% Solution	IV	0 days	0 days
Calcium	Calcuim gluconate	<i>extra-label</i>	50 to 100 ml 10 to 23% calcium ion solution	IV	0 days	0 days

NOTE:

In the table above PO = oral administration; SQ = subcutaneous injection; IM = intramuscular injection; IV = intravenous injection.

DNU = insufficient data available to make WDI estimation, this drug is not approved for lactating goats.

Herd Health at Different Production Stages

Goats have different health needs according to their stage of production. Providing for these health needs will increase your chances of having a healthy, productive herd.

Pre-breeding

Breeding does

Thirty to sixty days before the breeding season does should be examined for their udder and teat conformation, dentition (teeth), musculo-skeletal problems, and feet and body condition. Culling decisions should be made. Some common conditions seen in does include lameness, chronic mastitis, bad teats, and poor body condition due to a chronic disease, parasitism, old age, or other cause. Doelings should be at least 65 to 70% of their mature weight before their first breeding.



Bad teats.

Prebreeding vaccination for *Chlamydia* should always be given. *Leptospirosis* and *Campylobacter* are less common causes of reproductive failure and abortion and vaccinations may be done, if the disease is present. Monitor fecal egg counts and deworm if needed. Does can be supplemented (flushed) with grain 2 to 4 weeks before breeding this will improve their fecundity (number of kids born per doe). Abrupt fence line exposure to bucks in the late transition period in the fall when does can begin to come into heat can help bring about cycling.

Breeding bucks



Bucks are too often neglected and omitted from herd health management practices. Some of the common conditions seen in bucks are urinary calculi (stones), lameness, urine scalding around the prepuce, and front leg injury due to a dominant buck in the pen. In the case of urinary scald, wash the affected area. Application of petroleum jelly can help protect the affected areas. Maintain a 2:1 ratio of dietary calcium to phosphorous and provide a high level of salt (up to 4%) and 1 to 2% ammonium chloride in the diet to prevent urinary calculi. Bucks should be vaccinated at the same time as the does and for the same diseases. Body condition and breeding soundness should be evaluated at least 4 weeks before the breeding season and adjustments made to prevent bucks from becoming overly thin or obese. As breeding season approaches, extremely aggressive and dominant bucks may need to be penned separated to prevent injury. Monitor fecal egg counts in bucks or FAMACHA score and deworm as needed.

Breeding Season

Watch does and bucks carefully during the breeding season. This is a particularly strenuous time for bucks. Lame or sick bucks will not be able to breed adequate numbers of does. Fertility is drastically decreased by hot weather. Do everything you can to cool the buck off. This may include shade and fans during the day in very hot climates.

Gestation

Pre-parturition

A kid health and management program should actually begin prior to parturition with attention to the nutritional needs of the gestating doe in late lactation and during the dry period. An adequate diet for dry does is essential to produce healthy kids. Pregnant does should be fed to have a good body condition (score of 3.0 to 3.5 just prior to kidding). Does should be scored in early pregnancy and again six weeks prior to kidding. Remember that most fetal growth occurs in the last one-third of gestation and feed quantity and quality may need to be increased during this time. Clean, cool water and free choice trace-mineralized salt should be available.



Booster vaccinations for *Clostridium perfringens* C and D and tetanus toxoid should be given not less than 3 weeks prior to kidding. Vitamin E/selenium injections may be given during the dry period to prevent white muscle disease in kids, especially in areas where soils are selenium deficient and supplementation is inadequate. However, a nutrition program designed to provide adequate dietary selenium is preferable to providing injections. Provide other vaccinations or boosters for diseases causing abortion. Monitor fecal egg counts or FAMACHA score and deworm as needed.

Parturition (kidding)

While most meat goat does kid on pasture, there may be times when animals are brought indoors for kidding. The doe should kid in a clean environment; either a well-drained, clean pasture or a stall bedded with straw or other absorbent material. The kid prior to birth has been existing in a germ-free environment and parturition represents exposure to common disease organisms to which the mature animal has developed resistance. The kidding stall or pasture should be located near a well-traveled area so that the doe can be frequently observed for kidding difficulties. Few adult does require assistance at the time of kidding though problems are always a possibility. First-freshening does should be closely watched, especially if bred to bucks known to sire large kids.

Signs of impending kidding include udder engorgement, swelling of the vulva, restlessness, and mucous discharge. The ligaments in the pelvic area will relax and the udder secretion's will change from clear honey-like to thick white milk (colostrum). The doe may also lose appetite.

There are three stages of parturition. Stage 1 consists of uterine contraction and cervical dilation. This stage may last from three to six hours or more. The water bag ruptures at the end of this stage. Abdominal contractions will occur in Stage 2 and the fetus should be born within one hour. If the doe is having to provide undue straining or birth is delayed then examination and assistance may be needed; particularly if the doe is straining hard for 15 minutes or more. A veterinarian may need to be called. Stage 3 consists of expulsion of the placenta and usually occurs within a few hours after the last fetus is born.

Problems in parturition

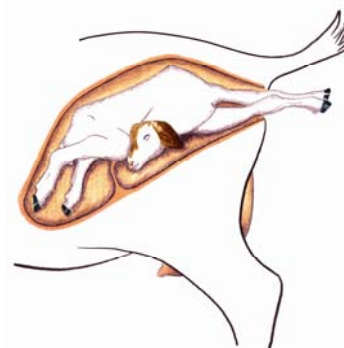
Most does will kid with little to no assistance required; however, problems can occur. Many of these problems revolve around either incorrect presentation of the fetus or a kid that is too large for the mother's pelvis. In a normal birth presentation the forefeet will enter the birth canal first, the hooves will be pointed downwards, and the head will be between the legs. Another presentation that is sometimes seen that usually causes little problem is when the rear legs enter the birth canal first. In this case, the kid's hooves will be pointed upwards. Abnormal presentations include the rump first (breech) or any of the legs or the head bent backwards. In these cases, assistance is required.



Normal kidding presentation.



Leg-back breech.



Head-back breech.

Examples of two types of breech presentations.

Drawings by K. Williams.

When assisting birth, it is important to clean the area around the vulva with disinfectant soap and warm water and to have clean hands. Wear gloves. There are certain diseases that can be transmitted to humans during this time period. Pregnant women should not assist with the kidding process. Lubricate the hand prior to entering the vagina. Feel and identify the parts of the kid. Try to ensure that all body parts felt belong to the same kid and not to two separate bodies. If you feel only one leg or no legs at all, reach further and try to determine the exact position of the fetus. Arrange the legs and/or head gently in a proper position for birth. The fetus may have to be pushed forward towards the doe's head until a leg can be grasped and repositioned. Once the limbs are in a proper position, the kid should be gently pulled out and downwards using only your hands. Clear the mouth and nasal passages of the kid with straw or a towel and ensure it is breathing. Rubbing the body with a piece of cloth can sometimes stimulate breathing. Never pull on any presentation other than a normal presentation of two front legs and a head or a presentation of two hind legs and a tail. Pulling on any other arrangement of limbs and body parts will only make the problem worse.

If the anticipated kidding problems appear severe, call for a veterinarian immediately.

Kid management at birth

At birth two management practices are critical to the future health and survival of the newborn kid. The navel cord should be dipped in a solution of tincture of iodine (7% iodine solution) to prevent entry of disease-causing organisms through the navel cord and directly into the body of the kid. Make sure the entire cord is immersed in the iodine solution. If necessary, a long navel cord can be cut to 3 or 4 inches in length. Dipping the cord in iodine not only prevents entry of organisms but promotes rapid drying and the eventual breaking away of the cord from the navel.

Another critical practice is the feeding of colostrum as soon after birth as possible. The colostrum, or first milk, contains antibodies, which the doe does not pass to the fetal kid in the womb. Consumption of colostrum must occur as early as possible, ideally within 2-4 hours of birth. At 24 hours after birth there is a rapid reduction in the permeability of the intestinal wall to colostral antibodies. If a newborn kid does not or cannot nurse, the colostrum should be bottle-fed or the kid should be tube fed to insure adequate consumption. Excess colostrum can be frozen for use in orphan or bonus kids. Recent research indicates that disease organisms, especially caprine arthritis encephalitis (CAE), may pass from doe to kid through milk and transmission might be avoided through the use of extra colostrum frozen from does tested and shown to be CAE-free or by feeding pasteurized colostrum. CAE is not considered to be a problem on most meat goat farms.



Frozen colostrum.

Kids should receive colostrum equal to 10% of their body weight during the first 24 hours of life. For example a six pound kid (96 ounces) should receive 10 ounces (roughly 300 ml) of colostrum within 24 hours of birth. This should be divided into at least 3 feedings. If fresh or frozen goat colostrum is not available, a commercial goat, sheep or cow colostrum replacement could be used. Fresh cow colostrum may also be used if necessary.

Under certain conditions newborn kids may benefit from injections of vitamins A and D approximately four days after birth. An iron dextran injection can be given but care is needed as iron is potentially toxic. A vitamin E/selenium injection may be beneficial in areas of selenium-deficient soils. These injections should be planned with your veterinarian as part of your herd health calendar. In general injection of vitamins and minerals is not necessary. If supplementation is necessary it is done more safely by dietary supplements. Realize that the fat soluble vitamins and all minerals are toxic if given in excess.

Kids should be checked carefully at birth for any physical deformities or abnormalities. Pneumonia is a major killer of young kids. A clean, dry, draft-free environment is an excellent preventative measure.

Artificial raising of kids

Milk is the principal component of the diet of the pre-weaning kid. Most meat goat kids will nurse their dam until weaning. However, for orphaned kids or for kids of does that have lactation problems it may be necessary to use a milk replacer. Goat milk replacers are commercially available. If necessary, a lamb milk replacer may be used as a substitute for goat milk. Typical lamb milk replacers contain 22 to 24 % protein and 28 to 30% fat (on a dry matter basis). If no other milk replacer is available whole cows milk or calf milk replacers can be used. Maintaining milk replacer quality after mixing is particularly important when kids are fed *ad libitum* (all they can consume).

Milk can be fed by using bottles, pails, or self-feeder units. The method chosen will depend upon such factors as the size of the herd and available labor, as well as personnel preference. With any system, the health of the kid, sanitation, and available labor are the major factors to consider.

Under natural suckling, kids consume small amounts of milk at very frequent intervals. Ideally, artificial rearing should mimic natural suckling but the constraint of available labor precludes frequent feeding. Nevertheless, kids should be fed 4 to 5 times daily for the first and second week and 2 to 3 times daily thereafter. Bottle feeding is more labor intensive but kids receive more individual attention and are easier to handle post-weaning than kids that are allowed to suckle does. Pail or pan feeding may reduce labor somewhat but bodyweight loss and need for extra “training sessions” at the beginning must be expected.

For larger herds, self-feeder units such as a “lamb bar” may successfully reduce labor. The key to use of the system is the maintenance of a low temperature of the milk (40°F) that will limit intake by the kid at any one time. Small, frequent feedings increase digestibility and decrease digestive disturbances. Rapid consumption of large quantities of milk may lead to fatal bloat due

to entry of milk into the reticulo-rumen. Rapid passage of milk through the abomasum and small intestines can result in diarrhea or nutritional scours.

The biggest problem with kids bottle fed lamb milk replacer occurs with the feeding schedule. Frequently kids become “pets” and there is a tendency to feed them as much milk as they will consume each feeding. Unfortunately, this may result in bloat and sudden death due to enterotoxemia or diarrhea. A restricted feeding schedule and amount is necessary.

Feeding schedule and amount for bottle fed kids.

<i>Age</i>	<i>Amount of Fluid/Feeding</i>	<i>Feeding Schedule</i>
1 to 3 days	4 ounces	5 times a day
3 days to 2 weeks	8 to 12 ounces	4 times a day
2 weeks to 3 months	16 ounces	3 times a day
3 months to 4 months	16 ounces	2 times a day

Dam raised kids

Most meat goat kids will be raised with their dams on pasture. While this removes the need for feeding milk replacer, these kids should not be forgotten in terms of nutritional and health needs. Producers must remember that since these kids are raised in the same environment as their dams, they are also exposed to the same health, disease, management, and grazing conditions. If internal parasites are a problem in the dams, expect the same in the kids and take management steps to reduce exposure to internal parasites through pasture rotation or other means. Crowding should be avoided and, if housed at any time, clean bedding and adequate ventilation are a must. Kids are naturally curious and will begin nibbling on items in their surroundings early in life. If there are toxic substances or plants, plastic, or other harmful materials lying about chances are some kids will eat them. If pasture is of very poor quality, kids beginning to nibble on grass or hay will not receive much nutritional benefit. This can slow down early growth.



Early access to a creep feed or creep pasture containing lush, nutritious forage will benefit kids becoming accustomed to solid feed, the development of their gastrointestinal tract, and in their early growth. Entry into the area containing creep feed or pasture should be restricted to kids by fencing or gates that prevent the entry of adult animals.

Weaning

In raising goat kids, increases in size and weight are not the only measure of success. A well-formed skeleton and proper development of internal organs are often neglected when the emphasis is on rapid gains. Dry feed consumption is important in developing body capacity. By increasing body capacity, feed intake and digestion increase.

In bottle fed kids over two weeks of age, limiting daily milk consumption to about 48 ounces will encourage daily consumption of dry feed. No later than three to four weeks of age a goat/lamb creep feed, other suitable creep feed, or even a calf starter should be offered. As the hay and grain consumption increases, gradually reduce the milk being fed. When the kid is eating $\frac{1}{4}$ pound of grain per day plus some hay and is drinking water from a bucket, it is time for weaning. Research has shown that at two months of age a weaned kid has a reticulo-ruminal capacity 5 times as large as suckling kids of the same age.

Kids on pasture should be consuming forages such as pasture grass or hay by two weeks of age and grain within four. Careful attention needs to be given to formulation of a concentrate supplement for the pre-weaning kid. Palatability is of primary concern. Molasses at the rate of 10% of the total dry matter, corn (preferably chopped or rolled) and whole or rolled oats make up the energy “core” of a good pre-weaning diet. Balance the crude protein needs by adding cottonseed or soybean meal or another high protein source. Though few studies with kids have been done, crude protein contents of the pre-weaning ration should be within the range of 14-18%. Ground alfalfa may be added at 5% or less to provide additional stimulation for reticuloruminal development.

Several factors need to be considered when making the decision as to weaning. The most important consideration is whether or not the average daily consumption of concentrate and forage is adequate for growth and development to continue in the absence of milk. Fixed weaning ages are less desirable than weight goals such as 2.0 to 2.5 times birth weight.



Vaccination Schedule for Meat Goats

Period	Time to Vaccinate	Disease	Booster
<i>Kids</i>	4 and 8 weeks of age	C. perfringens C&D* C. tetanus – toxoid	Prebreeding
	Between 8 and 12 weeks of age (single vaccination)	Contagious ecthyma	If a problem in herd.
	8 and 12 weeks of age	Caseous lymphadenitis	If a problem in herd.
	16 weeks of age	Rabies	Given if there is a rabies concern Yearly booster
<i>Prebreeding</i>			
<i>Doelings and bucklings</i>	60 and 30 days prior to breeding	Chlamydia Campylobacter Leptospirosis	If a problem in herd.
<i>Does and bucks</i>	30 days prior to breeding	Chlamydia Campylobacter Leptospirosis C. perfringens C&D* C. tetanus - toxoid	If a problem in herd.
<i>Gestation</i>			
<i>Does</i>	30 days prior to kidding	C. perfringens C&D* C. tetanus - toxoid	

* - 8-way clostridials like Covexin 8 could be used instead of C. perfringens C, D & T

Other disease preventive measures

Dam – 1 month prior to kidding

- CDT vaccine to help increase antibodies against enterotoxemia and tetanus in the colostrum. In areas deficient in Se and where supplementation is inadequate, BoSe® to raise selenium levels and prevent white muscle disease in kids and retained afterbirth in dam. Providing a proper mineral nutrition program to ensure adequate consumption of all minerals is preferable. Get local veterinary advice on selenium injections as the need and dosage level depend upon how much selenium is in the soil in the region, as well as on the dietary supplementation.

Kid – birth to first week

- BoSe® + vitamins A&D – use depends on soil in the region and the diet of the dam.

Kid – 3 weeks – begin coccidiosis prevention

- 4 and 8 weeks – CDT series.
- 4 to 8 weeks - BoSe® - repeat if in selenium deficient area.
- 6 to 8 weeks – begin monitoring for parasites and deworm as needed, especially if kid has access to outdoors.

Herd Health Calendar

A custom designed calendar is an excellent way to ensure the health of the herd is maintained. A calendar can be designed based upon your specific herd's production cycle. Consult with a veterinarian on the timing and need for vaccinations and other management procedures related to the health and well-being of your herd.

Planning Calendar for Meat Goat Herd Health

Stage	Suggested Health Practices		Additional Practices
Pre-breeding (30-60 days)	Bucks	<ul style="list-style-type: none"> • Be aware of heat stress. • Breeding Soundness Evaluation done. • Vaccinate for <i>Clostridium perfringens</i> type C&D, plus Tetanus Toxoid. • Vaccinate for Chlamydia, Campylobacter and Leptospirosis, if necessary. • Trim feet. • Body Condition Score and adjust management accordingly. • Deworm based upon fecal egg counts or FAMACHA score. 	<ul style="list-style-type: none"> • Vitamin E and Selenium given to does 30-45 days before breeding in selenium-deficient areas. • See Vaccination Schedule for Meat Goats • Put bucks next to doe pens. The “buck effect” will bring transitional does into heat,
	Does	<ul style="list-style-type: none"> • Vaccinate for Chlamydia, Campylobacter, and Leptospira if necessary. • Vaccinate for <i>Clostridium perfringens</i> type C&D, plus Tetanus Toxoid. • Trim feet. • Body Condition Score and adjust management accordingly. • Deworm based upon fecal egg count or FAMACHA score at least two weeks before breeding. • Final cull of does based on production records, udders, feet, and type. 	
Breeding	Bucks	<ul style="list-style-type: none"> • Provide additional feed. • Be aware of heat stress, provide shade. 	<ul style="list-style-type: none"> • Make sure cats are not defecating in feed to prevent Toxoplasmosis. • Perform fecal egg count or check FAMACHA score and deworm if necessary. • Treat for flukes if a problem in the herd.
	Does	<ul style="list-style-type: none"> • Observe for heat or use marking harness on bucks • If desired, check for pregnancy at 45-60 days with ultrasound. 	
Pre-kidding (15-30 days)	Does	<ul style="list-style-type: none"> • Booster <i>Clostridium perfringens</i> type C&D, plus Tetanus Toxoid. • Deworm based upon fecal egg counts or FAMACHA score. • Body Condition Score, adjust management accordingly • Watch for pregnancy toxemia. 	<ul style="list-style-type: none"> • Perform fecal egg count or check FAMACHA score and deworm if necessary. • Begin to collect supplies for kidding.

Kidding	<p>Does</p> <ul style="list-style-type: none"> • Observe 3-5 times per day. • Assist if needed. <p>Kids</p> <ul style="list-style-type: none"> • <u>Clip, dip, and strip</u>: <ul style="list-style-type: none"> ○ Clip navel cord to 2-4', ○ dip navel in 7% iodine, ○ strip small amount of milk to make sure teat ends are open. 	
Nursing/Lactation	<p>Does</p> <ul style="list-style-type: none"> • Feed extra feed to does with multiple kids. <p>Kids</p> <ul style="list-style-type: none"> • Observe daily for signs of diarrhea or respiratory disease. • Vaccinate – <i>Clostridium perfringens</i> type C&D and Tetanus, revaccinate at four weeks after first injection. • Castrate males before three months of age. • Start creep feeding by two weeks of age. 	<ul style="list-style-type: none"> • See Vaccination Schedule for Meat Goats
Weaning	<ul style="list-style-type: none"> • Weaning at three to five months or when marketed as young kids. • Check for internal parasites and deworm if needed. 	<ul style="list-style-type: none"> • May want to use coccidiostat in creep feed and post-weaning feed.
Post-weaning/Drying	<ul style="list-style-type: none"> • About every four weeks, check for internal parasites and deworm as needed. • Reduce feed to does just before weaning. • May want to reduce water availability for a day or two after weaning. 	

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