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Buying Healthy Goats and Keeping Them That Way

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BUYING HEALTHY GOATS AND KEEPING THEM THAT WAY

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Abstract

Starting a goat herd with healthy animals prevents expense and effort eliminating infectious diseases. Pre-purchase testing and examinations are worth their cost because of the savings realized through fewer animal illnesses, increased production, lower medication costs, and reduced culling. Key management practices such as hoof trimming, vaccinating, body condition scoring, and assessing parasite loads are needed to maintain herd health. Biosecurity practices must become routine to prevent the introduction and/or spread of contagious diseases. Several goat diseases are contagious to humans, so biosecurity measures must address this concern. Excellent record-keeping helps producers monitor health and production trends, document treatments, make breeding vs. culling decisions, and produce food products without illegal residues. Starting with healthy animals, reducing exposure to contagious diseases, providing excellent nutrition, reducing stress, practicing management tasks, selecting for healthy animals, and monitoring animal's daily health results in a goat herd consisting of animals rarely needing medical intervention.
Keywords: Healthy Goats, Herd Health, Prevention of Diseases, Biosecurity

Introduction

Unless you have unlimited money, time, and ability to tolerate animal illness and death, you will want to prevent as many goat diseases in your herd as possible. Resources devoted to disease prevention are well worth the investment. Disease prevention is also a foundational concept of animal welfare. That said, when establishing a herd, consult a local veterinarian familiar with breeders and diseases in your area. Instead of the high-risk approach of purchasing animals from sale yards, feed store fliers, or classified ads, ask your veterinarian where he/she would recommend obtaining breeding stock, then work directly with that breeder. Reputable breeders of high quality, lower-risk animals will be forthcoming about illnesses, treatments, pedigrees, production, and other details about individual animals. Many have expended considerable time and money to free their herd from specific diseases; expect to pay more for these animals but realize they are worth their added value.

From a biosecurity standpoint, it is best to assemble a herd from one source. If animals will be acquired from multiple sources, keep animals from each source with each other but quarantine away from other goats by at least 10 feet (Rowe, 2018) for at least 30 days, monitoring closely for evidence of illness. Use separate equipment and feeders for each group; wash hands and change clothing and footwear between groups during the quarantine period.

Pre-purchase Physical Examination

A pre-purchase examination of a prospective herd addition should include a detailed history of the individual's health status, including all illnesses, vaccinations, dewormings, and treatments. Breeding and kidding records should also be examined. A comprehensive physical examination should be conducted on all prospects, of course. Considerations such as conformation, docility, blemishes, faults, hornedness, etc. will be of greater or lesser importance depending on the

animal's purpose. For example, if assembling a herd of wethers for commercial brush clearing, one may not care about an animal's temperament, faults, etc. However, conformation and temperament are important considerations for breeding stock.

Some conditions such as ringworm, lice, and footrot may be readily apparent on initial examination. These diseases can all be treated successfully, but the animal(s) should remain on the original farm or placed in isolation on the new farm until the condition has been resolved. It would be wise to consider all new animals as carriers of the contagious footrot bacterium *Dichelobacter nodosus* because the consequences of importing this disease to a farm are dire. Follow the treatment recommendations described by Pezzanite et al. (2009), which include initial hoof trimming followed by immersion of hooves in a 10% zinc sulfate foot bath for 30 minutes. Hold treated goats on a dry surface for an additional 30 minutes. Repeat this procedure once a week for four weeks and cull any animal that appears lame at the end of this period.

Pre-Purchase Laboratory Testing

Going more in-depth with laboratory work, a breeding soundness evaluation should be conducted on potential herd sires—even proven sires—because previous fertility does not guarantee future fertility. Those purchasing does in milk may decide to have milk cultures done to look for contagious forms of mastitis such as *Streptococcus agalactiae, Staphylococcus aureus,* and *Mycoplasma* species. A fecal examination to determine parasite loads would be valuable, as would a fecal egg count 10 to 14 days after deworming to determine the presence of dewormer-resistant parasites (Coles et al., 1992). When purchasing animals, you are also purchasing their bacteria, viruses, and parasites.

Pre-purchase Biosecurity Screening

Additional pre-purchase biosecurity screening tests can be conducted for caseous lymphadenitis (CL), the caprine arthritis and encephalitis virus (CAE and/or caprine lentivirus), Johne's disease, brucellosis, tuberculosis, Q fever, and others. A veterinarian should be consulted to help interpret test results. Although most laboratory test results are accurate, tests differ in their sensitivity (ability to detect true positives) and specificity (ability to detect true negatives). Results in question should be confirmed by re-testing.

It is critical to appreciate that laboratory test results on individual animals are not as meaningful as the disease status of the entire herd of origin. Johne's disease testing in goats is particularly challenging: infected and clinically ill goats may test negative on all Johne's tests, yet succumb to the disease and be diagnosed positive at necropsy. A positive Johne's test is meaningful, but false-negative results abound. Screening tests are snapshots of one animal's disease status at a particular time; they may not be able to identify animals recently exposed to a pathogen and in the early phase of disease development. When it comes to Johne's disease, evidence of healthy aged goats in good body condition is a good sign the disease agent is not present in the herd.

Laboratory tests are designed to identify antibodies produced against a specific disease-causing agent or detect the agent itself. For example, the screening test for CL checks for antibodies to the causative organism (*Corynebacterium pseudotuberculosis*), which are generated if and when an animal is exposed to the agent. However, antibodies are also generated if an animal is vaccinated against CL, so consult a veterinarian for help interpreting CL test results. A discussion with the

breeder about an animal's vaccination history and historical presence or absence of CL in the herd should help with interpretation of test results; findings from a comprehensive physical examination may help clarify laboratory test results, as well.

CAE antibody tests are accurate after an animal is six months old; prior to that, a kid's CAE test results could reflect its dam's CAE status. A positive test indicates an animal has been exposed to and is infected with the CAE virus and has generated antibodies against it. Many positive animals will lead long and healthy lives, never showing signs of illness. However, they can transmit the virus vertically to their offspring through milk and colostrum and horizontally to herd mates (Rowe, 2018). Because the virus is contained in white blood cells, anything causing the exchange of infected cells between animals (breeding, infected needles, infected discharges, etc.) has the potential to transmit the CAE virus between goats. Herd-wide CAE testing enables creation of positive and negative sub-herds on a farm, which will facilitate the transition to a herd-negative status after management changes have been enacted (Nord et al., 1998).

Scrapie is a fatal transmissible spongiform encephalopathy of sheep and goats; the U.S. is trying to eradicate this disease from the country. Previously, tests were only possible on brain samples from dead or euthanized animals. However, testing can now be conducted on rectal biopsy samples from live animals to detect infected but subclinical animals (Dennis et al., 2009). Scrapie is another example of the value of knowing herd status vs. individual status: purchasing a goat from a premise on which a case of scrapie has never been diagnosed and healthy animals live to become elderly would be a low-risk venture regarding scrapie. Animals could be tested using the rectal biopsy test to further reduce the risk of purchasing an infected animal.

Routine Care

Hoof Trimming

After assembling a healthy herd, several routine practices will be needed to keep it healthy. Firstly, all goats' feet should be examined regularly to assess the need for hoof trimming. Hooves may need to be trimmed every 4 to 12 weeks, depending on environmental and individual factors. The typical sign of the need to trim is a long toe and wall that has grown over the sole (Figure 1). Trim hooves to resemble a parallelogram with the front and rear surfaces parallel and the top and bottom surfaces parallel. Disinfect hoof trimmers between goats to prevent the spread of footrot and other diseases.

Body Condition Scoring

Body condition scoring (BCS) should be done on all animals at least monthly and more often during critical times such as winter, lactation, and pregnancy. BCS is a hand-on assessment of the muscle and fat cover over an animal's skeleton. A five-point scale is used for goats, with '1' indicating emaciation and '5' indicating obesity. A BCS of three is desirable for most animals, but heavy milkers may drop body condition to '2' or even lower during peak production. Also, pregnant does may gain some condition during their dry period, but scores above four are not desirable. Villaquiran et al. (2007) produced an excellent training resource about BCS.

Figure 1. Overgrown Goat Hoof with Left Claw Partially Trimmed.
Note complete coverage of sole of the right claw with the overgrown hoof wall.

Vaccinating

Developing a herd vaccination program is another example of when it would be advantageous to work directly with a local veterinarian. She or he will be knowledgeable about local diseases and pathogen strains and able to make practical recommendations regarding vaccinating to reduce disease risk.

At a minimum, goats need protection from *Clostridium perfringens* types C and D and tetanus; properly using a three-way "CDT" vaccine will protect goats from these diseases. Vaccinate kids at six, nine, and 12 weeks of age; booster at six months, then every six months thereafter. Booster pregnant does one month before kidding so they produce and incorporate high levels of protective antibodies in their colostrum—this will provide passive protective immunity to their kids until the latter develop active immunity through vaccination. In some areas, it will be advisable to use a seven- or eight-way clostridial vaccine due to local disease risk. If using a seven- or eight-way vaccine, be sure it includes CDT protection.

Some farms will need to use the sore mouth vaccine in kids annually if the virus is present on the farm and/or kids will go to shows. This vaccine is modified live and causes a milder form of the disease. Protection is usually lifelong after initial vaccination and does pass on some protective

antibodies to kids via colostrum. The advantage of vaccination is timing: kids can be vaccinated after they have a good start instead of experiencing a more severe natural case of sore mouth when they are very young. Care should be taken when using this vaccine because humans can contract sore mouth.

A bacterial vaccine called *Mannheimia haemolytica-Pasteurella multocida* bacterin is licensed for use in goats to prevent outbreaks of Pasteurella pneumonia. The need for this vaccine will be much higher in large herds primarily housed indoors vs. smaller herds with significant access to pasture, and with herds going to shows and adding new animals vs. closed herds.

If needed, vaccines against additional diseases such as rabies, CL, enzootic abortion, foot rot, vibriosis, etc. will require the use of vaccines not licensed for use in goats. Such use is legal only with the recommendation and guidance of a licensed veterinarian with whom the producer has a legal veterinary-client-patient relationship. All goats are considered food animals, so their medications and vaccines are regulated by the U.S. Food and Drug Administration (FDA). It is a violation of federal FDA regulations to use a product in a food animal in any way not specified on the label unless in certain circumstances and with veterinary oversight.

Controlling Parasites

Most goat breeds developed in environments and/or under management systems that did not expose them to high loads of internal parasite larvae. Consequently, there was little genetic selection pressure on them to develop resistance to parasites. However, conditions in many parts of the U.S. are ideal for parasite survival. Goat caretakers must constantly assess all animals for signs of parasitism and practice specific pasture management techniques to minimize the intake of problematic parasite larvae. Assessment of internal parasite loads involves body condition scoring; FAMACHA© scoring ocular mucous membrane color; monitoring manure color and consistency; assessing production levels and rates of gain; observing appetite, hair coat quality, hind quarter cleanliness, and alertness; and checking for bottle jaw (fluid accumulation under the jaw due to low blood protein levels). Advanced monitoring involves comprehensive or targeted use of fecal egg counts to determine internal parasite loads.

When individuals animals have clinical signs of parasitism (thin, poor coat, anemia, diarrhea, bottle jaw, potbelly, poor appetite, dull, weak, etc.), they should be treated with an effective dewormer. However, owners are not obligated to keep these animals beyond the dewormer's meat/milk withdrawal period nor are they obligated to breed animals that need treatment. Each producer must determine how strongly he or she will cull animals based on how often deworming is needed. Retaining and breeding only the most resistant animals will help producers eventually develop a herd in which only individual animals occasionally need deworming. However, all animals will need a lifetime of frequent monitoring to quickly identify and treat animals in need.

Controlling parasites in goats also involves following best management practices for pastures. These practices include never allowing animals to graze lower than three inches; rotating animals through grazing cells; never leaving animals in a grazing cell longer than four days; not returning to a grazing cell sooner than six weeks; providing as much browse as possible; and dry lotting animals if needed to allow time for pasture regrowth or larval death.

Biosecurity Practices

Biosecurity practices help keep diseases off farms and help contain the spread of pathogens already on a farm. Pathogens are microscopic and no alarms sound when they are transmitted, so it is easy to become complacent about biosecurity measures. Biosecurity procedures should be developed with the guidance of a herd veterinarian and then strictly followed every day by everyone (Figure 2). Farms interested in educating the public via farm tours yet desirous of reducing the risk of disease introduction need to implement pre-event biosecurity protocols (Kerr, 2017).

In addition to the above-mentioned healthy animal selection criteria, general biosecurity recommendations include:

- Isolate sick animals
- Quarantine herd additions or returns
- Avoid livestock shows and sales
- Separate animals by age after weaning
- Practice excellent sanitation
- Do not feed animals directly on the ground
- Remove and compost manure
- Cull chronically ill animals and those that relapse frequently
- Wear disinfected boots and clean coveralls
- Change boots and clothing between groups of animals
- Vaccinate against relevant diseases
- Use effective cleaning and disinfection protocols
- Restrict farm visitors
- Wash hands after animal contact
- Do not borrow or loan equipment
- Separate feed and manure-handling equipment
- Restrict vehicle and foot traffic
- Wear disposable gloves when treating sick animals
- Perform chores from young to old animals and from healthy to ill

Zoonotic Disease Potential

A significant number of diseases can be transmitted and shared between goats and humans (Table 1, Appendix). The biosecurity and personal hygiene practices recommended above can mitigate the risk of contracting most of these diseases. Personal protective equipment such as disposable gloves, hair/beard net, eye protection, and nose/mouth mask will further reduce the risk of exposure. Goats of particular concern as sources of zoonotic diseases include those with diarrhea, contagious abscesses, skin lesions, neurologic signs, oral sores and ulcers, and miscarriages. Contact with aborting goats is such an elevated risk of zoonotic disease exposure pregnant women should have no contact with them whatsoever.

Figure 2. A keystone of farm biosecurity: thorough soap-and-water cleaning of footwear followed by ringing, drying, and required contact time of an effective disinfectant

Handwashing, washing and cooking food thoroughly, and pasteurizing dairy products will reduce the risk of many zoonotic and/or foodborne illnesses. Laboratory testing of sick animals should identify the pathogen involved and alert the owner of its zoonotic potential. An exception is Q fever: many healthy-appearing sheep, goats, and cattle shed this zoonotic pathogen sporadically. Q fever testing does not always identify infected animals, and infected animals do not always shed the organism (Van Den Brom et al., 2015). The disease is more serious in humans than livestock, as well. Consequently, food safety recommendations regarding pasteurization of dairy products should be followed. Raw milk is a potential source of Q fever and several other diseases.

Record Keeping Essential

Accurate records are essential on all farms for many reasons. As examples, they help identify problematic animals and family lines, document treatments and medication withholding periods, note breeding dates, and make doing farm taxes easier. Commercial software is available for both farm management and financial record keeping, or producers can create their own spreadsheets. Even hard copy record keeping is valuable. Items to document include, but are not limited to:

- Animal identification
- Sire and dam
- Birth date
- Birth weight
- Weaning weight
- Rate of gain
- Kidding ease
- Grafting details
- Number kids born
- Number kids weaned
- Pounds of kids weaned

- Milk production
- Dates of procedures
- Illnesses
- Treatment details
- Reason culled
- Necropsy results
- Where sold
- Fertility test results
- Carcass characteristics
- Breeding dates
- Sire used
- Pre- and post-treatment fecal egg counts
- FAMACHA scores
- Body condition scores
- Fleece weight & quality
- Somatic cell counts
- Test results
- Linear appraisal score
- Serial and lot numbers of vaccines and medications
- Medication withholding times
- Quality assurance actions

Conclusion

Starting with healthy animals, practicing routine management tasks, and enacting effective biosecurity protocols will go a long way toward reducing the occurrence of diseases on goat farms. When combined with a balanced nutrition program and a low-stress environment, these steps should allow goat owners to spend enjoyable time observing and monitoring animals instead of treating them for illness.

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Appendix (note; this Table 1 spans four pages, how will this be presented in the journal??)

Table 1. Diseases Transmissible between Goats and Humans

Disease	Cause	Transmission route	Livestock species involved	Notes
Campylobacteriosis	*Campylobacter jejuni* and other species	Oral (ingesting contaminated food or water)	Primarily chickens, cattle, birds, dogs, cats	Reduce risk through pasteurization, washing fruits and vegetables, disinfecting drinking water
Caseous lymphadenitis	*Corynebacterium pseudotuberculosis*	Breaks in skin	Goats and sheep	Risk significantly reduced by use of gloves and handwashing
Colibacillosis and Hemolytic Uremic Syndrome	*Escherichia coli* O157:H7	Oral (contaminated food or water; direct contact with infected animals)	Cattle, goats, sheep, deer	Young children, elderly, and immune-compromised are at elevated risk
Cryptosporidiosis	*Cryptosporidium parvum* and other species	Oral (ingesting contaminated water or food; contacting contaminated surfaces)	All domestic and wild mammals	Organism is very hardy in environment and resistant to many disinfectants
Echinocccosis	*Echinococcus granulosus*	Oral (ingesting food, water, or soil contaminated with infected dog feces; contact with contaminated dog hair)	Dogs, (definitive host) and sheep, cattle, goats, and pigs	Dogs are definitive host; other species are intermediate hosts

Erysipelas	*Erysipelothrix rhusiopathiae*	Breaks in skin	Domestic and wild mammals, fish, birds, shellfish	Most common livestock species affected is swine
Giardiasis	*Giardia lamblia* and other species	Oral (ingesting contaminated food, water, or soil)	Domestic and wild mammals	Organism is very hardy in environment and resistant to many disinfectants
Leptospirosis	*Leptospira pomona* and other species	Oral (ingestion of water, soil, or food contaminated with urine of infected animals); direct contact (infected body fluids from infected animals); inhalation; breaks in skin; mucous membranes	Domestic and wild mammals	Risk elevated during and after flooding
Listeriosis	*Listeria monocytogenes*	Oral (ingesting contaminated water, soil, or food, particularly raw food); in utero	Poultry, cattle	Pasteurization reduces risk of transmission through dairy products
Q Fever	*Coxiella burnetii*	Inhalation; contact with contaminated surfaces	Goats, cattle, sheep	Risk significantly reduced by milk pasteurization; avoid contact with animals giving birth

Rabies	*Lyssavirus*	Direct contact with saliva from infected animal; inhalation and transplants (rare)	Domestic and wild mammals	Most common wildlife hosts are bats, skunks, raccoons, coyotes, and foxes
Ringworm	*Trychophyton* and *Microsporum* species	Direct contact of skin with infected animals or contaminated surfaces	All domestic mammals	Usually lifelong immunity after infection
Salmonellosis	*Salmonella typhimurium* and other species	Oral (ingesting contaminated food or water); in utero	Domestic and wild mammals; reptiles; amphibians; poultry and birds	Poultry, turtles, and frogs pose elevated risk to children under five years old
Sore mouth	Orf poxvirus	Direct contact with livestock sores, scabs, and contaminated environment	Goats and sheep	Risk significantly reduced by use of gloves and handwashing
Toxoplasmosis	*Toxoplasma gondii*	Oral (eating contaminated and under-cooked food, ingesting contaminated water)	Potentially all	Life cycle involves cats and intermediate hosts (rodents and birds); all other affected species are accidental cases
Tuberculosis	*Mycobacterium bovis*	Inhalation; ingestion of infected dairy products; breaks in skin	Cattle, goats, sheep, deer, elk	Risk eliminated by annual testing of dairy animals and milk pasteurization

Undulant fever or Brucellosis	*Brucella abortus* and other species	Consumption of raw dairy products from infected animals; inhalation; contact with meat from infected livestock or wildlife	Many domestic and wild mammal species, particularly goats, sheep, cattle, camels bison, elk, caribou, moose, and feral swine	Risk eliminated by annual testing of dairy animals and milk pasteurization
Yersiniosis	*Yersinia enterocolitica*	Oral (ingesting contaminated water, milk, and undercooked food; contact with infected animals or humans)	Many domestic and wild mammal species	Pigs are the major animal reservoir

Note: Adapted from CDC Information