
Caseous Lymphadenitis (CLA, Boils, Abscesses) in Goats – with supplemental comments about Sheep

What do you do after the diagnosis is confirmed?

John S. Glenn, DVM, Ph.D.
Extension Veterinarian - UC Davis
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BACKGROUND

1. cause: bacteria - Corynebacterium pseudotuberculosis (C. ovis)

important characteristics -

- a) typically the abscesses contain a thick yellow-green pus with little or no odor
- b) once organism enters body, can be transported within cells - which protects organism from host's defense mechanisms (i.e. -antibodies); animal is infected for life and may or may not show intermittent clinical signs
- c) body builds thick walls around abscesses - which protects organisms from any antibiotics administered to the animal
- d) typically sets up housekeeping in lymph nodes and lymphoid tissues - especially superficial lymph nodes around head, chest, flanks; also occurs in lungs, spinal cord, liver, abdominal cavity, kidney, spleen, brain
- e) animal may have external boils without having internal boils and vice versa - no way to predict
- f) location of boils determines risk of transmission of organism to other animals - all external boils pose a high risk when draining, as do any boils in the lungs - boils in other tissues, while potentially harmful to the animal, probably don't pose a great risk to other animals
- g) lots of argument about how long organism can persist in the environment; more important to know how long it poses a practical threat - probably a matter of days if just smeared on surfaces, probably a matter of weeks/months if incorporated in organic material - bottom line is that resting pastures and pens for at least a month (especially in summer) probably reduces potential exposure to a minimum; scraping the top 2-4" of soil from pens and replacing with new sand or dirt will reduce contamination potential miscellaneous - organisms could theoretically leave infected animals via the following routes:
 - SKIN: abscesses draining through skin - important!
 - RESPIRATORY TRACT: coughing, nasal secretions releasing stuff from lung abscesses - important! High density (crowding) fosters transmission by this route
 - Urinary Tract: very unlikely to be shedding in urine (would need to have an abscess in the kidney)

Gastrointestinal Tract: reported to be present in the digestive tract but no one has any good data to implicate manure as a significant source of infection - plus goats are so finicky about what they eat - certainly would be a good idea to clean up manure and keep it out of feed bunks but I wouldn't be paranoid about it - would be most concerned about animals that were thin and "wasting" - need to remember that two other major causes of "wasting" are CAE and Johne's

Mammary Gland: there have been reports of shedding in milk if there are abscesses in the udder - risk that offspring could be infected this way (another good reason to pasteurize milk for human consumption)

2. Initial infection of a herd

introduced by bringing in infected animals

- may have external boils
- may not have any external boils but have some internally
 - may be actively shedding organisms
 - may be quiescent, but when the animal is stressed by things such as pregnancy, other diseases, nutritional deficiencies, starts shedding

3. Perpetuation within the herd

- a) infected animals
- b) environmental contamination of feed, water, and equipment (milking equipment, clipping equipment, feeders, fences) by infected animals (personally I don't think this persists as long as people say - which is to say that with good sanitation you can pretty effectively control this route)
- c) human hands (touching infected material and then touching another animal or milking without thoroughly washing hands - see comments in Sanitation and Lancing Abscesses section below)

4. Other causes of "abscesses"

Certainly abscesses can be caused by a wide variety of organisms when they gain entry into the body - through breaks in the skin (splinters, puncture wounds) or via transport in the blood (acidosis, septicemia). However, these abscess usually are warm to the touch and have very watery contents and a foul odor.

Occasionally, goats will develop salivary cysts along the jaws. If the contents of these are aspirated, it will contain a perfectly clear, very viscous fluid.

CONTROL - identify **INFECTED** animals and keep completely separate (housing, feeding) from **CLEAN** animals - this means no contact (see exceptions below) or sharing of space. Arrange husbandry routine so you work with **INFECTED** group last (to lessen chances of carrying organisms back to clean group).

MILKING - milk **INFECTED** group last and then clean-up well. Don't bring any does with draining abscesses into the milking parlor; wear gloves and change them if you touch an abscess - don't ever treat an abscess in the milking parlor

BREEDING - OK to use clean bucks on infected does (but never on a doe with an active abscess, severe coughing or wasting (can use AI on these cases)) - try to minimize any contact time - obviously AI would minimize the risk.

- Using an infected buck on clean does probably carries some risk (if buck is shedding organisms) - no evidence to support transmission by semen (would require an abscess in the testicle or associated structures) - might want to consider AI to minimize risk here

HOW TO GROUP ANIMALS

1) Do thorough physical examination of all animals

- a) animals with active abscesses OR boil scars over lymph nodes = **INFECTED**

Note 1: while it is true that a wide variety of other organisms can cause the occasional boil, you can't take the chance of missing a true CLA animal - if the boil is from some other cause, you're going to be able to salvage the offspring anyway - see below.

Note 2: There is no point in spending money to test animals in this group - you have adequate evidence to assume they have been infected.

Note 3: Personally I'm not rabid about culling these animals as long as they appear healthy and are productive and you are willing to take the risk they pose to your control/eradication efforts. There is no reason the majority of them can't go ahead and lead a productive life. BUT if there is an animal in this group that you have second thoughts about for some reason, then use this as an excuse to cull them. Always cull animals with chronic weight loss - not only will you eliminate animals that may be shedding boils organisms, but will also get rid of ones with advanced CAE and Johne's

Note 4: The most ruthless approach would be to automatically cull all visible cases, then blood test and cull all positives - retest remainder in a month - keep doing that until you got no more positives on two consecutive tests

Note 5: vaccines are discussed below - probably not a good idea to use any boils vaccines in this group of animals - #1, it's too late for them and #2, infected animals seem more prone to have a reaction to the vaccine

2) Depending on number remaining in CLEAN group:

I) Use Careful observation

a) take your chances and observe them very carefully - any animal with a developing lump goes into isolation until the abscess is healed and then goes into the INFECTED group. I'd also be inclined to put any animals that were thin for unexplained reasons or who coughed a lot, into the INFECTED group.

NOTE: This is the very least effective alternative since you never get rid of animals that don't show external signs, but are still shedding the organism and infecting others - you can expect to constantly see new cases cropping up but it should slow the flow of them.

OR

II) Blood Test

a) blood test using the Synergistic Hemolysin Inhibition (SHI) Test. This test measures the response to an exotoxin produced by the organism - the more active organisms present, the higher the response. Once the body gets the organisms walled off, the response decreases. A strong response = actively INFECTED

A weak response = exposed at some point - treat as INFECTED

A negative response can mean several things: the animal could be in the incubating stages of the disease and just not have responded yet; the animal might be truly clean; the animal might have been infected and the body has the infection under control (walled off) - having said all that, I'd consider these negative at this point and just keep a close eye on them. If the CLEAN group starts popping up with abscesses, then you might want to test the group again. Test can be done by:

California Animal Health and Food Safety Laboratory System
West Health Sciences Drive - UCD
Davis, CA 95616

- requires 0.5 ml of serum (red cells spun down and removed before shipping)

- costs \$5.15/sample if the animal resides in California, \$8.10/sample for submissions from other than California

- submission forms and billing information can be obtained at (530) 752-7577

b) There are many different ELISA tests available and there is lots of variation in them. The ELISA tests best use is to survey a herd to determine whether the infection is present in the herd, versus using it to decide the fate of an individual animal (i.e. - it would be a good test to use on a herd from which you were considering buying replacements). In some of the ELISA tests, there has been concern that the ELISA will cross-react with Johne's Disease (*Mycobacterium paratuberculosis*) - although you don't want any Johne's Disease in your herd either so maybe it's a moot point.

A number of different states offer the test, as does the lab in Canada:

Mann Equitest Inc.

335 Laird Road, Unit 4

Guelph, Ontario N1H 6J3

(51) 836-2400, fax (519) 836-5782

\$5.00 per sample

call first regarding necessity of an import permit

c) Just a few comments about laboratories - it's important to ask around and find a reliable laboratory and then stick with them - each laboratory uses slightly different procedures, uses different cut-off points and has it's own idiosyncrasies - it's important to develop a working relationship with the people so you can call and discuss questionable results with them (if you can't do this, then it's time to change labs) - this business of constantly changing laboratories and submitting samples to different laboratories until you get the answer you want is counterproductive - all you'll do is multiply the errors and confusion

d) This discussion of tests is full of terribly gross generalizations - the reliability and interpretation of all the tests depends a lot on the level of infection in the group of animals, so until you get some baseline data, it's pretty much conjecture as what's the best to use.

e) While it is true that all tests have some false positives, the even more disturbing aspect is that they all have some false negatives - in an eradication program it's the false negatives that really worry you. So the bottom line from an eradication standpoint is that you should feel comfortable about condemning any animal that tests positive but you should always be a little suspicious about animals that test negative (unless they came from a herd that has been thoroughly tested) - see comments above regarding possible reasons for negative tests.

e) Personally, if more than a quarter of the herd is infected and ruthless culling isn't practical, I'd skip the testing and go right to using the vaccine. If there are only a few animals infected, then the tests would be helpful in rooting out the few remaining bad actors. The **MAJOR** disadvantage of going directly to vaccination is that you then can't use the blood tests since you don't now whether the test is reacting to an actual infection or to the vaccination. This is a permanent downside of vaccination for this disease.

f) Regardless of what you do in terms of vaccination, it is critical to constantly observe these animals closely for any signs of abscesses. Certainly if any animals cough a lot or are very thin, it would be worth running the SHI test on them.

So now you have an INFECTED herd and a CLEAN herd. Once an animal goes into the INFECTED herd, it never comes back to the CLEAN one.

d) vaccinate the animals in the CLEAN herd with a CLA vaccine - animals need two shots the first year, followed by annual boosters. Adult does should receive their second shot the first year and their subsequent annual booster a month before kidding, so there will be maximum protection when the kids hit the ground and before they are old enough to respond to the vaccine themselves. Kids should then be vaccinated starting at 10 weeks of age.

i) Colorado Serum makes a vaccine (Case-Bac) but it is not labeled for use in goats (so the company had absolutely no liability if things go sour) - I've never used it, but I hear of mixed reactions by veterinarians, owners, and goats - some people swear by it and say they have never had problems with it in goats and others swear at it and say they will never use it again. It would probably be wise to initially vaccinate only a few animals and see where herd falls. I'm not aware of any studies but my guess is that the variation is due to a combination of goat genetics, possibly differences in organism strains, other organisms present in the animals, rations and other allergens, presence of stressors, karma, and so forth. The bottom line is that you need to proceed cautiously.

ii) Commonwealth Serum Labs makes a vaccine (Glanvac) in Australia that is used in goats and pregnant animals - I worked a lot with this vaccine when I was on sabbatical leave in Australia and was very impressed with it - we've been trying to get it approved for use in this country but the wheels of bureaucracy turn slowly - it is currently available in Canada.

iii) Autogenous vaccines (made from bacteria isolated on your specific ranch) have been used. You want to be certain that you use a reputable company to produce them for you and then try them in a few animals and wait a couple of weeks before you do the rest. There have been some bad wrecks in the past, so you definitely need to proceed cautiously here too.

In general, goats seem to be more sensitive to these vaccines than sheep and there is always some risk of an adverse reaction (anaphylaxis) - so have epinephrine available and observe the animals for about an hour after vaccination. It is not uncommon to end up with a swelling at the site of injection, followed by a lump that may take several months to disappear, as well as temporary lameness and even a drop in milk production.

In spite of the drawbacks mentioned above, vaccination is a critical part of clearing up a problem herd. Vaccination reduces the number of animals that become infected and develop abscesses (thus reducing exposure) and reduces the severity of and shedding by already infected animals - it seems to be especially effective in holding internal abscesses in check. It has NO effect in terms of ridding the animal of established infections - once infected, ALWAYS infected.

To be protective, the vaccines must be given to the animal before the initial exposure. So, the herd won't really be fully protected until every animal present has been vaccinated since they were kids. There is no quick fix for this disease - this is a long-term program - you just have to slog your way out of it over time.

OFFSPRING

1) progeny of infected animals should be removed at birth, BEFORE any nursing and raised on pasteurized colostrum and milk - this has the added benefit of also breaking the infection chain for Caprine Arthritis Encephalitis (CAE) Virus, Mycoplasma, Johne's Disease, and Q Fever. If one of these kids does nurse its dam, make a note in the records and observe the animal carefully. Probably a good idea to draw a blood sample just before vaccinating and test for CLA - if not vaccinating, then blood test as a yearling.

2) progeny of clean animals can be raised by their clean dams (although you lose the benefits of cutting off the transmission of the diseases mentioned above).

3) As mentioned above, vaccinate the clean does before kidding and then start vaccinating the kids at 10 weeks, giving the booster 4 weeks after that, followed by annual boosters.

OLD FRIENDS

Invariably you will find yourself in the position of having your very most special goat turn up infected. These animals occupy a special place in your heart and there is no reason you can't keep them around as long as you realize they are a real threat to your control program and take appropriate precautions.

QUESTIONABLE, VERY VALUABLE GOATS

If the animal has an abscess or scar over a superficial lymph node it's undoubtedly infected but sometimes for piece of mind you will want to use a blood test - the same goes for an animal for which you want to be absolutely certain of the status. In these cases, it's probably justified to do both the SHI test and an ELISA test to convince yourself what should be done with the animal.

HERD ADDITIONS

- 1) First choice would be to buy animals from reputable sources that have tested and know they are free of the disease (easier said than found!).
- 2) Quarantine animals in a special pen used just for this purpose for thirty days minimum when you bring them home and use both the SHI and ELISA test on them - if they come up positive to either one, return them to the seller or else place them in the INFECTED herd.

SANITATION & LANCING ABSCESSSES

Any animal with a developing abscess should be segregated (even if it's in the INFECTED herd) until the abscess is lanced or it bursts.

Wear disposable gloves whenever you work around the abscesses - the bacteria can infect humans. Abscesses around the jaws and throat often displace the jugular vein so it's probably a good idea to have these lanced by a veterinarian - a severed jugular vein is not something you want to have to deal with!

If you are going to lance an abscess, restrain the animal on some surface that can easily be cleaned (driveway?) if it gets contaminated, get a large plastic garbage bag and put all the contaminated materials and gloves in it.

Preferably burn the materials that have touched the abscess and it's contents.

Flush the abscesses with an iodine solution.

Scrub and disinfect (2 cups Chlorox in a gallon of water is good) any equipment or surfaces contaminated with abscess contents.

When abscesses are healed, the animal can go back into the INFECTED herd.

HEAT-TREATMENT OF COLOSTRUM

Colostrum can be heated in a double boiler to a temperature of 56 C (133 F) and should be kept at that temperature for 60 minutes (can use a preheated thermos bottle or water bath). Be certain to check the temperature regularly to make certain it is maintained at the proper level. If it is heated to 59 C (138 F) or above, the antibodies in the colostrum are harmed and the colostrum develops clumps - in this case it should be discarded since it then tends to cause diarrhea in the kids.

PASTEURIZATION OF MILK

Pasteurization of milk can be done on a stove or in a small home pasteurizer. Monitoring of temperature and times is important. Milk can be pasteurized by any standardized procedure - some temperature/time combinations include:

- a) 74 C (165 F) for 15 seconds, OR
- b) 63 C (145 F) for 30 minutes

MISCELLANEOUS WITCHCRAFT

Lots of myths associated this disease - the level of infection may gyrate wildly from year to year - so if you try some bizarre treatment, the next year there very well may be very few cases - easy to mistakenly attribute the change to the treatment when indeed they are not at all related.

Treatments:

- 1) Organic iodide (EDDI) in the feed - no scientific evidence to support efficacy

2) Isoniazid - drug used to treat Tuberculosis in people - no scientific evidence to support efficacy; no idea about drug residues or withdrawal times; very expensive

Sources:

1) Wind - some people will swear the disease is worse in years with a lot of wind and dust - most plausible explanation is that animals cough a lot more and probably some carrier with a lung abscess starts spewing out lots of organisms

MISCELLANEOUS COMMENTS

Some other factors you need to keep in mind:

- a) feeds with lots of sharp plant awns tend to enhance transmission (produce small breaks in the lining of the mouth, which provides an entry point for organisms)
- b) facilities (i.e. wood) that foster splinters and cuts enhance transmission
- c) I can't cite any papers but I'm convinced that anything that depresses the various functions of the immune system probably enhances the problem - things that come to mind are inadequate nutrition, inadequate Vitamin E, inadequate selenium and copper intake

CLOSING COMMENTS

1) no set answer to control

- if I had a small number of does and could maintain a closed herd (used AI), I'd build a program around blood testing
- if I had a commercial herd and had to bring in outside animals, I'd build a control program around vaccinating
- how's that for being truly evasive - the point though is that a wide variety of approaches can be effective as long as you understand the basics about the disease and use common sense
- this is really about the level of risk you are willing to accept, if you want to absolutely minimize your risk, be ruthless in declaring animals infected and culling them, use AI, etc. - obviously as long as there are any infected animals on the premises, your control program is always in jeopardy - all you have to do is have a lapse in separation, sanitation, etc. and you'll be back to ground zero. As you are willing to accept more risk, you can cut your costs by cutting some corners.

Supplemental Comments About Sheep

The material about the disease in goats is applicable to sheep, with the following modifications and additions.

A) Transmission: Shearing and the 2-3 week period after shearing are major times when boils transmission occurs because of the cuts inflicted during shearing, the loss of skin protection provided by wool, and the crowding that usually takes place before and after shearing.

Recommendations:

- 1) insist that shearing equipment be disinfected before shearing starts (to reduce the likelihood of introducing organisms picked up in previous flocks)
- 1) shear younger animals first (less likely to be infected)
- 2) shear older animals next (ones without visible lesions)
- 3) shear any animals with visible boils last (to reduce chances of contamination)
- 4) don't mix these groups of sheep following shearing
- 5) if the clippers shear through a boil, stop and disinfect the blades otherwise subsequent sheep may be inoculated with the organism
- 6) minimize dust in pens and minimize period of time animals are crowded together
- 7) get the sheep out of the pen area and dispersed out on pasture as soon as practical after shearing - the closer animals are crowded together, without their fleeces for protection, the more likely the organism can be transmitted between animals.
- 8) obviously the cleaner you can keep the shearing equipment and shearing area, the better

B) Vaccines:

- 1) Sheep seem less likely to have an adverse reaction to boils vaccination and the reactions they do have, are usually milder than in goats. However, the comments about autogenous vaccines also apply to sheep.
- 2) The Colorado Serum vaccine is approved for use in sheep, but the company recommends that it be used in pregnant ewes only if you are dealing with a "severe" problem.