# Joints, ears, and navels!

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**Abstract**

Infectious diseases of the joints, ears, and umbilicus are common diseases of the calf. Many different infectious agents can play a role in disease at these different anatomic sites. Combinations of these diseases often present in the same population of calves, and the problem can often be traced back to inappropriate colostrum management practices. This review provides an overview of septic arthritis, otitis, and navel ill in calves as well as a brief discussion on colostrum management practices.

**Key words**: septic arthritis, otitis, omphalitis, omphalophlebitis, omphaloarteritis, urachitis

**Résumé**

Les maladies infectieuses des articulations, des oreilles et de l'ombilic sont communes chez le veau. Plusieurs agents infectieux peuvent jouer un rôle dans la maladie à ces différents sites anatomiques. Différentes combinaisons de ces maladies se présentent souvent dans la même population de veaux. Des pratiques de gestion inappropriées du colostrum sont souvent à l'origine de ces problèmes. Cet article donne un aperçu de l'arthrite septique, de l'otite et des affections de l'ombilic chez les veaux de même qu'une brève discussion des pratiques de gestion du colostrum.

## Introduction

Why talk about joints, ears and navels all together? They all represent very common sites for infection in calves, share several underlying infectious etiologies, and may result from similar management problems.

*Septic arthritis*

Septic arthritis is a common cause for lameness in calves. Often, septic arthritis is accompanied by severe lameness, however, this is *not always* the case. Cases can be missed, or only found when chronic, if careful examination is not performed. Reasons that lameness may be masked include systemic illness such that the calf is depressed, slow moving, weak or unwilling to rise, or multiple-limb lameness that obscures the severity of lameness in each specific limb. It can occasionally be difficult to detect pain or lameness in young calves, and thus the expected severe lameness associated with septic arthritis may be less obvious in some cases. Other clinical signs that alert the clinician to possible septic arthritis are joint effusion, enlargement of the draining lymph node, heat or pain on palpation, and changes in range of motion. History or evidence of infections such as pneumonia, enteritis, or omphalophlebitis should raise the concern for possible septic arthritis secondary to a bacteremia or septic event.

Septic arthritis in calves typically results from hematogenous spread of infectious agents.[13] Although external trauma or extension from digital infections can certainly result in septic arthritis in calves, these are less common routes compared to adult cattle who typically acquire septic arthritis as an extension from disease in the digit. Bacteria commonly isolated from cases of septic arthritis in calves include: *Streptococcus* (coag negative), *Trueperella pyogenes,* Pasteurellaceae, Enterobacteriaceae, and *Mycoplasma bovis.*[4,5,8]

A presumptive diagnosis of septic arthritis can be made on the basis of physical exam findings in some cases; confirmatory testing usually includes arthrocentesis and diagnostic imaging. Arthrocentesis is an extremely useful tool for the diagnosis of septic arthritis in calves. In suspected cases, joint effusion usually allows for relatively easy access for joint fluid aspiration. After aseptic preparation of the site and appropriate restraint of the animal, a sample is obtained with a needle and syringe and is examined grossly for evidence of decreased viscosity, cloudiness or foul odor, any of which are suggestive of septic arthritis. The diagnosis can be further supported by laboratory evaluation including cytology and biochemical analysis. Cytology predominated by neutrophils or presence of bacteria in neutrophils, or increased protein concentration are all consistent with septic arthritis. Ranges for cytologic and chemical evaluation of bovine synovial fluid have been published.[14] Culture and sensitivity can be useful for prognosticating and planning treatment. *Mycoplasma* must be cultured using different techniques than standard culture and sensitivity, so the clinician usually must request *Mycoplasma* testing in addition to standard culture and sensitivity. *Mycoplasma bovis* PCR is available at some laboratories and may be a more rapid way to investigate cases of *Mycoplasma bovis*. If joint infection is suspected, empiric treatment should begin without delay, before results of culture/ sensitivity are complete. Treatment recommendations can change after receiving results if indicated. Unfortunately, culture and sensitivity testing do not always yield positive results despite clinical evidence of sepsis in a synovial structure. The absence of bacteria on culture should not be taken as a sign that the joint is not septic. The clinical picture, gross and microscopic appearance of joint fluid, and biochemical analysis of joint fluid can all be used to determine if the joint is likely septic or not.

Radiographs can also be helpful in cases of suspected septic arthritis, particularly when differentiating between

other causes of severe lameness such as a fracture. Radiographic changes associated with joint sepsis may include increases or decreases in joint space, lytic lesions of the subchondral bone, articular destruction, osteomyelitis, or boney/periosteal proliferation. Boney changes and joint space reduction are more supportive of chronic severe infection, while soft tissue swelling and increased joint space may be less chronic. In cases where joint effusion or increase in joint space are the sole radiographic abnormality, it is wise to keep septic arthritis on the differential list and strongly consider arthrocentesis to confirm, despite lack of boney changes. Radiographic changes lag behind the pathology occurring in these cases.

Ultrasound is another useful imaging technique for investigation of joint disease. This tool may be more practical for the ambulatory food animal practitioner who may not carry a portable radiograph machine. The linear rectal probe can be a useful tool examine the fluid character of an effusive joint. The best image is obtained after clipping, cleaning, and application of a coupling agent such as ultrasound gel or isopropyl alcohol (or obstetric lube in a pinch). Joint effusion with echogenic strands or mixed echogenicity may indicate fibrin or cellular debris in the joint and should increase the clinician's suspicion of joint sepsis. Ultrasound can also be helpful in locating the most effusive or abnormal joint pouches for arthrocentesis.

There are many options for the treatment of joint infections in cattle. A detailed discussion on this topic is beyond the scope of this proceedings; an excellent reference has previously been published.[5,13] The basic principles of treatment include managing infection and provision of pain control. Treatment with systemic and local antibiotics is usually necessary. The proceedings for regional limb perfusion from this conference discuss the provision of local antibiotics in cattle in more detail. Removal of infected debris from the joint is also imperative. In acute cases, through and through lavage of the joint using needles and sterile isotonic crystalloids may be effective. However, cattle are excellent makers of fibrin and joint sepsis is often accompanied by significant fibrin deposition in the joint. This feature makes simple through and through lavage less than rewarding in many cases, especially chronic cases. More aggressive debridement of the joint can be accomplished via arthrotomy or arthroscopy. Further surgical debridement or other intervention may be necessary depending on the location, extent, and severity of the infection. The reader is referred to previously published review articles for an excellent discussion of the surgical options for joint sepsis treatment in cattle.[13]

Any confirmed case of joint sepsis in a calf warrants investigation into the systemic health of the animal and concurrently addressing any ongoing sites of bacterial shedding such as pneumonia, navel ill or enteritis. Concurrent pneumonia or otitis in this animal or its cohorts warrants serious consideration of *Mycoplasma bovis* as a possible causative agent. The original illness that resulted in bacterial spread to the joint may have progressed beyond the acute phase or may have resolved by the time of diagnosis of the septic joint. Additionally, if there is 1 septic joint that appears to have resulted from the hematogenous route, the clinician should carefully examine all palpable joints to ensure no other joints are affected. The prognosis for return to soundness decreases as the number of affected joints increases. The location, severity, and extent of infection can all influence the prognosis for return to function.

*Otitis*

Otitis in calves can result from multiple routes; it can occur via the Eustachian tube as may occur with an extension of respiratory disease, via hematogenous spread from another infected site, or more rarely from the external ear inward as occurs in combination with ear parasites. Otitis occurring from extension of respiratory disease is common in calves, and the same pathogens have been found in both cases of otitis and respiratory disease including: *Mycoplasma bovis*, *Mannheimia haemolytica, Pasteurella multocida, Histophilus somni*.[3,15]

Clinical signs of otitis include ear droop, head tilt, aural discharge and may also include signs of facial nerve dysfunction (such as facial paralysis or signs of a corneal ulcer from lack of blink or decreased tear production), additional vestibular signs, head shaking, or signs of systemic illness such as fever and lack of appetite. When disease is bilateral, head tilt or ear droop may not be obvious because both sides are affected.

Diagnosis of otitis can be challenging if clinical signs are vague or discharge is not apparent. An otoscopic exam can be performed in calves and may reveal an opaque or ruptured tympanic membrane; appropriate restraint greatly improves the ability to visualize the canal to the tympanic membrane. The author prefers to restrain calves in lateral recumbency to perform an otoscopic exam; this usually requires sedation. Otoscopic exam is not always practical in larger or older calves, and the sensitivity of this technique for diagnosing otitis media/interna is not known. Ultrasound for diagnosis of otitis in calves has recently been described.[2] This technique can be useful to confirm cases of otitis media/interna and can be performed in the field using a linear rectal probe.[10] Radiographs may also be helpful in diagnosing and evaluating the extent of boney involvement of otitis in calves. However, obtaining diagnostic skull radiographs can be challenging in the field, and overlapping structures can make interpretation of plain films for the evaluation of otitis challenging. For animals whose individual value warrants investment in diagnostics, advanced imaging such as CT can provide more information on extent of disease associated with otitis[6] and may be useful for surgical planning if surgery is indicated.

Treatment of otitis in calves primarily relies on administration of appropriate antibiotics. Early cases are more likely to respond to medical management alone. Myringotomy may be necessary to establish drainage and has been described

in calves.[12] Due to the predilection for *Mycoplasma bovis* to cause otitis in calves, the antibiotics selected should have empiric efficacy against *Mycoplasma*. No drugs are labeled specifically for otitis in cattle, so off-label drug use due to an off-label indication must be considered. When copious debris or exudate is present, lavage may be helpful to improve drainage. Gentle lavage with sterile solution, such as sterile saline, can be used. Comorbidities should be investigated and treated; respiratory disease is commonly present with otitis in calves.

*Navel ill*

Omphalitis/omphalophlebitis/omphaloarteritis/urachitis result when the umbilical remnant structures become infected. These infections can present with a variety of clinical signs depending on which structures are infected and the extent of infection. Most umbilical infections result in some degree of external swelling and pain on palpation of the base of the umbilicus (omphalitis). Other disease processes or herniation can result in umbilical swellings; umbilical swellings in general are discussed in another session of these proceedings.

The umbilical remnant structures include the umbilical arteries, umbilical vein, and urachus. The internal portion of the umbilical arteries coarse caudally, around the urinary bladder, and become the lateral ligaments of the bladder. Infection of the umbilical arteries is called omphaloarteritis. The urachus likewise runs caudally and attaches to the apex of the urinary bladder. Infection of the urachus is called urachitis. The umbilical vein runs cranially, passes through the liver, and travels to the ductus venosus. Infection of the umbilical vein is omphalophlebitis. Infection can extend from external to the internal umbilical remnants and any associated tissue. Any combination of the umbilical structures can be affected.

Diagnosis of external infection, or navel ill, is usually not challenging and is typically based on clinical appearance and palpation of the navel. Swelling, pain on palpation of the base of the umbilicus, or wetness of umbilical tissue lasting beyond the first day of life are suggestive of infection. Calves may be dysuric with urachal remnant infection; they may display prolonged posturing to urinate, or frequent incomplete urinations. This is presumably due to the abnormal persistent attachment of an abnormal urachus between the apex of the bladder and the body wall. Additionally, infection may extend into the urinary bladder and cause cystitis. A patent urachus is relatively rare in cattle. The more common abnormality of the urachus is infection or abscessation; often there are very firm to ropey attachments to the bladder, but it is usually not patent. Internal infections of the umbilical arteries or vein may not be as obvious. Signs may be vague and include fever, ADR or failure to grow as expected, or simply the external signs of navel ill. Internal umbilical structure involvement can occasionally be determined with abdominal palpation, although this can be more carefully assessed by ultrasound when available. Descriptions of umbilical remnant ultrasound in calves have been published and provide useful references.[1,11]

Determination of internal structure involvement is important for planning treatment and prognosis. Involvement of internal umbilical structures typically requires surgical resection of abscessed structures, whereas external infection alone is commonly treated medically or by lancing external abscesses if present.

Treatment of umbilical remnant infection relies on drainage and removal of any infected structures that extend internal to the body wall. External navel ill is typically treated medically and involves maintaining a clean dry umbilicus and administration of antibiotics in moderate to severe cases. Drying agents such as iodine or isopropyl alcohol are sometimes used for this purpose. When an abscess is present, lancing the abscess and allowing external drainage allows for healing. Systemic antibiotic therapy is warranted in moderate to severe cases to prevent spread of infection and treat cellulitis of the base of the umbilicus. When internal umbilical structure involvement is present, resection of the umbilicus and the infected structure(s) via ventral midline laparotomy is ideal. This technique allows the surgeon to remove the umbilicus en bloc with the infected internal structures. When umbilical vein infections extends to the liver, the surgeon may elect to marsupialize the umbilical vein to allow it to drain externally. A more complete discussion of surgical procedures of the umbilicus in the calf has been published.[1]

Prevention of navel ill requires proper hygiene in the calving area, dipping of navels, and maximizing immunity through proper colostrum management. A variety of navel dipping solutions have been used in calves, with no strong evidence to favor 1 specific treatment.[7,16]

*Unifying features and disease prevention*

Probably the biggest unifying feature of septic arthritis, otitis, and navel ill in calves is a lack of effective immunity. A cornerstone of maximizing immunity of the calf crop is ensuring **adequate**, **timely** intake of **high quality colostrum**. When investigating herd problems with the diseases discussed in this session, a break in colostrum management should be considered. A full discussion of colostrum management practices is beyond the scope of these proceedings; however, a nice summary of colostrum management practices in dairy calves has been published recently.[9] Some basic control points in colostrum management to consider include donor cows (appropriate immunity, disease status such as *Mycoplasma* shedding, etc.), colostrum milking equipment, colostrum quality testing (IgG concentration, bacterial contamination testing), storage methods, heat treatment or other method of colostrum treatment, volume fed to calves, timing of colostrum feeding to calves, hygiene of bottles/nipples/tubes, and calf factors that may decrease absorption (hypothermia, previous ingestion of other things, hypoglycemia, etc.).

Another unifying feature, specifically of otitis and arthritis, is common underlying infectious etiology. Both diseases are common manifestations of *Mycoplasma bovis*

infection. Calf exposure is primarily through contaminated colostrum or milk. Other sources of calf exposure include exposure of naive calves to infected calves or adult cattle shedding disease. Preventative methods are aimed at minimizing contamination of colostrum and milk through appropriate screening (bulk tank monitoring or monitoring of pooled colostrum or hospital milk sources), heat treatment of colostrum, and pasteurization of milk fed to calves. Treatment of calves affected with disease due to *Mycoplasma* (commonly pneumonia, otitis, and arthritis) should be started early in the course of disease to limit morbidity and mortality from the disease. It is important to note that once an animal has been infected with *Mycoplasma*, shedding may occur after clinical signs have resolved and the animal may never be completely free of the organism.

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