



Johne's Disease

Mycobacterium avium subsp. paratuberculosis (MAP)

Extended version

Classic case: Thin, older dairy cow, chronic diarrhea, good appetite at 1st

**VERY IMPORTANT DISEASE - WORLDWIDE DISTRIBUTION
POSSIBLE IN ALL RUMINANTS**

"A chronic contagious granulomatous enteritis characterized by diarrhea, progressive weight loss, debilitation and death" –Merck Veterinary Manual

Presentation:

- **Primarily DAIRY CATTLE : up to 20-50% of dairy herds**
- Cattle, sheep, goats, camelids, deer, and elk can all get MAP
 - Prevalence underestimated in sheep/goats
 - Tested less often, diarrhea often not seen



Johne's disease, cow

Bovine

- Alert, no fever
- **Chronic/intermittent DIARRHEA**
- Loose → pea soup → watery
- Appetite good at first
- Milk production ↓s w/ protein levels
- Weight loss, debilitation emaciation
- Submandibular, ventral edema

Necropsy:

Thickened, **corrugated intestine**, esp terminal ileum; enlarged/**edematous lymph nodes**

Sheep/Goats

- **Weight loss is #1**; Weakness
- Diarrhea **not** common, intermittent
- Wool break - shed wool/hair easily;
- Submandibular edema in late stages
- Decreased milk production

Necropsy:

Foci of **caseation w/ calcification of Intestinal wall and lymph nodes**; enlarged distal mesenteric lymph nodes

Epidemiology/Transmission:

- **Transission**
 - **Management** important – comingling of age groups and species, stocking density
 - **Infection pressure** important – exposure to high #s bugs = more likely to become infected
 - **Age** – younger animals infected more easily
- **# 1 mode of transmission Fecal-oral; also passed in colostrum, milk; intrauterine**
 - Large ## organisms passed in feces
 - Shedding begins **prior** to onset of C/S
 - "SUPER-Shedder" cows may pass **10⁶ CFU/gram** feces
 - **"Silent" shedders are #1 mode of transmission**
- Clinical disease
 - Usually seen in cattle > 2 yr
 - May see disease in younger sheep and goats
 - Subclinical bovine cases may be ADR
 - **If clinical signs evident, DEATH is inevitable**
- Strains
 - Cattle strains affect many species of ruminants
 - Sheep susceptible to sheep strain, not cattle strains



Corrugated intestine, Johne's disease

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Differential Diagnosis:

CHRONIC DIARRHEA

- Parasitism
- Chronic Bovine viral diarrhea
- Salmonellosis
- Eosinophilic enteritis
- Renal amyloidosis, Glomerular dz
- Congestive heart failure
- Intestinal neoplasia

WEIGHT LOSS

- Malnutrition
- Starvation
- Fat necrosis
- Chronic peritonitis
- Cobalt or Cu deficiency

In **deer and elk**, think of [chronic wasting disease](#) (CWD)

Test(s) of Choice:

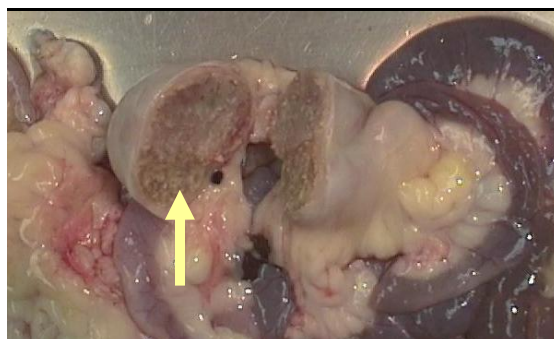
- **Depends** on situation:
 - Breeding animals
 - Commercial vs pet herds
 - Dairy vs. beef vs. sheep/goats, wildlife species, etc
 - Surveillance vs. control vs. individual diagnosis
- Pooled fecal samples used to investigate prevalence and in surveillance for control programs
- Environmental fecal samples may be used for surveillance
- Individual samples to diagnose clinical cases & identify subclinical cases
- **Organism Detection** tests
 - **Gold standard** – **Culture *M. paratuberculosis*** from feces or postmortem specimen
 - **Difficult to culture**, takes many **weeks**, use **USDA-approved labs**
 - Sheep strain especially hard to culture
 - PCR on feces
 - Histopathology
 - Used in breeding animals to obtain and maintain negative status
 - Confirm diagnosis in clinical cases
- ELISA used in control programs and in known positive herds
 - Milk, serum, or plasma
 - Positives are reliable, can be graded via magnitude of response
 - False negatives are possible
 - In goats, may cross react with *Corynebacterium pseudotuberculosis*

Herd wide testing is **not** useful, and is a waste of resources unless management is appropriate.



Chronic diarrhea, Johne's dz,

*Caseated lymph node, cut,
Johne's disease, cow*





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Treatment/Control/Prevention

- **No satisfactory treatment – CULL clinically affected animals**
- **Control**
 - can take several years, requires constant management oversight
 - Utilize screening tests
- **Prevention** – depends on species, type of group involved
 - Difficult where co-mingling is prevalent, ie beef, sheep, goat herds
 - Document herd status/prevalence via testing
 - Buy replacements only from MAP negative herds
 - Quarantine and test replacements
 - Many recommendations involved – one example below:
 - ♦ Maternity protocols for dairy cows
 - Multiple use maternity pens for negative cows only
 - Use milk replacer for calves from positive dams
 - No pooled colostrums, give colostrum from negative dam to her calf
- **Vaccines** - several exist for various species. Results are improving; some interfere with TB tests

Pearls:

- *M. avium subsp. paratuberculosis* : Acid-fast bacteria; **difficult to culture**
- **TOUGH BUG-Survives > 1yr in soil, longer in water; survives pasteurization!**
- Control programs present in many nations – serious economic impact; still voluntary in US
- Pathogenesis – Fecal-oral transmission is most common
 - Usually infected very early in life
 - Multiplies in lower SI, enters Peyer's patches; spreads to macrophages in GIT & LNs
 - Chronic granulomatous enteritis
 - ♦ Malabsorption/maldigestion; protein-losing enteropathy
 - ♦ Eventually bacteremia and dissemination to other organs
- Passive fecal shedding-may see pos cultures in uninfected animals; esp w/ super-shedders in herd
- **REPORTABLE** in Sheep/Goats in all US states; in *some* states for CATTLE
- ******Potential zoonotic risk to humans**; Possible relation to Crohn's disease in humans; review by the American Academy of Microbiology
- **LOOK FOR JOHNE'S DISEASE** in any ruminant that has chronic wasting +/-diarrhea
- Resistance to disease differs:
 - Cattle >> Sheep > Goats
 - Some genetic resistance may be present – less disease in certain lines



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Refs: Pasquini's Guide to Bovine Clinics, 4th ed pg 23, Merck - Johne's Disease, Vet Clinics of NA, Food Animal Practice, Vol 27, 2011, Divers and Peek, Rebhun's Diseases of Dairy Cattle, 2nd ed., pp. 279-83, Images courtesy, Dr. Lisle George

My Notes: