# Western Canada Feedlot Management School

## February 11-2026

# Mycoplasma
# The Complicated Opportunist

Bruce J Kostelansky DVM

# Agenda

01 What is *Mycoplasma bovis*?

02 What types of disease does it cause?

03 Prevalence and Pathogenises

04 *Mycoplasma bovis* treatment

05 *Mycoplasma bovis* prevention

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# History of *Mycoplasma bovis*

- 1961: first time isolated from a mastitis case, in the US
- Now a worldwide pathogen of extensively farmed cattle
- Dairy and veal calves: pneumonia, arthritis, otitis media
- Stocker and feeder cattle: BRD and arthritis

Steer affected with ***M. bovis*** infection, resulting in **polyarthritis** and **chronic pneumonia**.
Note the swollen carpi and tarsi and the abnormal stance.

Courtesy of Dr. John Campbell

# What is *Mycoplasma bovis*?

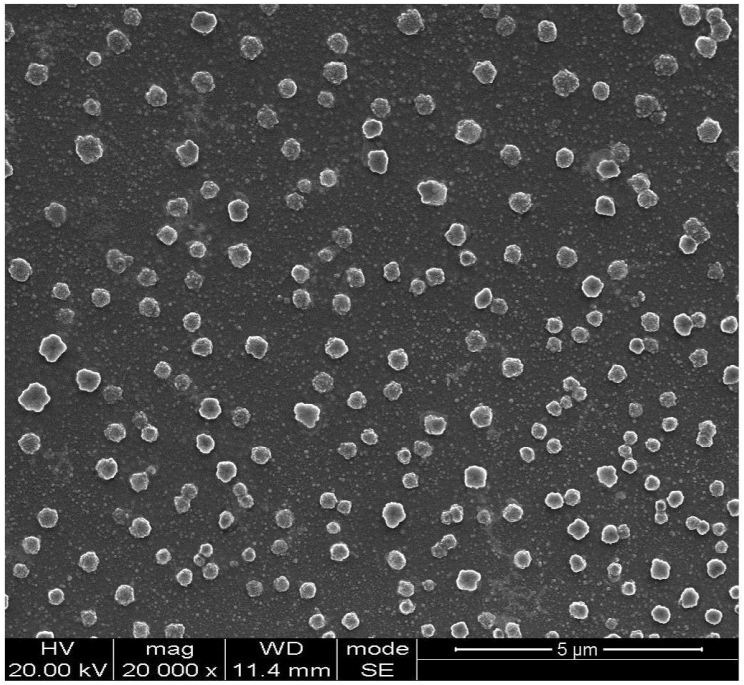


Photo source Chen et al. Differential Immunoreactivity to Bovine Convalescent Serum Between Mycoplasma bovis Biofilms and Planktonic Cells Revealed by Comparative Immunoproteomic Analysis. Micobiol. Vol 9. 2018.

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# *M. bovis – a very unique bacteria*

- Mollicutes Class:
  - **NO cell wall**
  - Among smallest free-living organisms
  - Parasitic organisms

- Well adapted to colonize mucosal surfaces such as respiratory, genital, urinary, mammary glands, conjunctiva.
- Capable of intracellular infection of a wide variety of cell types.

# *Mycoplasma bovis* disease


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# Pneumonia BRD



- Often in combination with other causes of BRD
  - Part of the BRD complex
- Causes significant local suppression of the immune system and leads to chronic pneumonia

- Also a primary cause of bacterial pneumonia
  - Young dairy cattle
- Bacteria can persist for months in lung tissue
- Clinical signs similar to other causes of BRD; may develop slowly

## *Mannheimia haemolytica*

(Courtesy Dr. Amelia Woolums, Mississippi State University, Starkville, Miss.)

Note the extensive **dark red consolidated** ventral lung, white **fibrin** on lung pleural surface

## *Mycoplasma bovis*



(Courtesy Dr. Tom Mullaney, Michigan State University, East Lansing, Mich.)

Note the extensive **nodular abscessation** of the cranioventral lung

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# Middle ear infection

- Can occur early in the disease (by 14 days)
- Often occurs with pneumonia
- Bacteria moves from the throat up the auditory tube and into the middle ear, causing a head tilt- No drainage
- **Dairy and winter born beef calves most common**

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# Joint infection

Courtesy of Dr. John Campbell

- Common syndrome in feedlot cattle
- Bacteria in the lungs moves into the blood stream and travels to multiple joints
- Considered a “secondary” problem but may be the main feature in some herds
- Very poor response to treatment

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# Take Home Message



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# PREVALENCE

# Prevalence

- Beef
  - initially 0-7% calves positive
  - **Increases with mixing**
  - 28% cattle necropsied  3 CDN feedlots CPPS-Chronic pneumonia poly arthritis syndrome
- Dairy
  - 34% if have associated Mycoplasma BRD
  - 6% in disease free herds

Campbell J. Economics of Mycoplasma bovis. In: Proceedings of the International Conference on Bovine Mycoplasmosis, Saskatoon, Canada, July 7–9, 2009. Available at: http://www.bovinemycoplasma.ca/. Accessed February 2, 2011.

Mycoplasma bovis Infections in Cattle
F.P. Maunsell, A.R. Woolums, D. Francoz, R.F. Rosenbusch, D.L. Step, D.J. Wilson, and E.D. Janzen J Vet Intern Med 2011;25:772–783

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# Prevalence – Western Canada

- Follows similar patterns
- Tested 59 Dairy herds
  - 19% Positive
  - Mainly bulk tank samples, likely low estimate
  - Utilizing qPCR and culture

Paul Adams
**Kwantlen Polytechnic University**

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# How is *Mycoplasma bovis* spread?

- Purchased animals thought to be the main route of introducing *Mycoplasma bovis* into a herd; infected carrier could be symptomless
- Transmission via nose-to-nose contact
- Transmission also possible though infected milk/colostrum, aerosol, and exposure during calving from carrier cows.
- **Animal-to-animal most common but can survive in water and straw in the environment**.

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# How fast can *Mycoplasma bovis* spread?

- Calves shipped from Saskatchewan to a feedlot in Ontario
- Took samples from 350 calves

**Prevalence and genotype of *Mycoplasma bovis* in beef cattle after arrival at a feedlot**

Fernanda Castillo-Alcala, DVM, DVSc; Kenneth G. Bateman, DVM, MSc; Hugh Y. Cai, DVM, DVSc; Courtney R. Schott, BSc; Lois Parker, BSc; Mary Ellen Clark, BSc; Patricia McRaild, BSc; Rebecca M. McDowall; Robert A. Foster, DVM, PhD; Marie Archambault, DVM, PhD; Jeff L. Caswell, DVM, PhD

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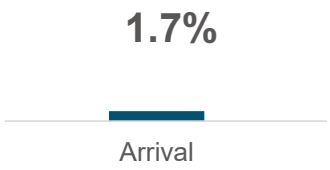


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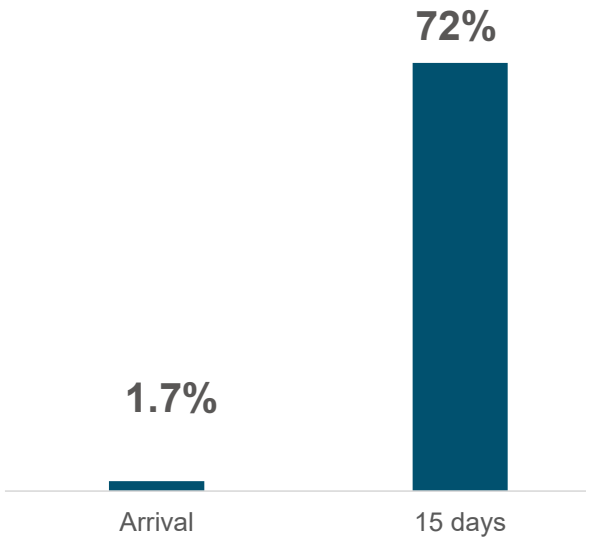


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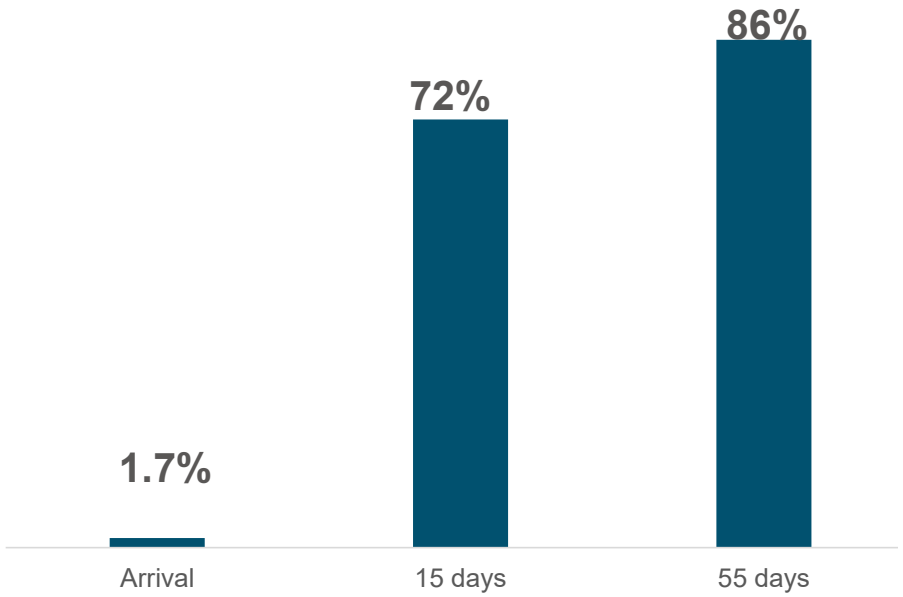


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# How common is *Mycoplasma bovis*?

- Large scale survey in US; sampled over 3200 healthy and sick cattle

Lubbers et al. 2017. Prevalence of respiratory viruses and Mycoplasma bovis in U.S. cattle and variability among herds of origin, production systems and season of year. Bovine Practitioner Vol 51 (2) 159 - 164

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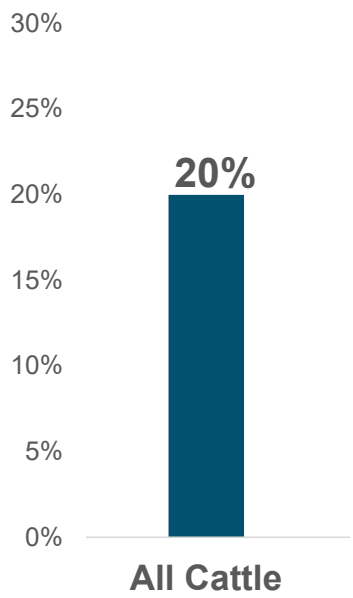


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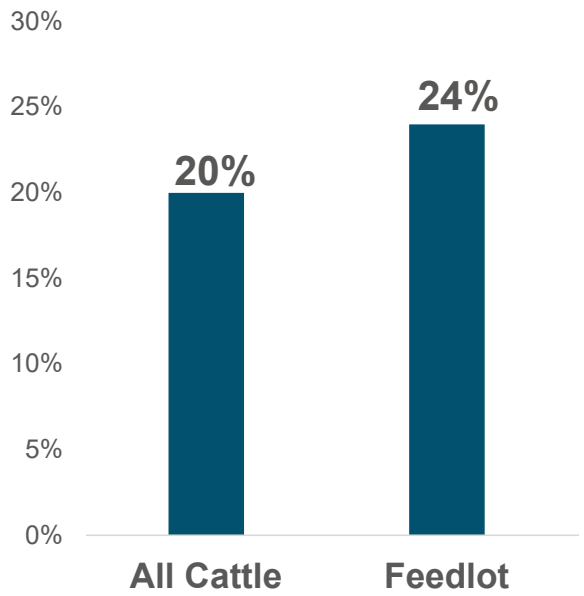


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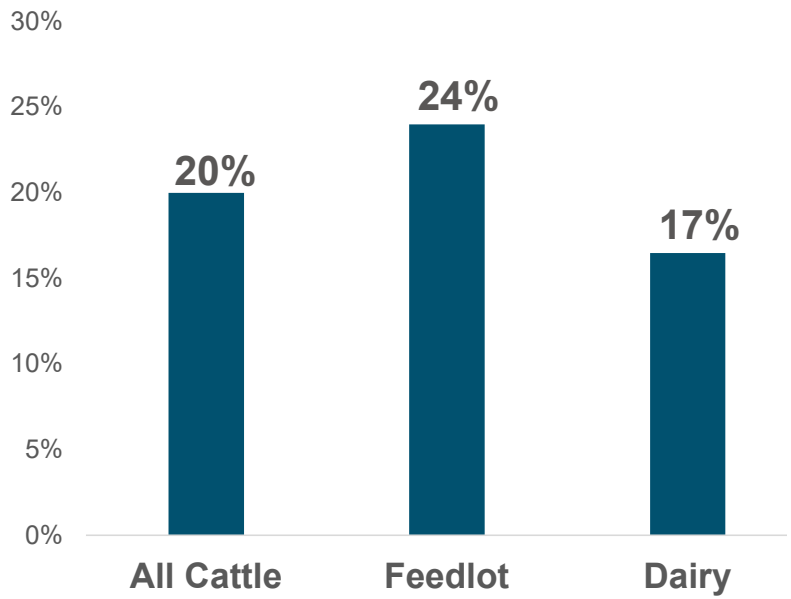


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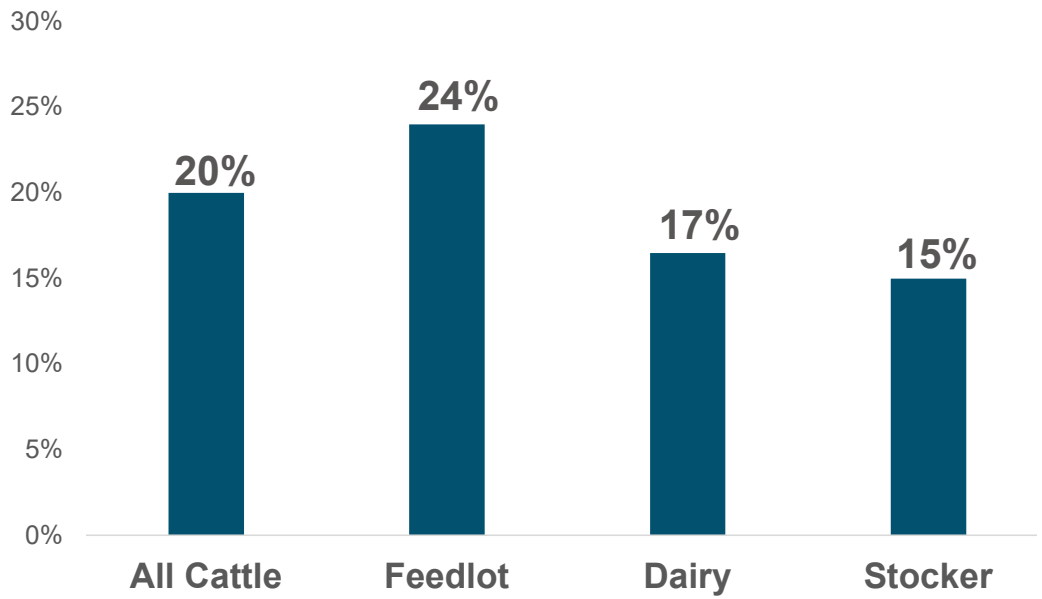


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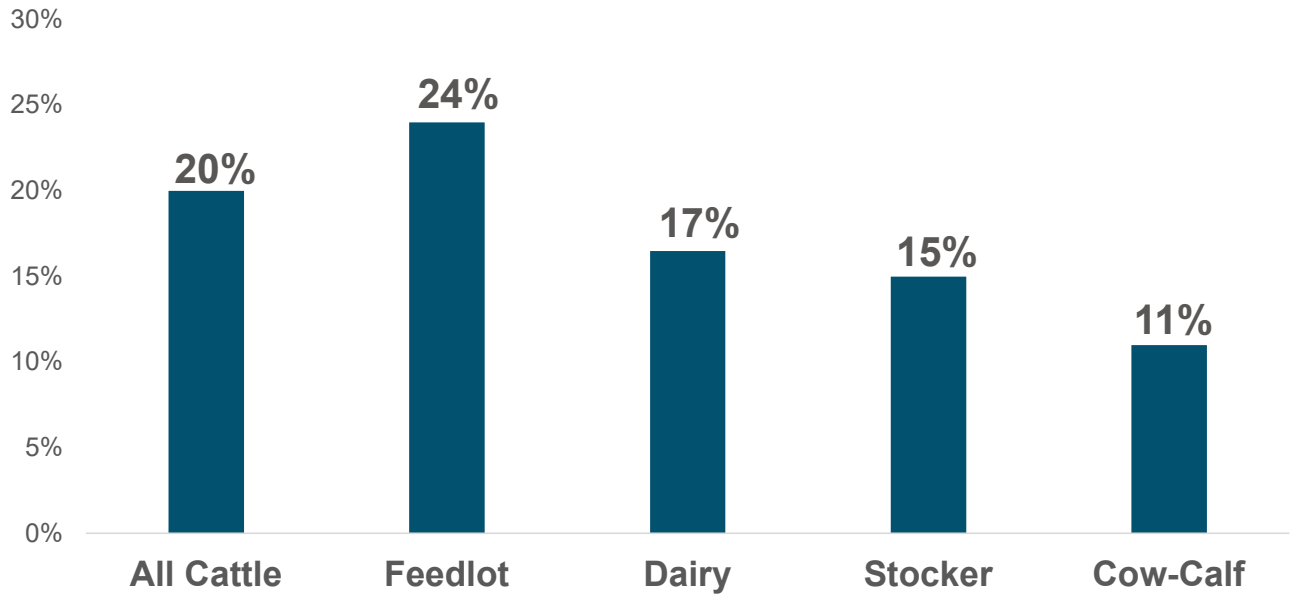


**We will import 500,00 head of feeder cattle from the US in 2025**

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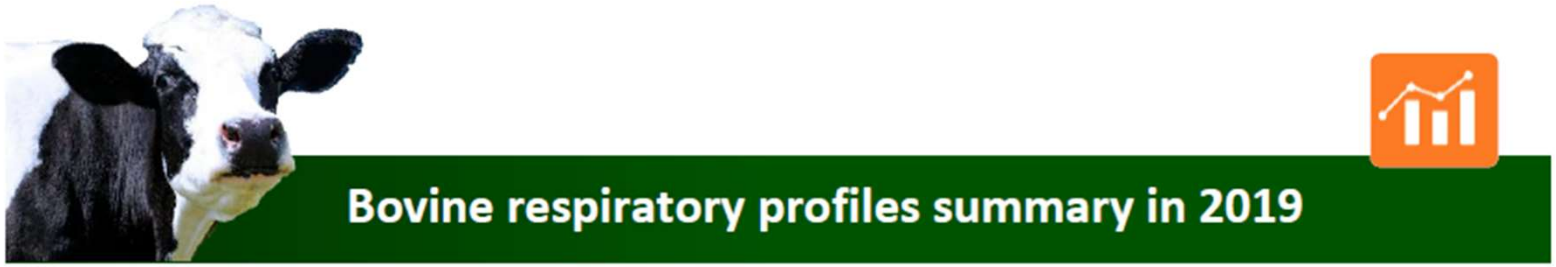
# How common is *Mycoplasma bovis*?

- Similar prevalence in surveys from Quebec (23%) and western Canada (20%)




by Christian Savard, André Broes

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# Take Home #2

# How does Mycoplasma cause disease- Pathogenisis

# Pathogenesis

- A variety of ways to evade the host immune response
  - ➢ Persistent infection and poor response to therapy

## Mycoplasma bovis

## Interactions with the Immune System and Failure to Generate an Effective Immune Response

VCNA, 2019

Fiona P. Maunsell, BVSc, PhD[a,*], Christopher Chase, DVM, MS, PhD[b]

# Pathogenises

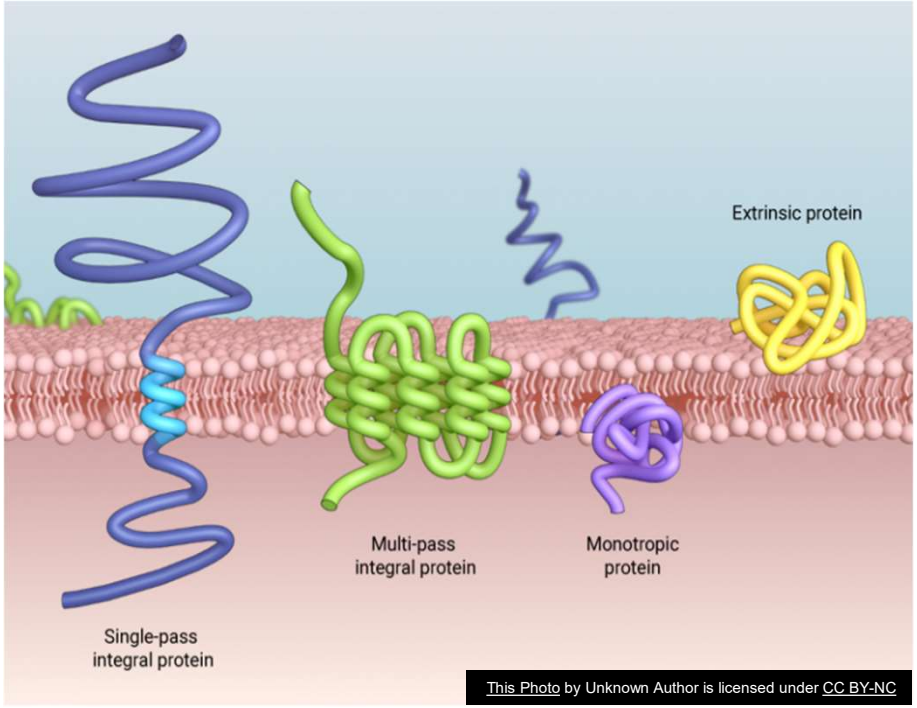
- A variety of ways to evade the host immune response
  - ➢ Persistent infection and poor response to therapy

- Variable surface proteins (VSP)
- Can directly impair the activity of neutrophils and monocytes
- Can kill lymphocytes
- Induction of pro-inflammatory cytokines
- Hydrogen Peroxide production

- **Basically, alter their appearance, kill all the good guys and blow things up**

# Variable Surface Lipoproteins- Vsps

- Variable Surface lipoproteins
  - Should be targets for adaptive immune respsonse
  - Surface antigen variation
  - **Reasons why Ab response not indicative of protection**
  - Allows for chronicity
  - Involved in Biofilm production



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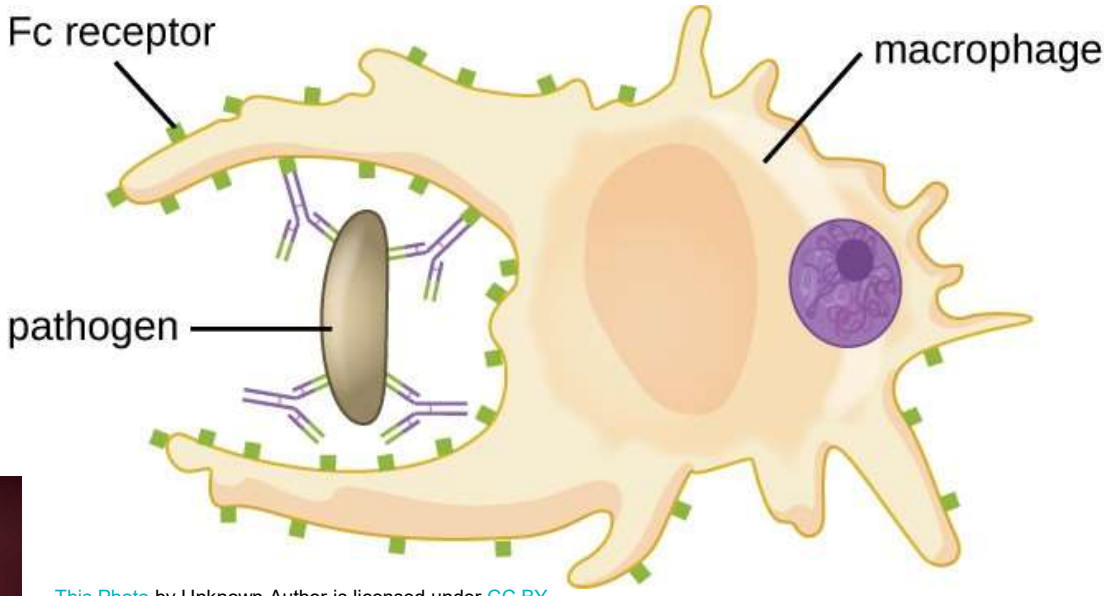
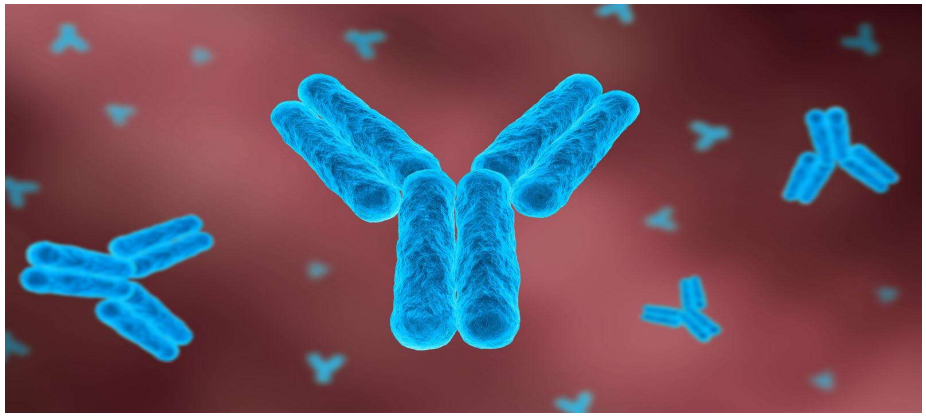
# Killed Vaccines Less effective for Mycoplasma

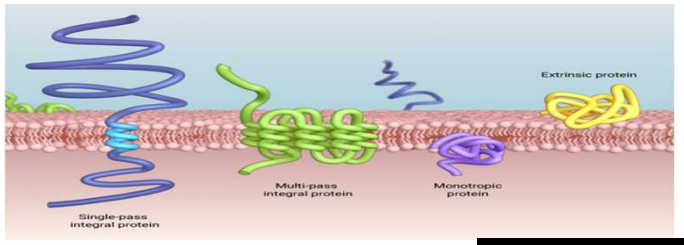
## Key Features-

- Stimulate Humoral immune system
  - Antibody formation
- Usually formulated with strategic antigens
- **Mycoplasma can change strategic antigens**
  - **Evading the host immune system**







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# Biofilms

- Many isolates of *Mycoplasma bovis* capable of producing biofilm
- More resistant to temperatures of 50ºC
- More resistant to desiccation/drying at 32 hours
- Important within the host as well, protect from opsonization.
- Allow it to live longer in the enviroment

Biofilm formation by mycoplasma species and its
role in environmental persistence and survival
Laura McAuliffe,1 Richard J. Ellis,2 Katie Miles,1 Roger D. Ayling1
and Robin A. J. Nicholas1

Microbiology (2006), 152, 913–922 DOI 10.1099

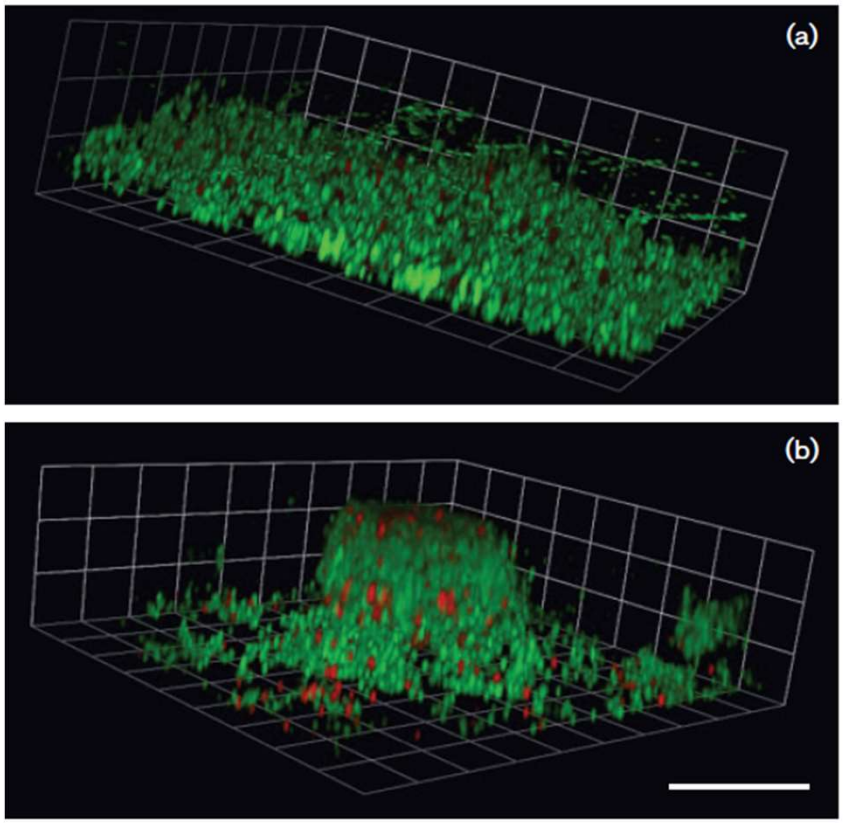


**Fig. 6.** Three-dimensional confocal image of *M. putrefaciens* biofilm stained using BacLight (Molecular Probes). After 24 h a layer of cells has formed on the coverslip (a); after 48 h stacks of cells can be seen within the biofilm (b). Bar, 20 μm.



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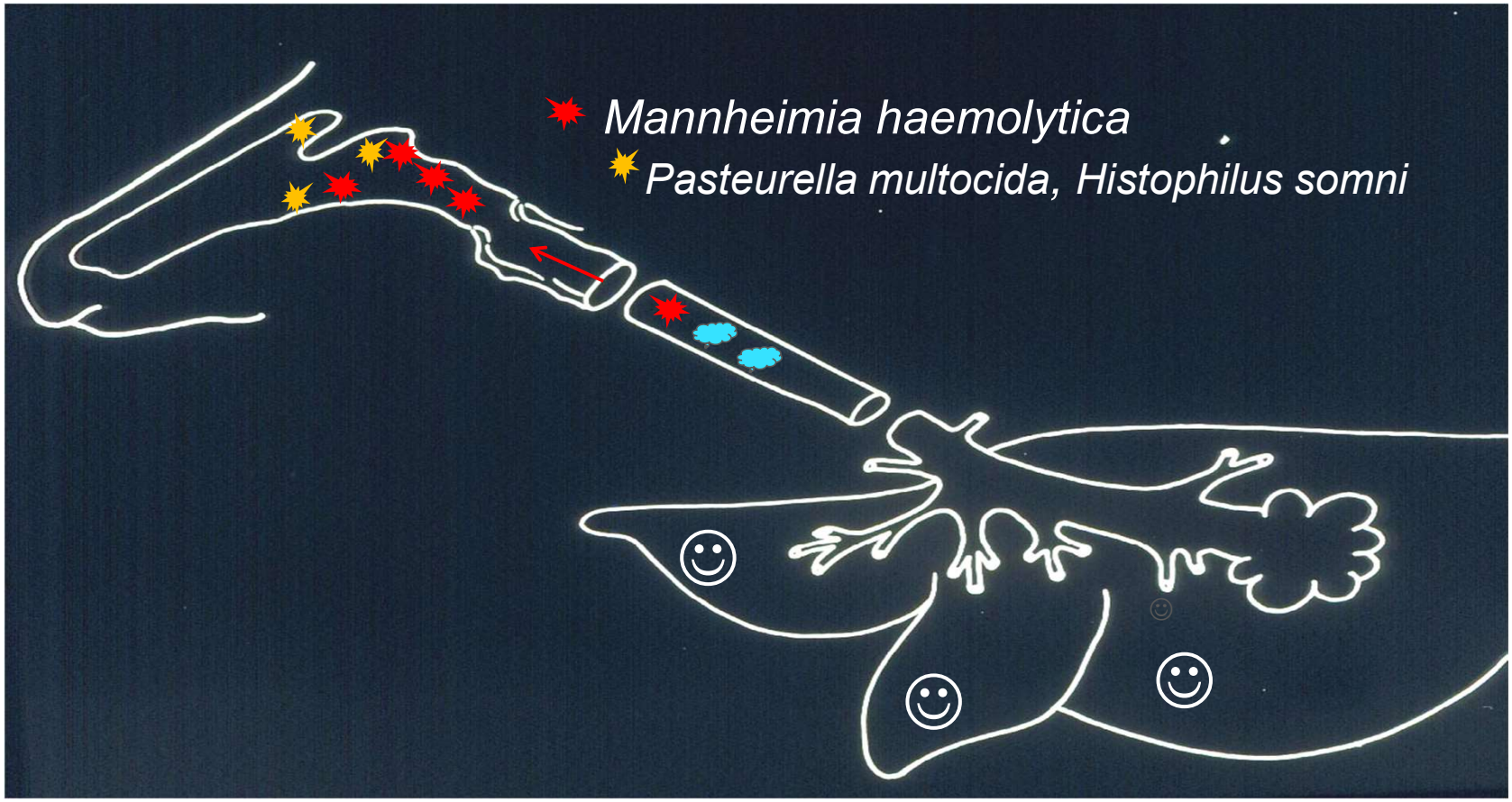
# Bovine respiratory disease
# How does it happen?

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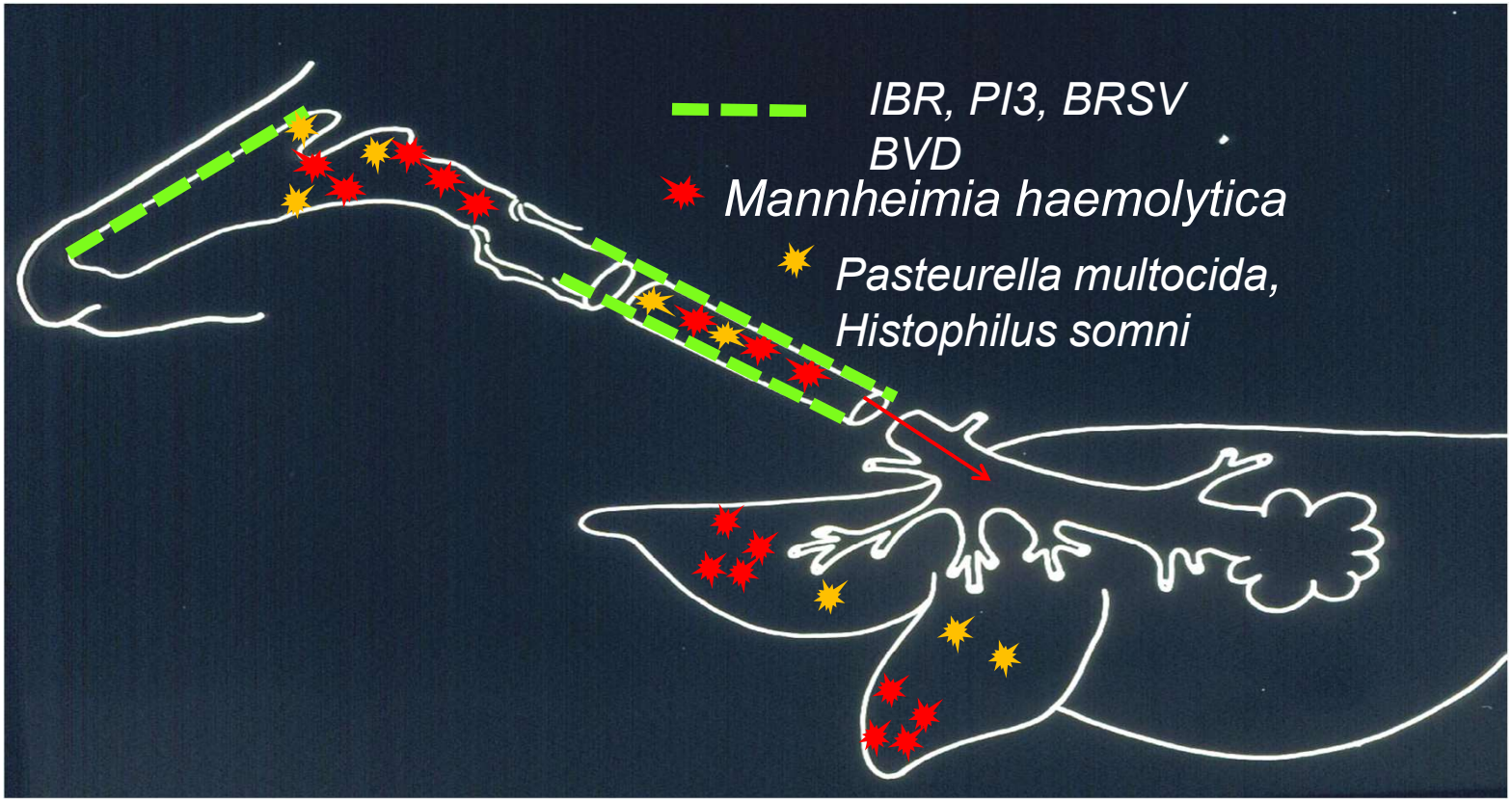


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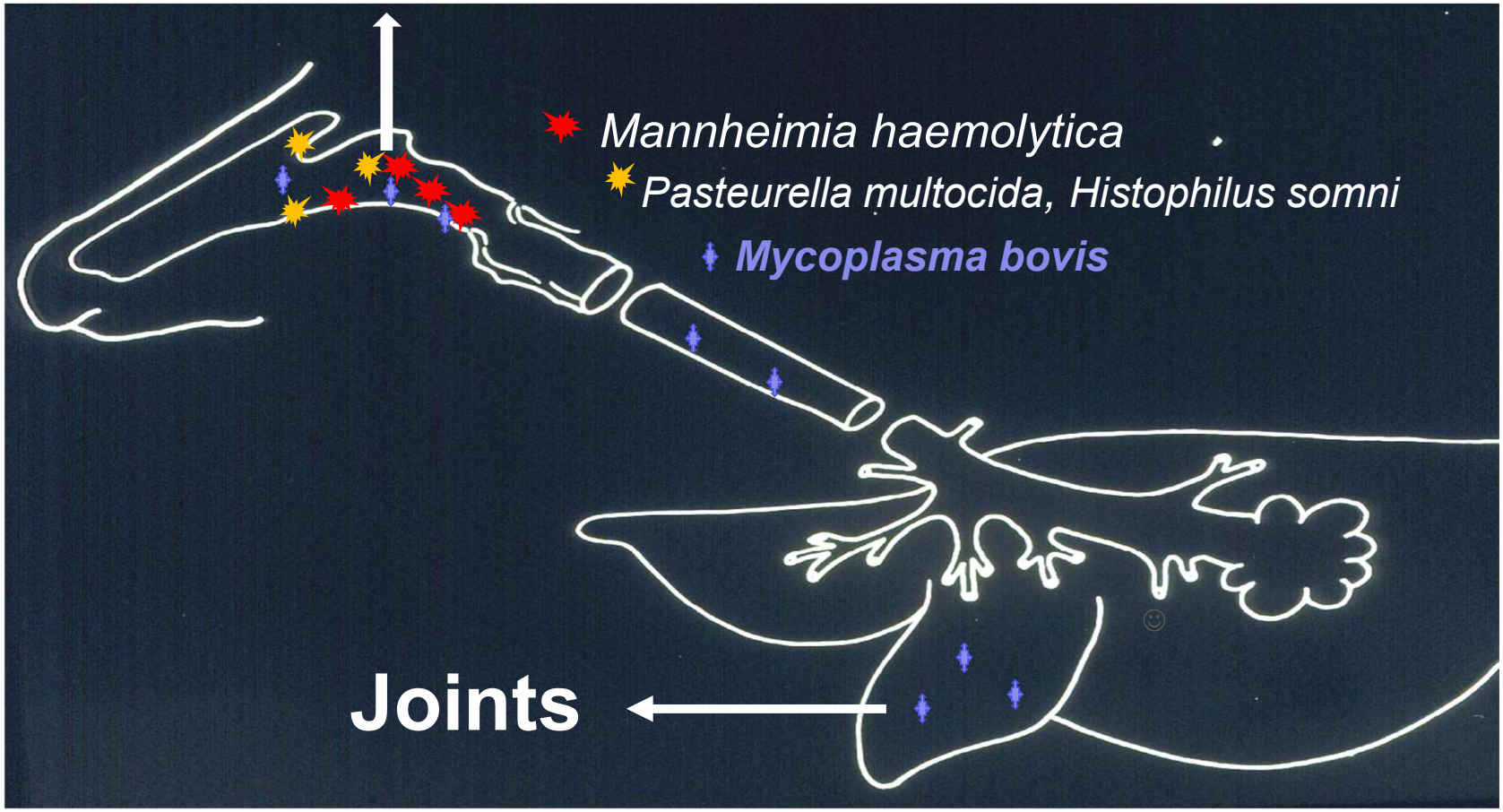
# *M. Bovis* can cause disease while acting alone

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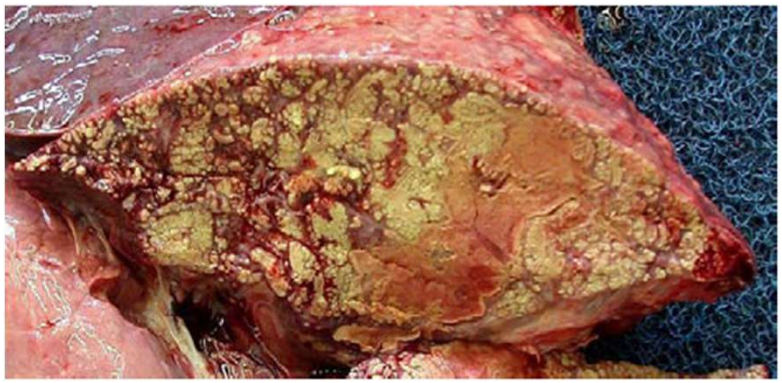
# Chronic Pneumonia - Poly Arthritis Syndrome

- CPPS- Chronic
- From lungs hematogenous to joints
- May also involve surrounding tendons and synovial structures



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# Inciting causes- Usual suspects

- Damage to physical defense **IBR BRSV BVD**
  - Ventilation
  - Dust
  - Viral infections
  - Bacterial infections
- Immunosuppression
  - Transportation
  - Weaning
  - Heat **or Cold stress**

**Mannheimia**

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# Treatment and Prevention

# TREATMENT

- Do NOT have a cell wall - the target of several antibiotics

- Beta-lactams: penicillin and cephalosporins will **NOT** be effective
  - Excede®: ceftiofur crystalline free acid
  - Excenel® SP: ceftiofur sodium
  - Excenel® RTU EZ: ceftiofur hydrochloride
  - Eficur-ceftiofur suspension
  - Cevaxel RTU- ceftiofur suspension
- Naturally resistant to sulfonamides- including trimethoprim sulphas
  - Borgal® , Trimidox

# TREATMENT- On Label- Tulathromycin

**INDICATIONS:**

**Bovine respiratory disease (BRD):** Injectable Solution is indicated for the treatment of BRD associated with *Mannheimia haemolytica*, *Pasteurella multocida*, *Histophilus somni (Haemophilus somnus)* and *Mycoplasma bovis*

**These products also have a reduction in morbidity claim against the same organisms**

1. Draxxin®
2. Lydaxx
3. Increxxa
4. Macrosyn
5. Tulaven
6. Tulinovet
7. Tulissin
8. Draxxin®KP
    - Treatment only

# Treatment

- Other antibiotics with reported In-vitro activity
  - Danofloxacin- A-180®
  - Enrofloxacin- Baytril 100
  - Marbofloxacin- Forcyl®?

  } Fluoroquinolones

  - Florfenicol-Resflor® , Nuflor®,Florkem, Fenisolve, Zeleris®
  - Macrolides- Tildipirosin- Zuprevo®, Tilmicosin-Micotil™
  - Tetracyclines?
  - **Consulting Veterinarian's Protocol**

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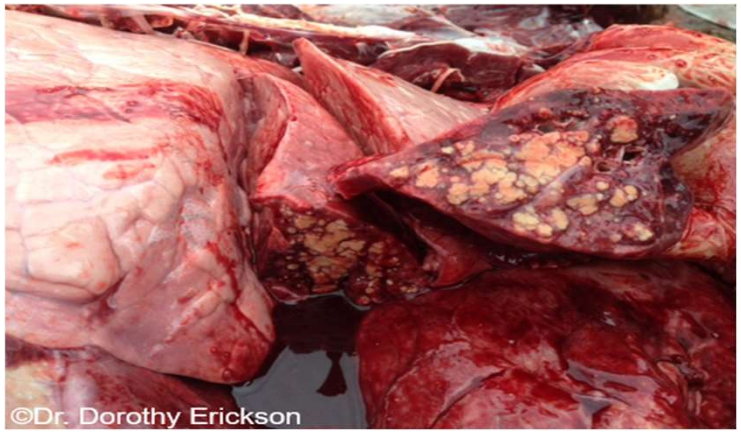
# Challenges in treating

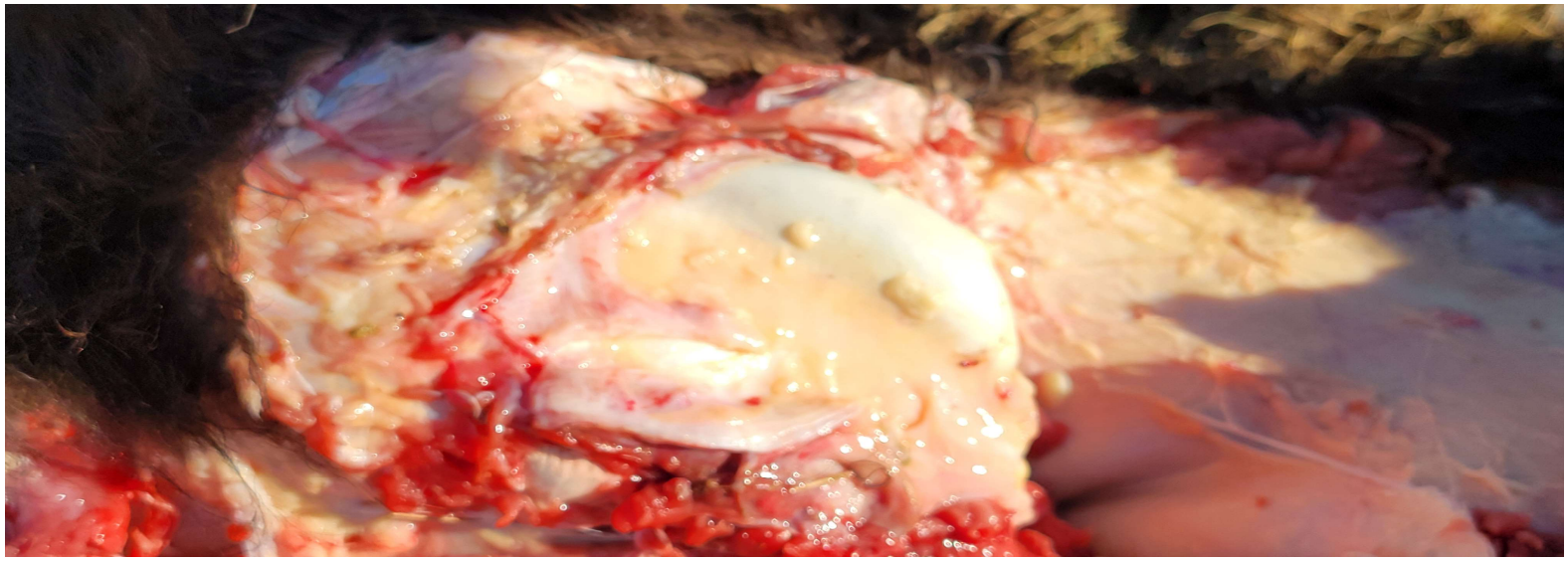
- Ability to avoid the host's immune response + slow development of clinical signs => can delay disease detection.
- Late detection => delayed treatment => poor treatment response
- Lungs with abscesses and necrosis: antimicrobials are not maximally effective in this environment
- Insufficient duration of treatment

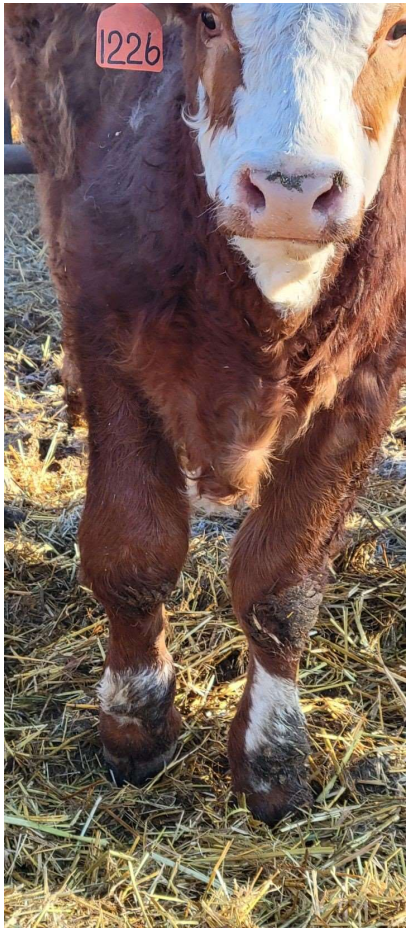



- Anecdotal reports suggest that **early treatment** is critical for success and that treatment should be continued for **at least 10 to 14 days.**

# Arthritis Treatment- Difficult

- Getting consistent antimicrobial concentrations into the joint difficult
- Often surrounding joint capsule and tendon sheaths involved



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# Prevention/Vaccines

# Vaccines Licensed in Canada

## Myco-bac™

- **Bacterin with adjuvants**
- Myco-Bac is effective for the vaccination of healthy cattle four months of age or older against Mycoplasma bovis.
- Mix well and aseptically inject 2.0 mL subcutaneously in the side of the neck. Repeat on days 7 and 14 alternating sides of the neck.

## Protivity®

- **Avirulent live culture**
- This product has been shown to be effective for the vaccination of healthy cattle 1 week of age or older against respiratory disease caused by *Mycoplasma bovis*.

*General Directions:* Aseptically rehydrate the freeze-dried vaccine with the sterile diluent provided, mix well and administer 2 mL subcutaneously.

- *Primary Vaccination:* Healthy cattle should receive two doses administered 21 days apart.



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# How Is Protivity® Different?

PROTIVITY®

- Avirulent live *M. bovis* vaccines stimulate cell mediated immunity more effectively than bacterins.[1]
  - **Bacterins fail to adequately induce the cellular response which is indicative of protection.**
  - Seroconversion is not predictive of protection.[2,



1. Chao J, Han X, Liu K, et al. Calves Infected with Virulent and Attenuated Mycoplasma bovis Strains Have Upregulated Th1 Protective Responses. *Genes*. 2019;10:656.
2. Mulongo M, Prysliak T, Perez-Casal J. Vaccination of feedlot cattle with extracts and membrane fractions from two Mycoplasma bovis isolates results in strong humoral immune responses but does not protect against an experimental challenge. *Vaccine*. 2013;31(10):1406-1412.
3. Soehnlen MK, Aydin A, Lengerich EJ, et al. Blinded, controlled field trial of two commercially available Mycoplasma bovis bacterin vaccines in veal calves. *Vaccine*. 2011;29:5347-5354.
4. Data on file, Study Report No. B832R-US-17-665, Zoetis Inc.

# How Is Protivity® Different?

PROTIVITY®

- Avirulent live *M. bovis* vaccines stimulate cell mediated immunity more effectively

- Challenge studies
- **Substantial reduction in lung lesions in challenge studies (74% reduction mean percentage of total lung lesions).[4]**
- Substantial reduction in duration of clinical signs in challenge studies (77% reduction in clinical signs).[4]


1. Chao J, Han X, Liu K, et al. Calves Infected with Virulent and Attenuated Mycoplasma bovis Strains Have Upregulated Th17 Inflammatory and Th1 Protective Responses. *Genes*. 2019;10:656.
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# Research Protivity

- Naturally occurring study in ultra high-risk Holstein bull calves- approx. 1 week of age[1]
- Reduced mortality from 12.5% to 8.2% over 1st 120 days
  P= 0.02
- Majority of research in young calves

1. Study on file- 22CRGBIO-02-01

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# Protivity- Concurrent antimicrobial use

- Protivity is an avirulent live culture
- Antimicrobials with efficacy against Mycoplasma may affect vaccine efficacy
- Veterinary consultation
  - Feedlot protocols
- Tech Service support


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# BRD Prevention- Integrated approach

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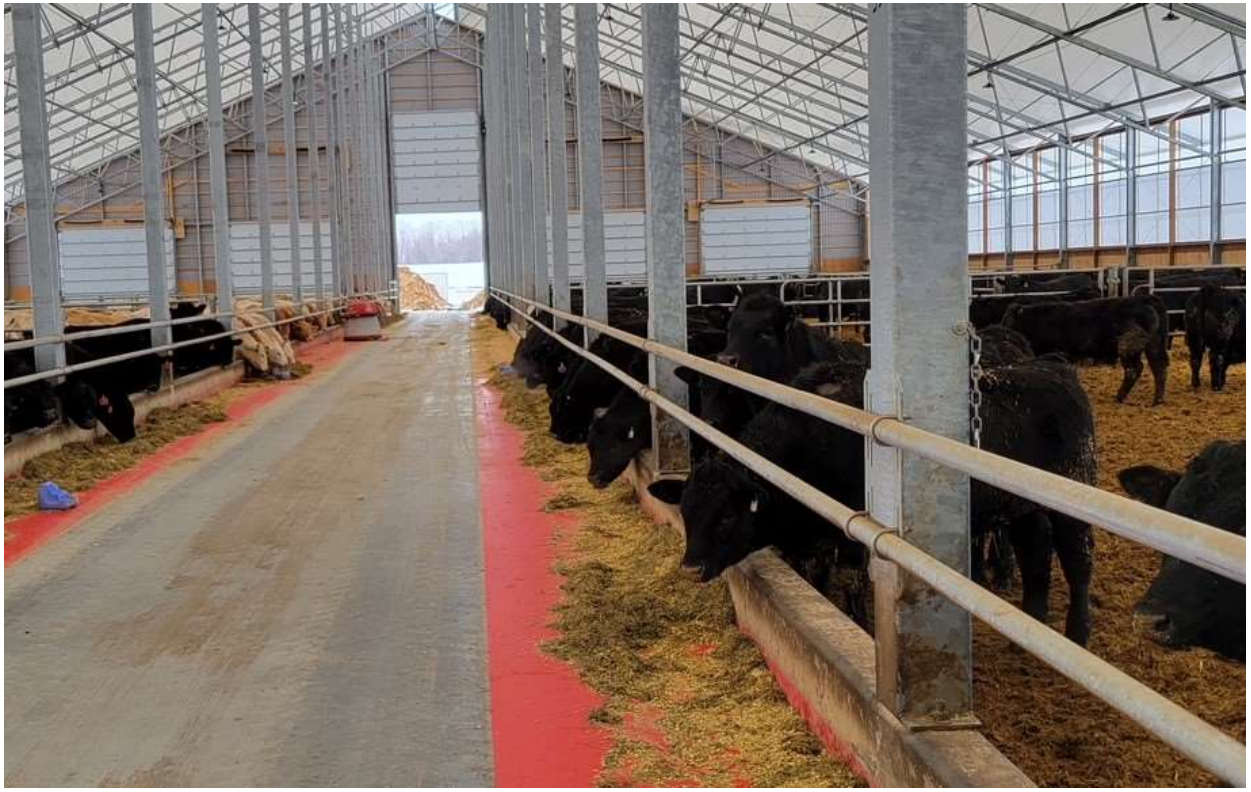
# BRD Prevention- Integrated Approach
# Animal Husbandry Matters



- Pen conditions
- Pen size
- Bunk Space
- Receiving rations
- Economies of scale??

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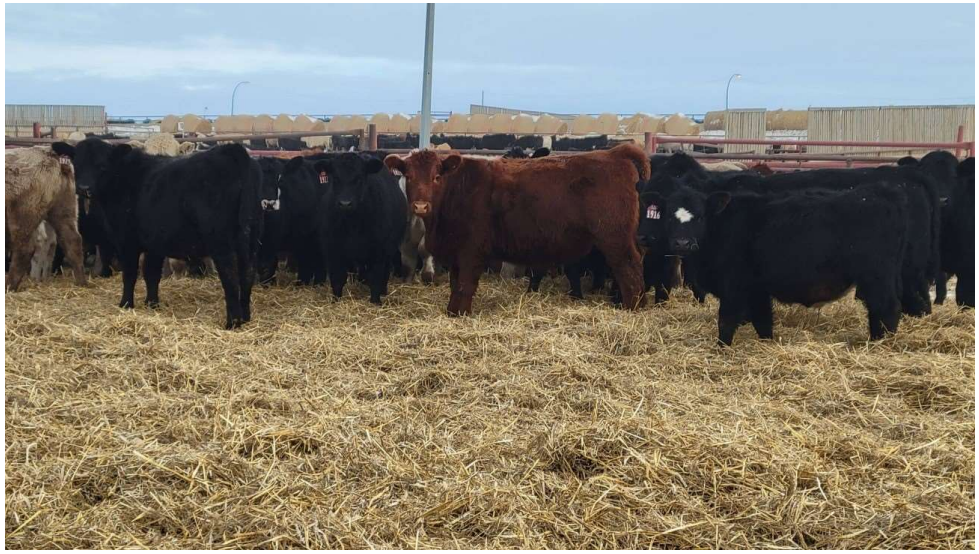
# BRD Prevention- Integrated approach Systems

- BRD is caused by stress-induced immune dysfunction initiated during the feeder cattle marketing process
  - John Richeson WTAMU

- Manage wellness not sickness
  - Robin Falkner DVM



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# BRD Prevention Mixing

## Herd of Origin- When there are greater than 6 herds of origin per 100 animals there is 5X the risk of dying from BRD Mortality

**Calvin Booker DVM MSC- 2024 BRD Symposium**

# Take Home Summary

**Be able to recognize the symptoms**

***Mycoplasma bovis* prevalence increases with mixing**

***Mycoplasma bovis* plays an important role in BRD**
**Is adept at avoiding the immune system**
**Treatment difficult**

**Prevention is an integrated approach**
**Vaccines available**

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# Questions