Management Board meeting
DISCONTOOLS, 28 November 2022 in London

Update on *Mycoplasma bovis*, *a non zoonotic bacterium involved in multifactorial diseases of* ***huge economic consequences*** *for cattle* ***worldwide***

Dr. Florence TARDY, Head of Mycoplama unit in Anses, Lyon

Significant mycoplasmas in livestock animals

- Cattle : *M. bovis* (bronchopneumonia, mastitis, arthritis, otitis)

World Organisation for Animal Health Founded as OIE

M. mycoides subsp. *mycoides* **(CBPP)**

- Small ruminants : *M. capricolum* subsp. *capripneumoniae* **(CCPP)**

World Organisation for Animal Health Founded as OIE

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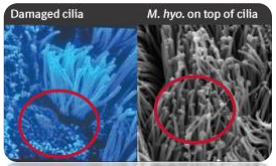
M. agalactiae, M. mycoides subsp. *capri, M. capricolum* subsp. *capricolum,*

M. putrefaciens (**CA**)

- Swine : *M. hyopneumoniae* (**enzootic pneumonia**)



- Poultry: *M. gallisepticum* (chronic respiratory infection)

World Organisation for Animal Health Founded as OIE

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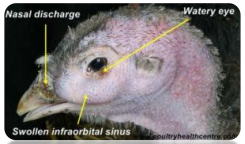
M. synoviae (joints, bones, respiratory infections + eggshell apex abnormalities)



Mycoplasmas are peculiar bacteria

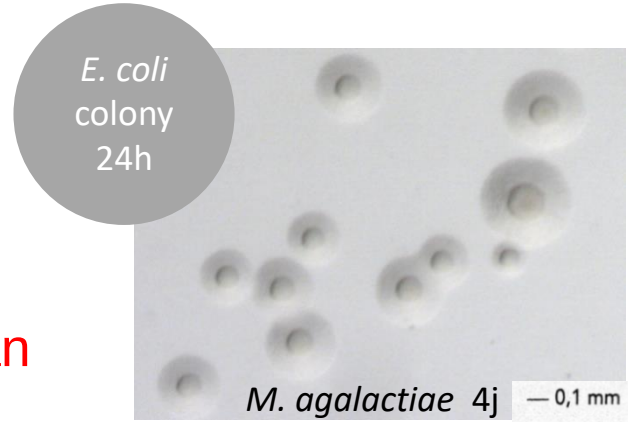
No cell-wall = neither Gram +, nor Gram –

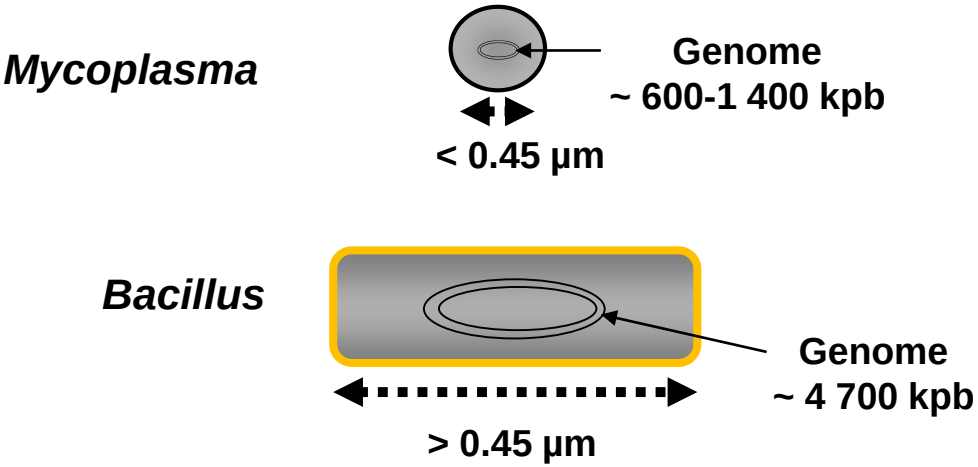
Fastidious to grow (sterol need)

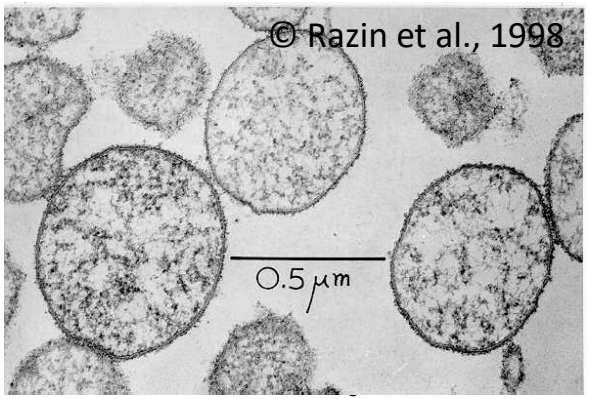
Small cells

Small genomes = poor metabolic expression

Specific codon usage: UGA reads as tryptophan

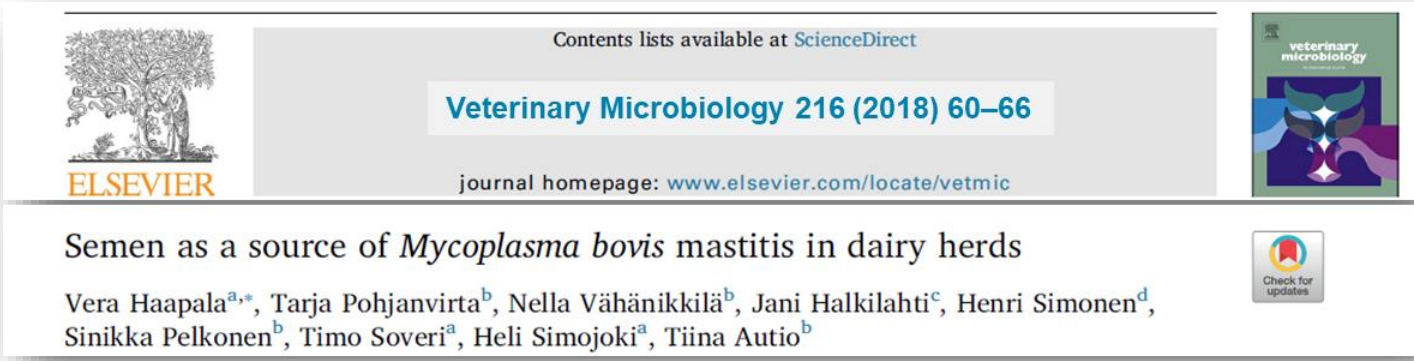






Main reasons for revising the chapter on *Mycoplasma bovis*

Transmission through semen (2012)



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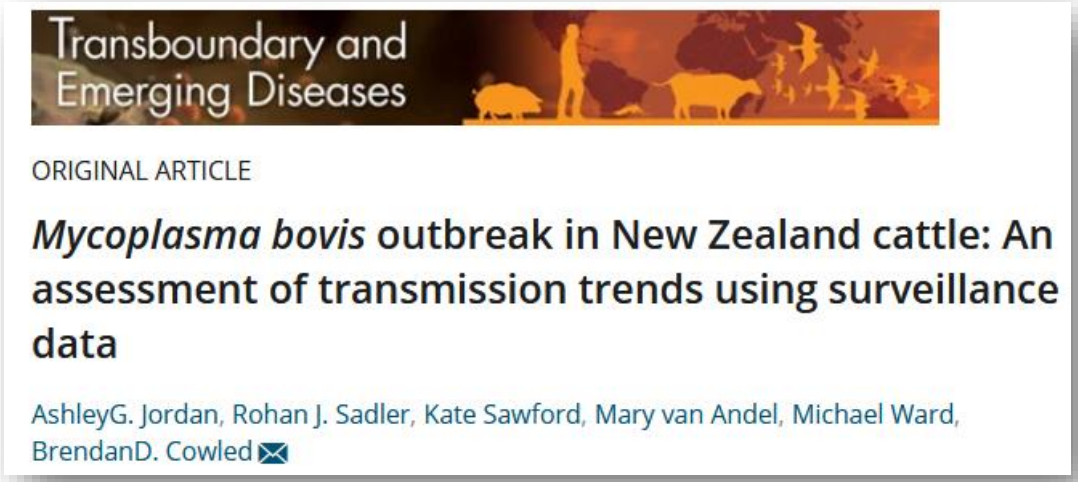
Semen as a source of *Mycoplasma bovis* mastitis in dairy herds

Vera Haapala[a,*], Tarja Pohjanvirta[b], Nella Vähänikkilä[b], Jani Halkilahti[c], Henri Simonen[d], Sinikka Pelkonen[b], Timo Soveri[a], Heli Simojoki[a], Tiina Autio[b]

Outbreak in New Zealand (2017) ->eradication program estimated at some $800M so far.



Transboundary and Emerging Diseases

ORIGINAL ARTICLE

***Mycoplasma bovis* outbreak in New Zealand cattle: An assessment of transmission trends using surveillance data**

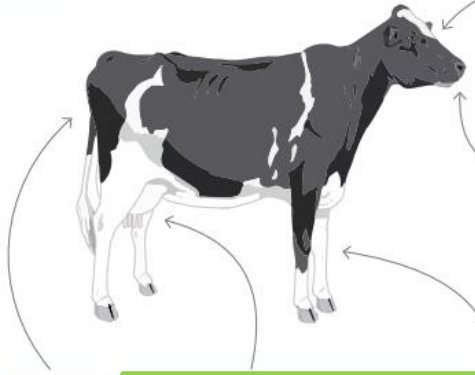
AshleyG. Jordan, Rohan J. Sadler, Kate Sawford, Mary van Andel, Michael Ward, BrendanD. Cowled

MYCOPLASMA BOVIS – what to look out for

***Mycoplasma bovis* is an unwanted organism in NZ. It is important for all farmers to contact their veterinarian and/or MPI if they see the following unusual signs in their herd.**

- *M. bovis* is spread mainly by prolonged close contact between animals and feeding milk from infected cows to calves.
- Equipment used on animals must be cleaned and disinfected thoroughly between farms.
- Don't wait if you have animals with suspicious signs, early intervention from a veterinarian is important.
- In some cases animals can be infected and show no signs of disease.

Cattle



Conjunctivitis

- Sticky eyes, white eyes

Pneumonia

- Hacking cough

Abortions

- Slips, early calves, small calves

Mastitis

- Swollen (rubbery quarters), involves multiple quarters
- Non responsive to treatment
- Affected quarters will rapidly dry off

Lame cows with swollen legs/joints

- Painful and hot

Calves / young stock

Ear infections

- Droopy ear
- Ear discharge
- Head tilt

Conjunctivitis

- Sticky eyes, white eyes

Lame calves with swollen legs/joints

- Painful and hot

Fading calves

- Inflammation of the joints, and sometimes the brain

Pneumonia

- Hacking cough

anses

NZVA beef+lamb new zealand Biosecurity New Zealand Ministry for Primary Industries Manatū Ahu Matua DAIRY CATTLE FEDERATED FARMERS OF NEW ZEALAND DairyNZ

The team of experts and their experience with *M. bovis*

Inna Lysnyansky, head of the Mycoplasma Unit at Kimron Veterinary Institute, **Israel**

Nadeeka Wawegama, Senior Research fellow in Veterinary Microbiology, Melbourne Veterinary School, University of Melbourne, **Australia**.

Henk Wisselink, Senior research scientist, Wageningen Bioveterinary Research in Lelystad, **The Netherlands**.

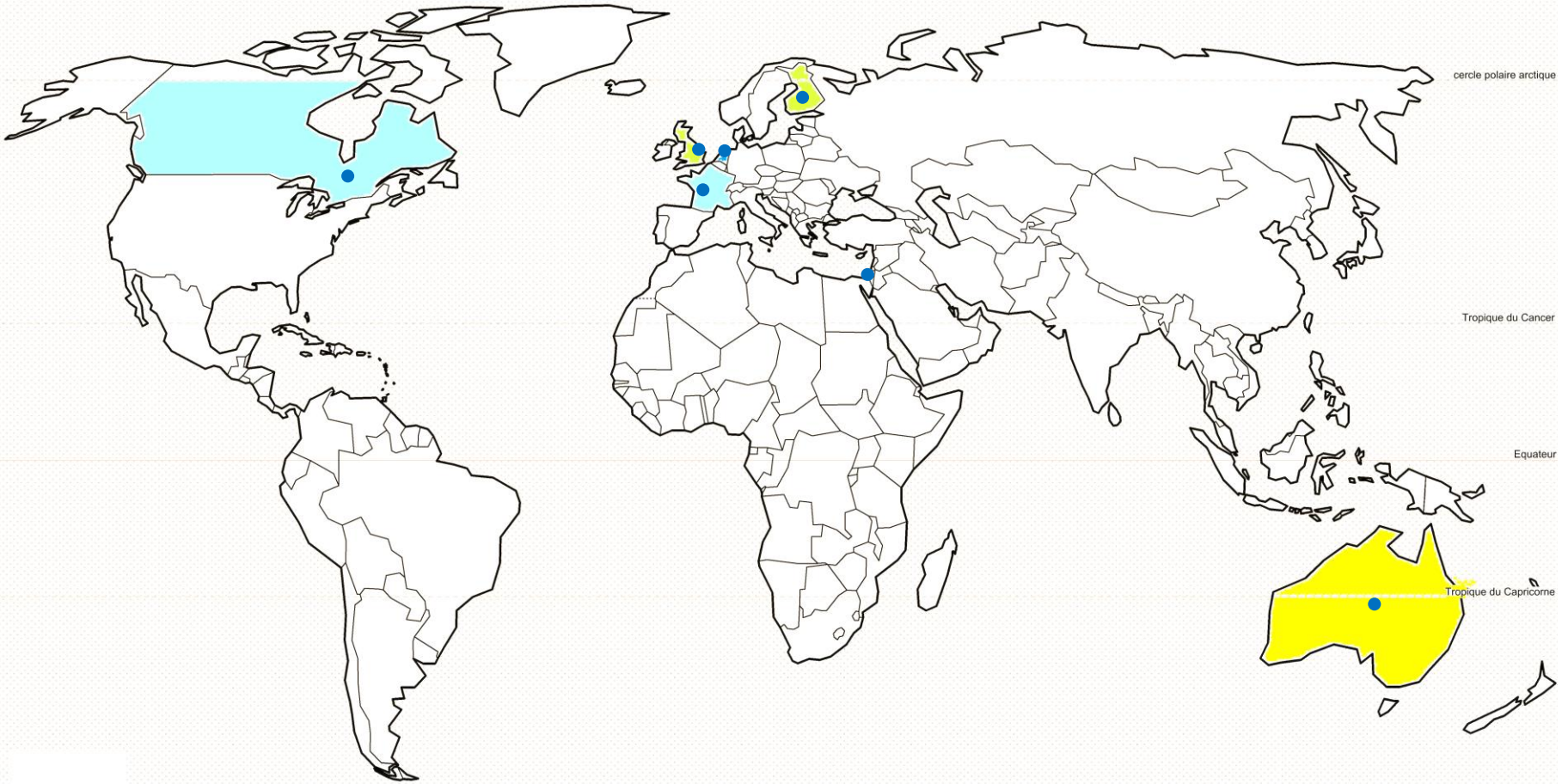
Anne Ridley, Mycoplasma Team leader, WOAH reference center for contagious agalactia, Animal and Plant Health Agency, **UK**.

Jose Perez-Casal,
Research Scientist
Vaccine and Infectious Disease Organization, Saskatoon
Canada

Tarja Pohjanvirta
Head of section, specialist in animal infectious diseases
Finnish Food Authority, Kuopio
Finland

Geert Vertenten MSD Animal Health as Global Technical Director for Ruminant Biologicals, **The Netherlands**.
global ruminant team of MSD Animal Health

Florence Tardy
Senior specialist in animal mycoplasmoses
Anses, Lyon
France


cercle polaire arctique
Tropique du Cancer
Equateur
Tropique du Capricorne

The expert group facing *M. bovis* infections in their respective country…

Israel :

- Pneumonia/BRD in feedlot calves >>> mastitis in dairy cows (3% of the isolates).
- WGS-single nucleotide polymorphism analysis, revealed a circulation of dominant cluster among Israeli *M. bovis* strains associated with mastitis.
- This cluster showed a close genomic relatedness to *M. bovis* strains isolated from calves imported from Australia, or to Chinese strains (Both Israel and China import cattle from Australia).

Canada :

- Feedlot producers experience significant financial losses due to *M. bovis* including veterinary costs, antibiotic treatment and culling of infected animals.
- The bison population is also affected by *M. bovis*

The Netherlands :

- Many animal health problems as a result of *M. bovis* infections
- Both in dairy and in fattening lots

The expert group facing *M. bovis* infections in their respective country

UK :

- Calf pneumonia but also pneumonia in older cattle (>1year old,13%)
- *M. bovis*-associated mastitis, arthritis and otitis, are less common.
- Interest in trade associated testing of germplasm.

Australia :

- High seroprevalence in dairy herds
- Strains isolated from European countries clustered together and separately from Australian and Chinese isolates.

France :

- *M. bovis* recovered from ~15% BRD cases, only a few cases of mastitis
- Circulating strains are multiresistant (except fluoroquinolones) and belong to a predominant subtype.

Gaps and needs, difficulties

Gaps and needs (1)

i) Few vaccines available (USA) but poor efficacy (**on going attempts but still a long way to go**)

ii) In vitro resistance to most of the antibiotics currently in use (**adapted CBP?).**

iii) Insidious infection with asymptomatic and chronic forms (impact on AW), not always easily diagnosed (**early, cheap diagnostics is needed**)

iv) Difficulty to eliminate the disease from a herd (**understanding the epidemiology of the disease at the herd level will help, e.g. infectious routes and doses**)

v) Difficulty to assess the contribution of *M. bovis* in the bovine respiratory disease complex when a number of other pathogens are also involved (**better knowledge on the pathophysiology in co-infections**)

Gaps and needs (2)

i) A better understanding of the **immune response against *M. bovis*** is needed for vaccine development.

ii) Data about **routes of transmission** (including through the environment and potential biofilms, semen, etc.) and **infection doses** per route are required to improve herd management practices.

iii) Need for **experimental models for reproducing the disease** + Need for clarification about the **pathophysiology** of *M. bovis* infection that could hint towards **new therapeutic** development.

iv) Need for interlaboratory trials to validate **(new, quicker) diagnostics methods** and commercial kits (including antimicrobial susceptibility testing). Ultimately transfer to accurate in-field tests would be most useful.

v) Need for **clinical interpretative criteria** for antimicrobial susceptibility testing.

Difficulties

Difficulties to get financed (limited contribution to One health)
Lots of hope in the coming EUP AH&W.

Will trading controls on germplasm become compulsory worldwide?

By Keith Woodford*

It is now increasingly evident that European-sourced semen, imported legally but containing live Mycoplasma bovis that survived the antibiotic cocktail, is the likely source of the organism in New Zealand dairy.

Difficulty to enroll the industry in research projects with low TRL, although *Mycoplasma bovis* BRD is recognized as an economic disease highly ranked in the priority list of industries (new ATB, vaccines or diagnostics tools…).

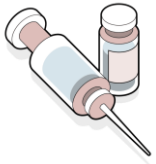
Take home messages

Be aware of mycoplasmas as primary pathogens although non-zoonotic.

Associated disorders impact on both AH & W

Non-targeted treatment with beta-lactamins might facilitate mycoplasma development

Vaccines are needed



Lots can be learned from the NZ experience (biosafety) : how far do we want to go ?

Develop the right tests with the right interpretation