



Enterococcus cecorum:
Updating Knowledge and
Management Protocols in a
Framework for Reduced Antibiotic Use

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Overview

Background

Prevalence of *Enterococcus cecorum* infections in Canada

- Data from animal pathology laboratories
- Comments from practitioners and pathologists

Situation in Québec

Research in Québec

What we do know...

Clinical signs

Proposed management protocol

Conclusion

Acknowledgments

Background

The first cases of *Enterococcus cecorum* infections were diagnosed in Scotland in 2002

Today, this pathology is endemic throughout the world

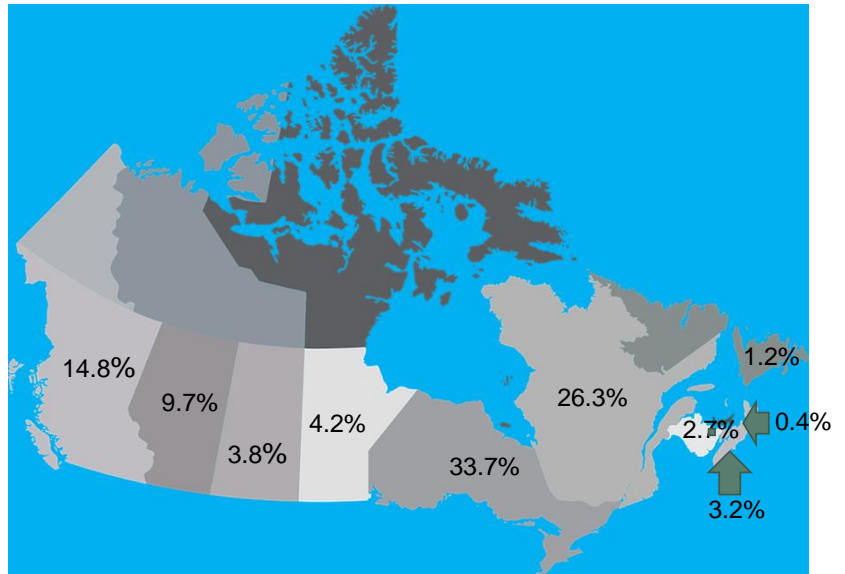
In Québec, infections have been present since 2010

- A significant increase was observed in the number of cases since 2019

Enterococcus cecorum infections mainly create locomotion problems starting around 18-20 days of age, resulting in a weekly increase in selection and important economic losses

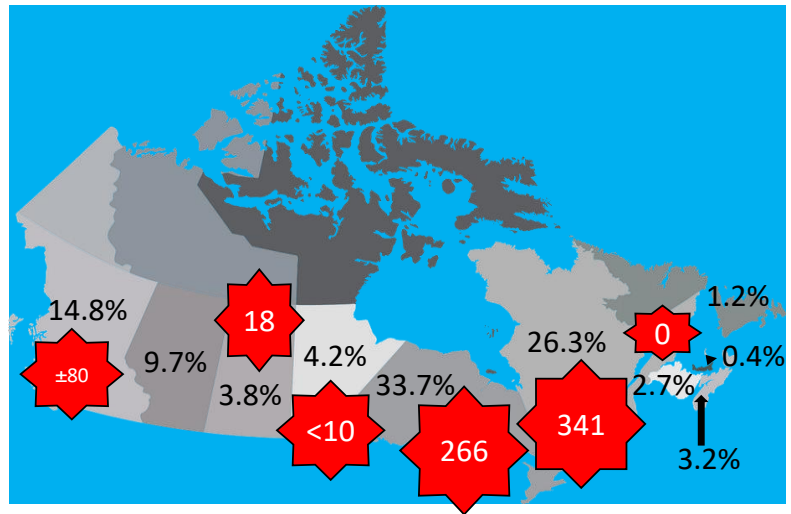
Broiler production in Canada in 2020

Broilers production
distribution
in Canada
by province
in 2020



Enterococcus cecorum infection prevalence in Canada

Number of diagnosis of *Enterococcus cecorum* infections in broiler chicken in 2020



Data from the different provincial animal pathology laboratories

Comments from veterinary practitioners and pathologists

British Columbia (14.8% Canadian production)

- They had several cases between 2015 and 2017
 - VOA form: vertebral osteoarthritis (osteomyelitis of the T4-T5 vertebrae)
- They now see more osteomyelitis affecting the femur, hepatitis (liver infection), endocarditis (heart infection), arthritis
- More cases with mixed *E. coli* + *E. cecorum* infections
- They worked on chick quality and brooding management
- Use of probiotics or acidifiers on the litter
- Remains a main cause of uniformity and economic losses

Saskatchewan (3.8% of the Canadian production)

- Data from Prairie Diagnostic Services Inc.

Year	Nb of <i>E. cecorum</i> cases
2016	43
2017	56
2018	24
2019	83
2020	18

- Fewer cases in 2020
- *E. cecorum* represented 2.5% of the lab submissions in 2020, down from 16% in 2019
- Lesions observed: sepsis, pericarditis and osteomyelitis affecting the femur
- Rare problem

Manitoba (4.2% of the Canadian production)

- In the pathology laboratory, less than 10 cases/year in the last 2-3 years
- Was a more important issue 4-5 years ago in the form of osteomyelitis affecting the T4-T5 vertebrae with spine abscess

New Brunswick (2.7% of the Canadian production)

- N-B Provincial Laboratory, Animal Health Branch
- Performed few necropsies on birds from commercial flocks
- No diagnosis of *E. cecorum* infection from 2017 to 2021
- Veterinary services come from Québec

Nova Scotia (3.2% of the Canadian production)

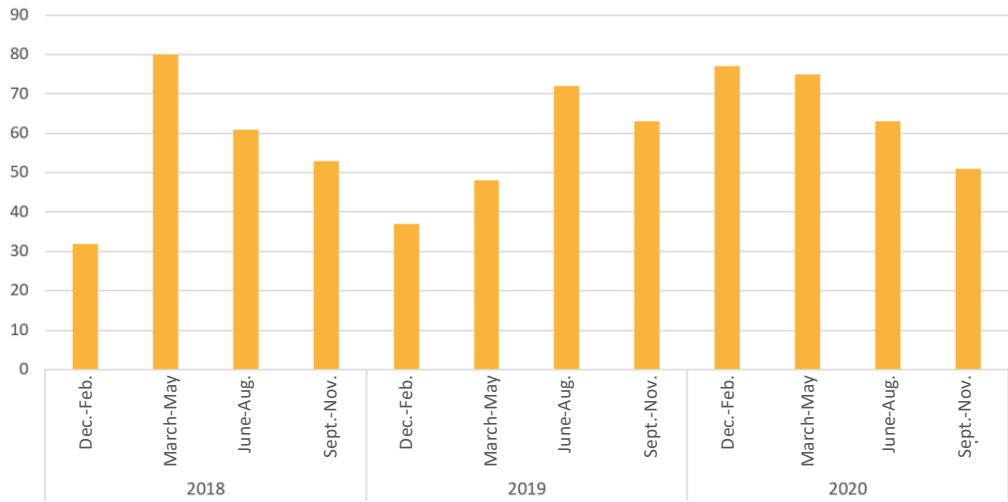
- Not a big problem
- Will sometimes get the late form (> 28-30 days): osteomyelitis affecting the T4-T5 vertebrae with spine abscess
- Mentions the importance of gut integrity to prevent the disease

Ontario (33.7% of the Canadian production)

- Declining number of cases in 2021
- See more sepsis cases with mixed *E. cecorum* and *E. coli* infections in young birds
- Also see osteomyelitis affecting the femur, pericarditis and sometimes osteomyelitis affecting the T4-T5 vertebrae with spine abscess
- One veterinarian observed that the abscesses affecting the spine's T4-T5 vertebrae are seen more frequently in male flocks with very good ADG
- Veterinarians are working on the 0-7 days brooding management (floor temperature, RH %, etc.) and chick quality
- Ongoing trials adding probiotics to litter or feed

Ontario

Number of diagnosis of *E. cecorum* infections in broilers, Animal Health Laboratory (AHL), Guelph



Most common recommendations from east to west...

Work on:

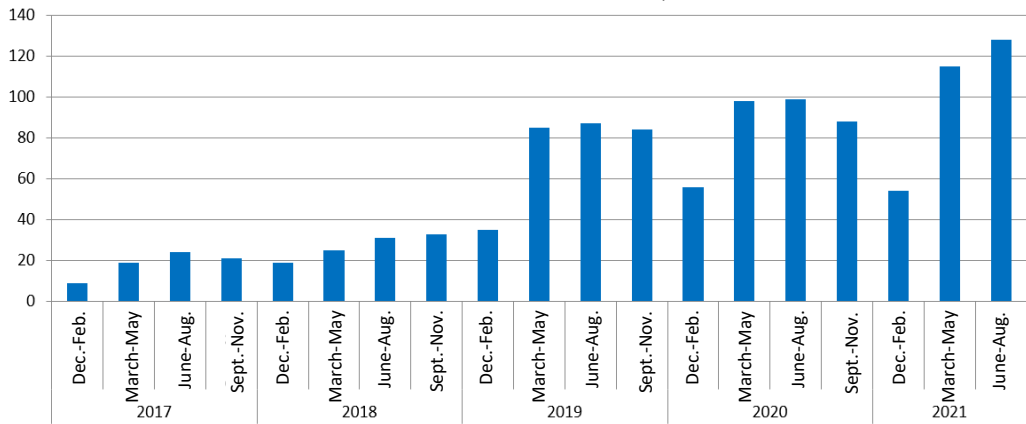
- Brooding management
- Chick quality
- Washing and disinfecting the house
- Gut integrity

If recurring in a house, add amoxicillin or penicillin to the drinking water

Ongoing probiotics trials (litter, feed)

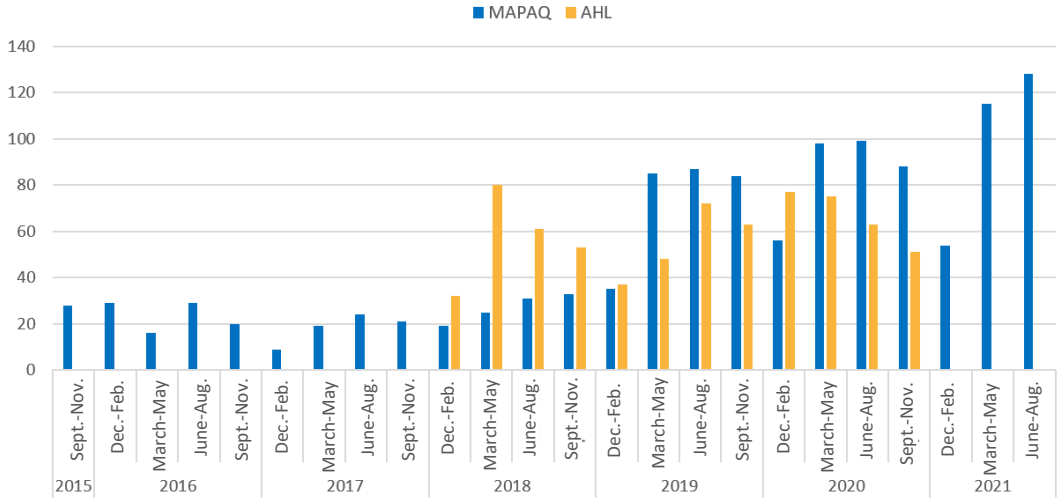
Situation in Québec (26.3% of the Canadian production)

Number of broiler chickens diagnosed with an *E. cecorum* infection in MAPAQ laboratories



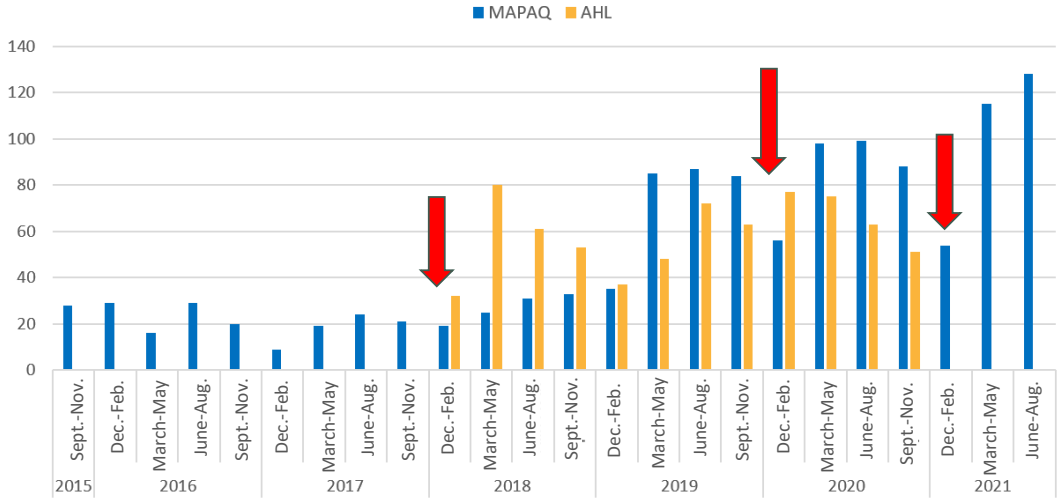
Ontario-Québec comparison

Number of E. cecorum infection diagnosis in broilers, MAPAQ vs. AHL Guelph



Ontario-Québec comparison

Number of E. cecorum infection diagnosis in broilers, MAPAQ vs. AHL Guelph



Hypothesis to explain the different prevalence seen between Ontario and Québec

- Genetic diversity of the *Enterococcus cecorum* strains that can influence the case pathogenicity and severity
- Production rights management method
 - The production period is 9 weeks in Ontario vs. 8 weeks in Québec
 - Quota rental is possible in Québec
 - Possible double flock in the same period in Québec
 - Effect on the downtime duration
 - Effect on flock density
- More integrated hatchery-feed mill-slaughterhouse in Ontario (except in Eastern Ontario): more integrated approach of the problem
- Earlier onset of the problem in Ontario: now better controlled

Research in Québec

Characterization and control of *Enterococcus cecorum*, an emerging multidrug-resistant bacteria in broiler chicken

Poultry Research Chair, FMV, Dre Martine Boulianne mv

Objectives:

- Evaluate the persistence and genetic diversity of *E. cecorum* strains isolated from broiler chickens and their environment
- Testing the effectiveness of alternative control methods to antibiotics

Methodology

After a positive dx for *Enterococcus cecorum*, samples are taken from the affected flock and the next flock:

- Healthy and sick birds: ceca, tibia and bursa
- Sick birds: lesions swabs (osteomyelitis, pericarditis, abscess on the spine)
- Biofilm samples in water lines
- Fresh dropping samples on the litter
- Dust samples in the fan
- Darkling beetle samples
- Rodent dropping samples
- Starter and grower feed samples
 - Component analysis



Methodology (continued)

Between 2 flocks, the poultry house is subjected to one of the following 3 treatments:

- Washing and disinfecting the poultry house, washing the water lines and spraying insecticide (darkling beetle)
- Heating the house for 4 days at 100 °F
- Washing and disinfection, fumigation and use of probiotics on the litter (2 applications)

Follow-up on the research project

To date, the project allowed the development of PCR and qPCR tests specific to *Enterococcus cecorum*

- PCR : helps identify the pathogen strain
- qPCR : helps determine the quantity of *E. cecorum* present

For more information, contact Dr. Martine Boulianne mv
martine.boulianne@umontreal.ca

Final analysis of the results is planned for March 2023

What is known...

Enterococcus cecorum is a Gram-positive coccus

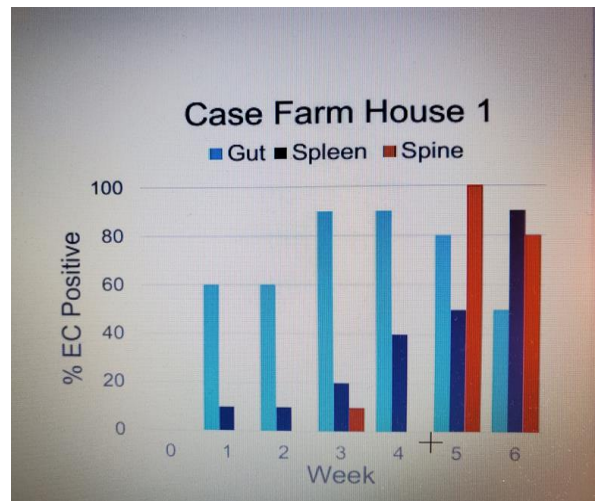
Until 2002, the presence of *Enterococcus cecorum* was considered normal in the gut

Dr. Luke Borst work at the University of North Carolina has shown:

- The *Enterococcus cecorum* strains isolated in the lesions are different from the commensal strains found in the gut
- All the "pathogenic" strains have the O antigen in common. This O antigen is not present in the commensal strains

Main characteristics of the pathogenic strains

1. Ability to colonize the gut as soon as the first week of life, while the commensal strains are only found around 3 weeks of age
2. Bird remains a lifelong carrier of the bacteria (in the spleen)



Borst et al., 2017, Pathogenesis of enterococcal spondylitis caused by *Enterococcus cecorum* in broiler chicken

What is less known...

According to field observations, it seems that, in addition to the presence of pathogenic strains, some predisposing factors must be present for the disease to develop

Among those factors, there is:

- Loss of gut integrity
- Changes in the gut microbiota
- Ossification problems
- Rapid growth, particularly of associated with an aggressive lighting program

Clinical signs

Sepsis phase

- Around the age of 10-12 days
- May go unnoticed
- Or the birds will be feverish for a few days and a light mortality peak can be seen

After that

- Uniformity loss
- Difficulty moving
- Significant increase of daily selection
- Hock sitting



How to control *Enterococcus cecorum* infections without antibiotics?

Reducing the *Enterococcus cecorum* load in the chick's environment

Act early in the bird's life to stop the bacteria from passing through the gut to the blood stream and then to target organs and tissues

Ensure a good bone growth

Control stress and diseases

Review the production rights management approaches?

Reducing the *Enterococcus cecorum* load in the chick's environment

- At the hatchery:
 - Ensure the supply of quality eggs
 - Clean nests and conveyors
 - Managing T° and RH % in the egg chamber and during transportation
 - Ensure optimal chick development with a rigorous control of incubation parameters
 - Make sure the protocols for washing and disinfecting the hatchers are effective
 - From hatching to delivery, maintain the chick in a suitable thermal comfort zone (vent temperature monitoring)

Reducing the *Enterococcus cecorum* load in the chick's environment

- On the farm, after a flock tests positive for *E. cecorum*
 - Apply a darkling beetle treatment before removing the manure
 - Thoroughly wash WITH SOAP and apply a disinfectant
 - Monitor the washing quality with ATPmetry before applying the disinfectant
 - To disinfect, put particular emphasis on the floor, the bottom of the walls (1 m), the feeders and water lines
 - **Dry the house** as soon as possible. Bacteria love humidity!
 - 14-day **downtime or longer**
 - Heat the building to 100 °F for 4 days before spreading the litter
 - Cleaning the water lines (soap and disinfectant): just before placing the chicks!

Act early in the bird's life to stop the bacteria from passing through the gut to the blood stream

- Apply the Chick Podium (2021 version)
 - GOAL: quick establishment of a good gut microbiota **in all the birds** by making sure they eat and drink as soon as they arrive on the farm
 - How:
 - Brooding area correctly positioned according to the heating, ventilation and lighting equipment
 - Brooding on an area covered with paper sprinkled with 75 g of feed/chick
 - Careful observation of the chick's behaviour and adjustments, if needed
 - Monitor vent temperature and crop fill
- Manage the ventilation and heating systems to meet the chick's need (not necessarily in automatic mode!!)

Ensure a good bone growth

Ensure quality of starter and grower feed

- Ingredient quality
- Texture and grain size
- Additives
- Component analysis and availability: mainly minerals (Ca, P, Na, K, Cl)
- Electrolyte balance

Avoid increased activity caused by an overly intense light

Avoid lighting programs that are too aggressive

Control stress and diseases

Avoid drastic temperature variations and drafts

Avoid lack of feed

Control humidity in the house to keep the litter dry

Control, if needed, the infectious bronchitis and Gumboro diseases

Review the production rights management approaches?

Should the management of the production rights in Québec be reviewed to take into account their impact on the birds' health?

- Downtime duration
- Stocking density
- Double flock in the same period

Presently, there is a lot of pressure on the bird...

Conclusion

Pathogenic strains of *Enterococcus cecorum* are present across Canada, but their clinical importance varies from one province to the other

The diversity of the strains in each province is not yet known

In the context of reducing the preventive use of category I and II antibiotics, *Enterococcus cecorum* control will require the review and update of our management and production approaches

Even though this condition is better understood today than when it first appeared, several elements remain to be investigated to properly control this disease

More research is required

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