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Infectious Bronchitis: how this coronavirus affects your birds

Martine Boulianne¹, DMV, Ph. D., Dip ACPV and Carl A. Gagnon², DMV, Ph. D.

¹Poultry Research Chair, ²Pathology and Microbiology Department
Veterinary Medicine Faculty, University of Montreal

Infectious Bronchitis: how this coronavirus affects your birds

This presentation will discuss:

- The prevalence of bronchitis in Québec
- Viral genomics!
- Its persistence in the environment, how it's transmitted...
- The health problems it causes
- Research projects on the subject

Infectious Bronchitis

Cause

- Virus from the *Coronavirus* family
- This virus makes many mistakes during multiplication = variants apparition
- Several of those serotypes have names you already know
 - Massachusetts
 - Connecticut
 - DMV
 - 4/91...

} Vaccine-derived strains

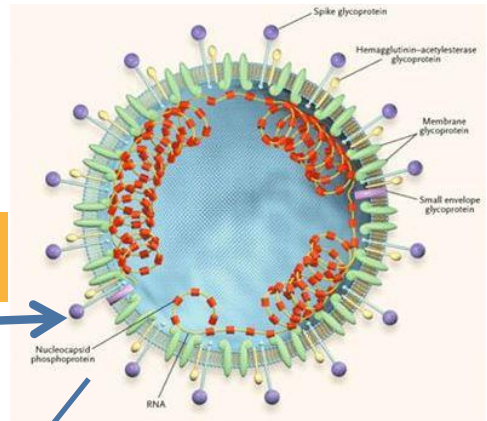
Infectious Bronchitis

A little genomics!!



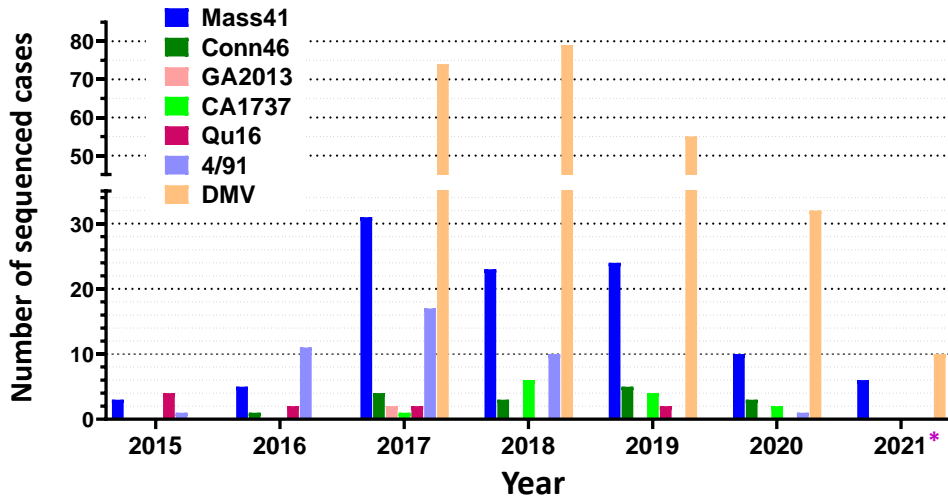
Coronavirus (PEVD). Image by C. Provost
Electronic Microscopy Service, FMV, UofM

**S: Surface protein
recognized by antibodies**



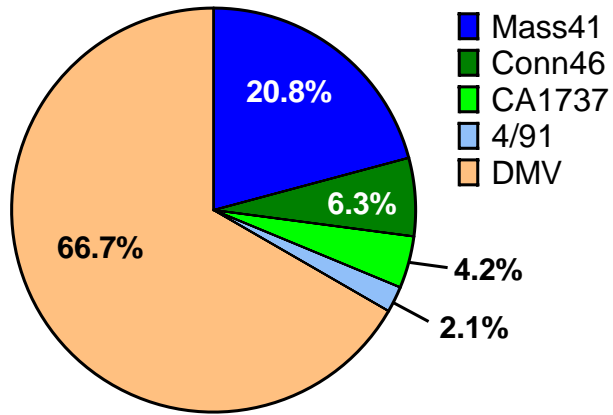
Sequencing: Analysis of the S protein, and not of the entire genome

IBV virus strains detected



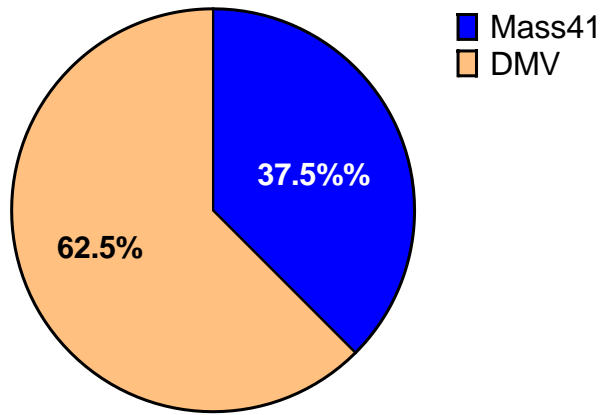
*: Up to September 30, 2021

Proportion of IBV genotypes identified in 2020



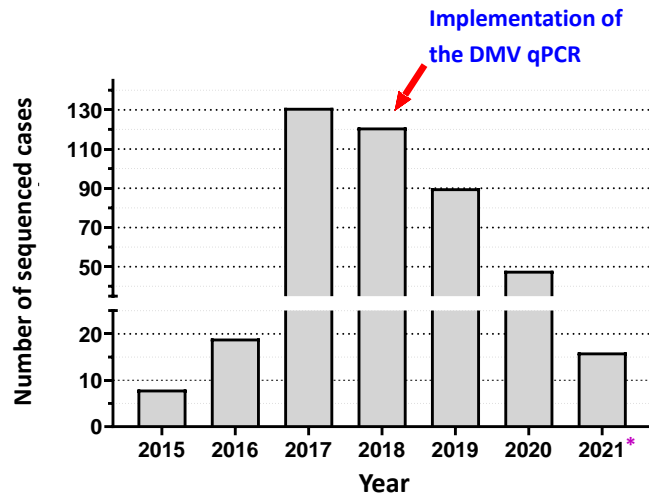
$n = 48$

Proportion of IBV genotypes identified in 2021



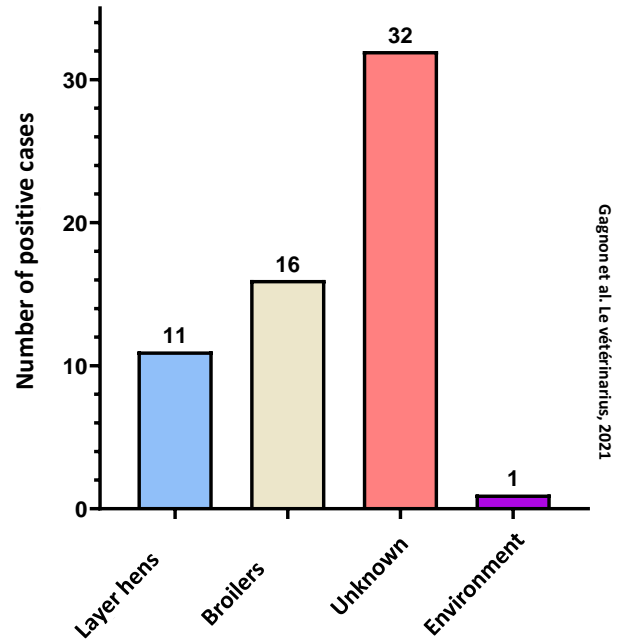
$n = 16$

Total number of IBV cases sequenced per year



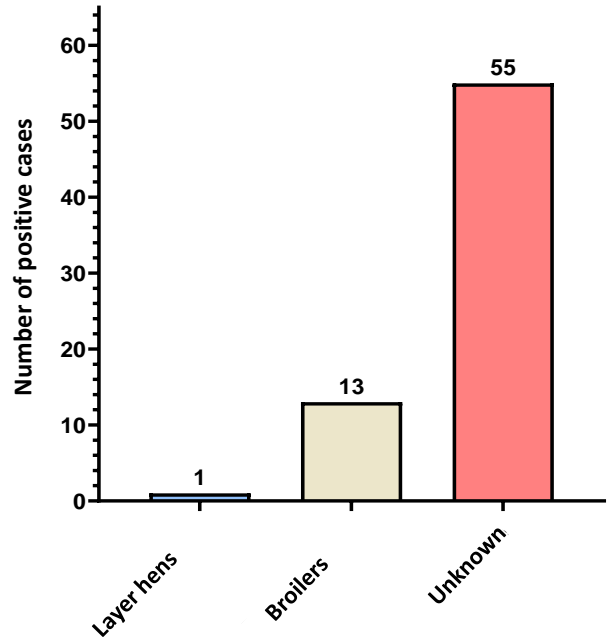
*: Up to September 30, 2021

Origin of positive qPCR cases for the DMV IBV strain in 2020



Gagnon et al. Le vétérinaire, 2021

Origin of positive qPCR cases for the DMV IBV strain in 2021



DMV strain detection at an early age

Risk of false layer syndrome

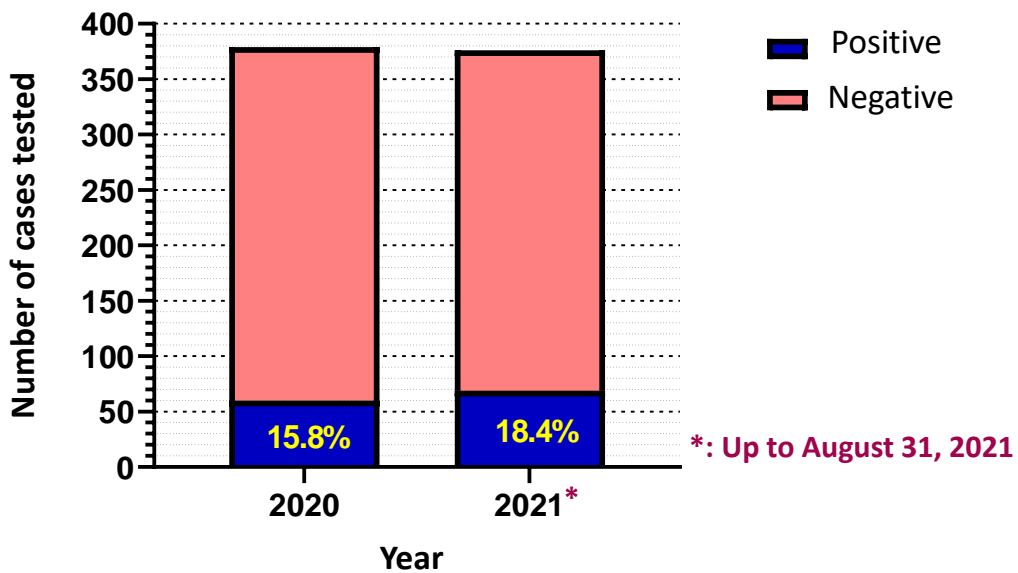
2020 Data	Age of the birds (days)	Files submitted	Total pool tested	Positive files (n/%)
	7 to 13	53	221	2 / 3.77%
	14 to 20	73	325	3 / 4.11 %

Status of the positive DMV pool files (n/%)

2020 Data	Age of the birds (days)	Pool total	Positives	Inconclusive	Negatives
	7 to 13	9	4 / 44.44%	3 / 33.33%	2 / 22.22%
	14 to 20	20	12 / 60%	1 / 5%	7 / 35%



Proportion of positive DMV qPCR files



DMV/1639 prevalence in Québec

Lanthier and al., submitted

Table 1. Prevalence of IBV-DMV/1639/11 in the province of Quebec, Canada and for each administrative region.

Administrative region	Number of sites	Positive farms	Negative farms	Prevalence (%)	95% C.I.
Province (total)	52	9	43	18.9	9.9 - 27.0
Abitibi-Témiscamingue	1	0	1	0	0.0 - 0.0
Bas St-Laurent	3	0	3	0	0.0 - 0.0
Capitale-Nationale	2	0	2	0	0.0 - 0.0
Centre-du-Québec	6	1	5	16.7	0.0 - 44.7
Chaudière-Appalaches	10	4	6	40	13.9 - 66.1
Estrie	4	0	4	0	0.0 - 0.0
Lanaudière	4	0	4	0	0.0 - 0.0
Laurentides	2	0	2	0	0.0 - 0.0
Mauricie	1	0	1	0	0.0 - 0.0
Montérégie	14	4	10	28.6	7.9 - 49.2
Outaouais	1	0	1	0	0.0 - 0.0
Saguenay-Lac-St-Jean	4	0	4	0	0.0 - 0.0

DMV/1639 prevalence in Québec

Lanthier and al., submitted

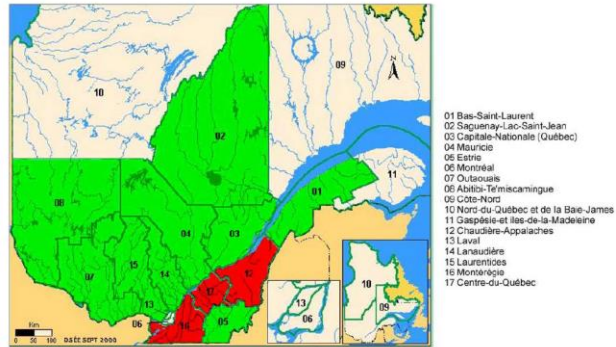


Figure 1. Geographical distribution of the positive and negative administrative regions (AR) of the province of Québec, Canada for IBV-DMV/1639/11. Green regions (01, 02, 03, 04, 05, 07, 08, 14, 15) indicate no positive sites within the AR, while at least 1 positive site was identified for regions in red (12, 16, 17). No laying sites were located in uncolored regions (06, 09, 10, 11, 13).

Infectious Bronchitis

- Acute disease, very contagious, affecting only chicken (*Gallus gallus*)
- The incubation period is very short (24 to 48 h) and the disease spreads like wildfire in the flock

Infectious Bronchitis

Transmission

Excretion:

- Respiratory secretions and droppings
- Intermittent until 20 weeks post-infection (peak: 3-5 days PI)

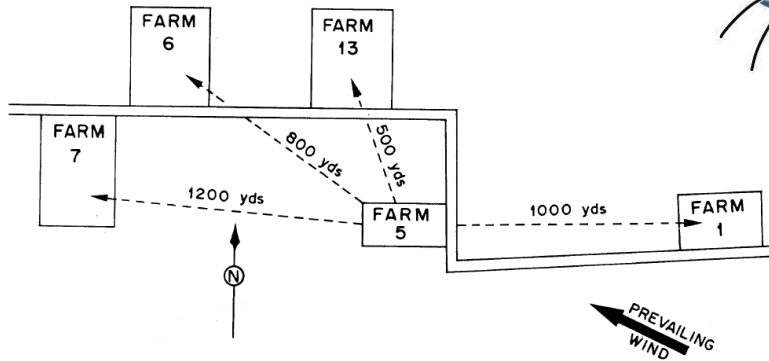
Propagation:

- Aerosol, contaminated feed or water ingestion, contact with contaminated equipment or clothing



Infectious Bronchitis

- Possible aerosol transmission



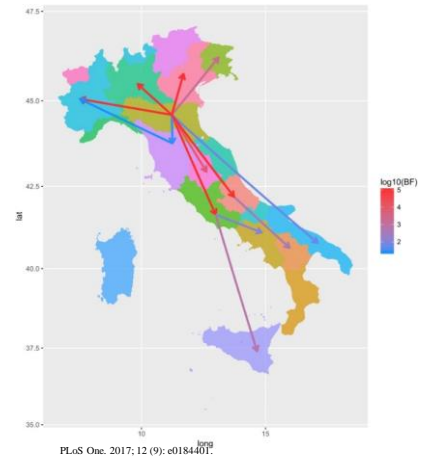
Cumming, Avian Diseases 1970

Infectious Bronchitis

Transmission

According to a study in Italy

- The disease is spreading via birds and equipment transportation
- And it will spread quickly if concerted measures are not taken



And other risk factors???

DMV/1639 prevalence in Québec

Lanthier and al., submitted

Risk factors	Categories	Number of sites	Number of sites positive to IBV-DMV/1639/11	Odds ratio	p-value	95% CI
Age of flock	-	52	9 (17.3%)	0.94	0.07	0.08 - 11.51
Size of flock	-	52	9 (17.3%)	1.00	0.27	0.27 - 3.69
Number of nests on site	-	52	9 (17.3%)	1.10	0.78	0.46 - 2.62
Presence of a pullet replacement flock on site	No	28	6 (21.4%)	Referent		
	Yes	24	3 (12.5%)	0.52	0.401	0.16 - 1.76
Presence of broiler houses on site	No	42	5 (11.9%)	Referent		
	Yes	10	4 (40.0%)	4.93	0.047	1.39 - 17.48
Type of lodging	Conventional cages	23	4 (17.3%)	Referent		
	Enriched cages	16	3 (18.8%)	1.10	0.913	0.19 - 5.80
	Aviaries	8	1 (12.5%)	0.68	0.747	0.03 - 5.67
	Organic flocks	3	1 (33.3%)	2.38	0.519	0.10 - 31.76
	Free-run hens	2	0 (0.0%)	0.00	Not applicable for "0" probabilities	

Infectious Bronchitis

Other important points and reminders

- Very contagious
- Virus survival in the environment
 - Several weeks, especially in cold temperatures, or
 - when protected with organic matter
- Sensitive to most disinfectants
- Carrier status: excretion via droppings

Infectious Bronchitis

The virus has different tropism:

- respiratory system
- reproductive system
- urinary system (this form has not yet been diagnosed in Québec)

Infectious Bronchitis

Clinical signs: respiratory problems

- Appears 24-48 post infection
- Sneezing, eye and nasal discharges, birds seem chilled
- Morbidity 100%

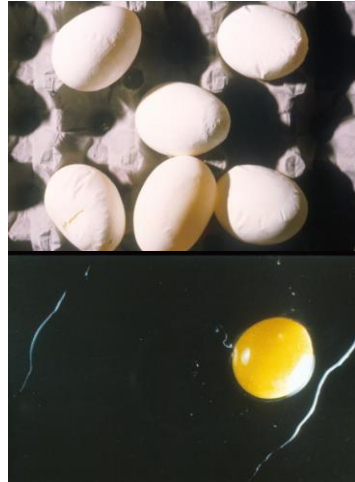


Infectious Bronchitis

Clinical signs: reproductive problems

During an infection in an adult

- Variable egg drop
- Deformed eggs
- Bad quality yolk
- TEMPORARY



Virus replication in the oviduct

- Evidence of higher viral replication in pullets infected at an early age vs as adults
- This age difference in IBV replication will result in different clinical and pathological results in boilers
 - e.g.: Pullets from 1 to 14 days of age infected with different IBV strains, like MASS, QX or AustT type strains, develop cystic oviducts without affecting ovarian functions, causing the false layer syndrome, with no egg production

Lesion development

The disease scope and severity in layer pullets are influenced by the age at the time of infection

The proportion of cystic oviducts and cellular lesions of the epithelial lining of the oviduct decreases as the birds get older

Effects of Infectious Bronchitis in Baby Chicks

D. I. BROADFOOT

Hy-Line Poultry Farms, Owatonna, Minnesota

B. S. POMEROY

University of Minnesota, St. Paul, Minnesota

AND

W. M. SMITH, JR.

Hy-Line Poultry Farms, Des Moines, Iowa

(Received for publication January 9, 1956).

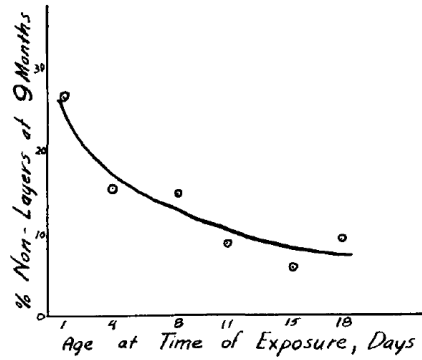


FIG. 1. Relationship of age of exposure to infectious bronchitis virus and non-layers at maturity.

Dr. Faizal Careem's research work at the University of Calgary

- Experimental infection of 1-day-old pullets with the IBV-DMV virus
- Observations up to 16 weeks of age
- Results
 - Lesions to the trachea and lungs
 - Oviduct lesions (6/13)
 - Kidney lesions

PRC project research using ultrasound as a diagnostic tool

- Goal: Identify the presence of cystic oviduct using ultrasound
- Then checking the oviduct with a post-mortem examination
- In a commercial layer pullet flock infected with an IBV-DMV infectious strain at an early age



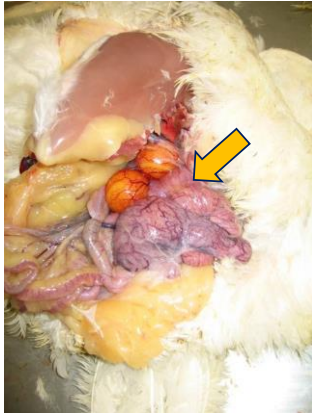
Study findings

- Ultrasound can be used to diagnose cystic oviducts in young pullets
- However, cystic oviducts will atrophy later on and it will then be impossible to see this lesion with an ultrasound scanner
- Ultrasound help check the presence of an egg in the oviduct (vs. intracloacal palpation)

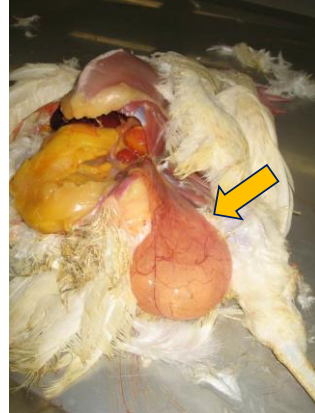


Detection at the onset of lay

- By palpation and selection over several days



Normal oviduct for a 38-week hen



Cystic oviduct for a 38-week hen

Research projects on early detection of false layer syndrome

EQCMA Health Technical Team

Dre Martine Boulianne, PRC, FMV

Dr. Ghislain Hébert and Martin Pelletier, EQCMA

Lise-Anne Girard, FPOQ

Study protocol

Objective: Validating an early detection protocol of false layer syndrome cases

- Sampling 30 cecal swabs **at 7 and 14** days of age
 - Pullet flocks placed over approximately one year
 - **Four administrative regions selected**
- qPCR test for the DMV/1639/11 strain
 - On all Day-14 samples
 - On all Day-7 samples related to the Day-14 samples that got a positive result
- Necropsy of 49 8-week-old pullets from qPCR positive flocks
 - Identification of the prevalence of cystic or atretic oviducts

Study protocol

Collected data:

- PCR test results with CT value
- Proportion of pullets with oviduct lesions
- Monitoring the layer flocks with daily data collection between the onset of lay and 30 weeks of age
 - Number of eggs
 - Number of hens
 - Age
- If flock shows suboptimal egg production (<93%) with qPCR DMV negative test:
 - Testing the frozen samples with a generic bronchitis PCR and sequencing to identify a possible alternative strain

Diagnostic and early detection

- Programs vary depending on companies
 - Swabbing and PCR
- During necropsy of 8-week-old pullets
 - 8 weeks into research (ongoing)
 - Importance of the sample size



Normal oviduct for an 8-week-old pullet



Cystic oviduct for an 8-week pullet positive with DMV

Remember QuMV?



Key findings in the 2000 study

Disinfection	95% CI: 0.20 (0.04-0.91)
Darkling Beetle control program	95% CI: 0.09 (0.01-0.70)
Domestic animals having access to dead birds	95% CI: 9 (1.14-71.04)
Wearing rubber OR disposable boots VS. not for each house	90% CI: 0.25 (0.06-0.91)

In conclusion...



Biosecurity!!
(and vaccination...)