

Pathogenicity of the Canadian Delmarva (DMV/1639) Strain of Infectious Bronchitis Virus (IBV) for Laying Hens



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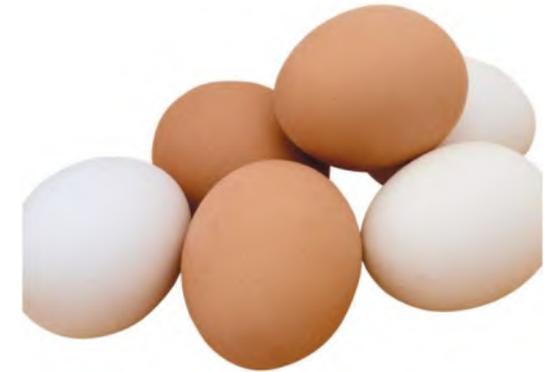
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Canadian Egg Industry

- Layers: chickens raised for table egg production
- 26.57 million hens were in production in 2021
- 320 eggs are produced per year per hen
- Lots of eggs = lots of money



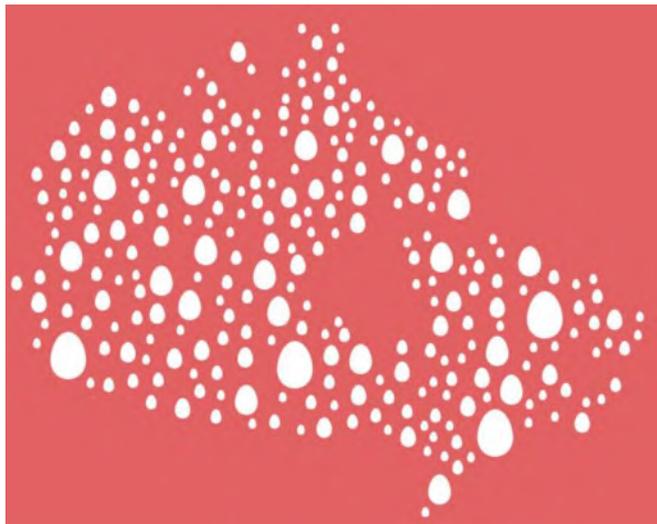
**\$1.3
billion**

contributed to
Canada's GDP.



Supply Management

- Matching Canadian demand with made-in-Canada eggs
- Quota System



Farmers and average flock size per province and territory

Province or territory	Number of farmers ¹	Average number of layers per farmer ²
BC	145	22,421
AB	169	16,463
NT	4	24,210
SK	67	18,829
MB	156	15,831
ON	432	22,647
QC	178	31,089
NB	15	35,754
NS	26	30,629
PE	7	20,590
NL	6	54,843
Total	1,205	22,027

Source: EFC

¹ Reported data for 2021.



Infectious Bronchitis (IB)

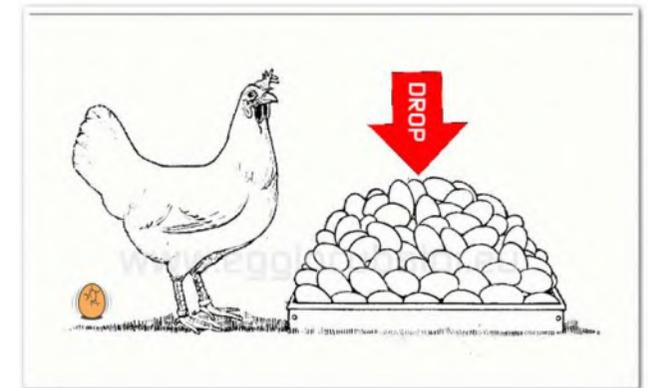
- Highly contagious disease of chickens
- Infectious bronchitis virus (IBV)
- *Gammacoronavirus - Coronaviridae*



Respiratory



Renal



Reproductive



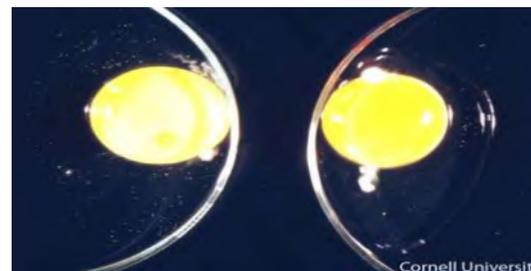
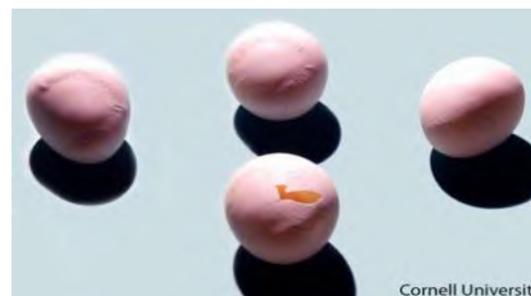
Reproductive IB

☉ M41, QX, and Aust T ✓

Young birds



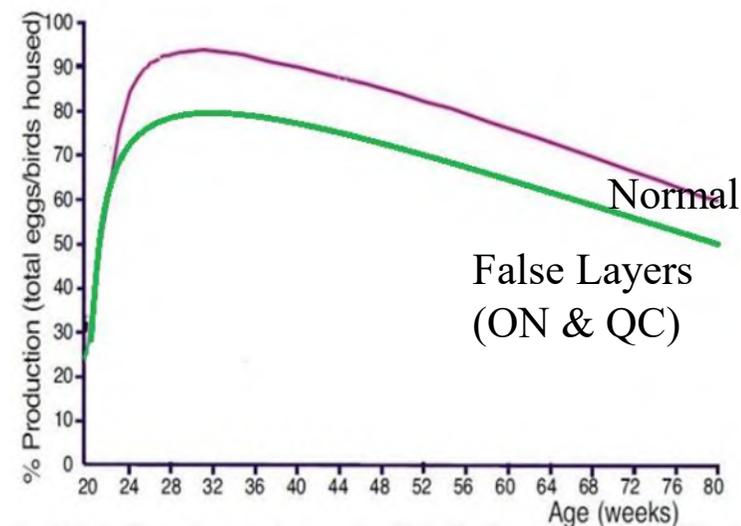
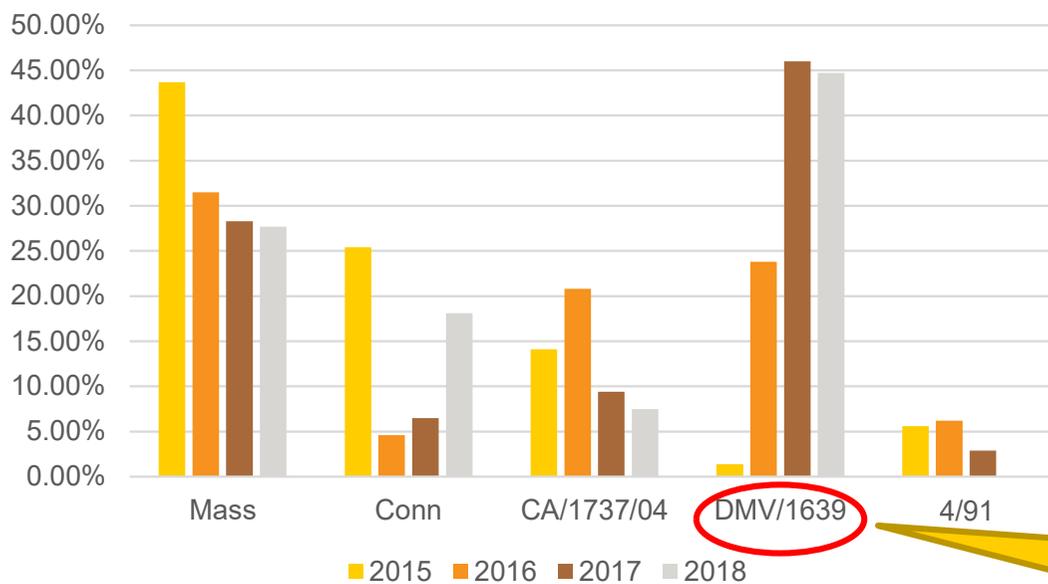
Adult birds





IBV in Canada

IBV Genotyping (HVRs of S gene)



Nephropathogenic strain
2011 (USA)



Hypothesis

- ◎ We hypothesized that infection of **young** and **adult** laying hens with the Canadian IBV DMV/1639 strain causes **gross** and/or **microscopic** lesions in the ovary and/or oviduct that adversely affect **quantity** and **quality** of eggs produced



Objective

- ◎ The objective of the study was to investigate the **pathogenicity** of Canadian IBV DMV/1639 strain to the reproductive tract of **1-day-old** and **29-week-old** chickens

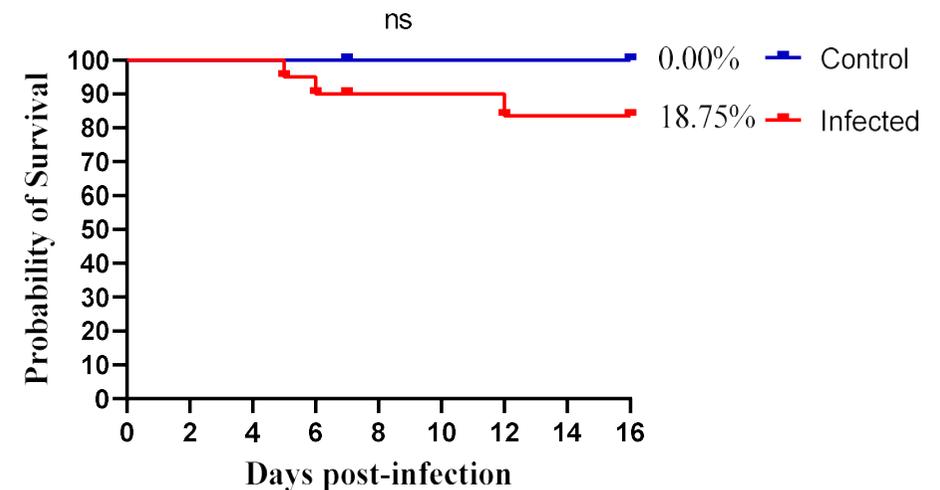
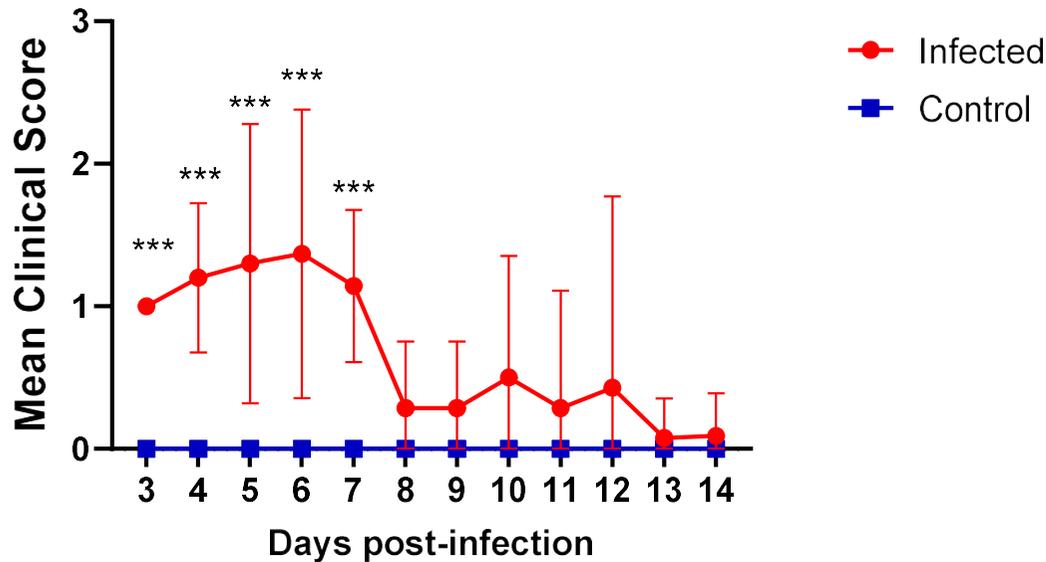


Experiment 1

Birds/Challenge	1-day-old females		Oculo-nasal DMV/1639 10^6 EID ₅₀ n= 20		PBS n= 20
Clinical observation	Twice daily/clinical signs				
Swabbing	Weekly OP and CL swabs				
Euthanasia	7 dpi (n=5) and 112 dpi (remaining)				
Sampling	Portions of trachea, lung, kidney, oviduct, ovary and cecal tonsils (RNASave [®] , formalin, and OCT med.)				
Development of reproductive system	Weight of ovary, length of oviduct, & lesions				



Clinical Score



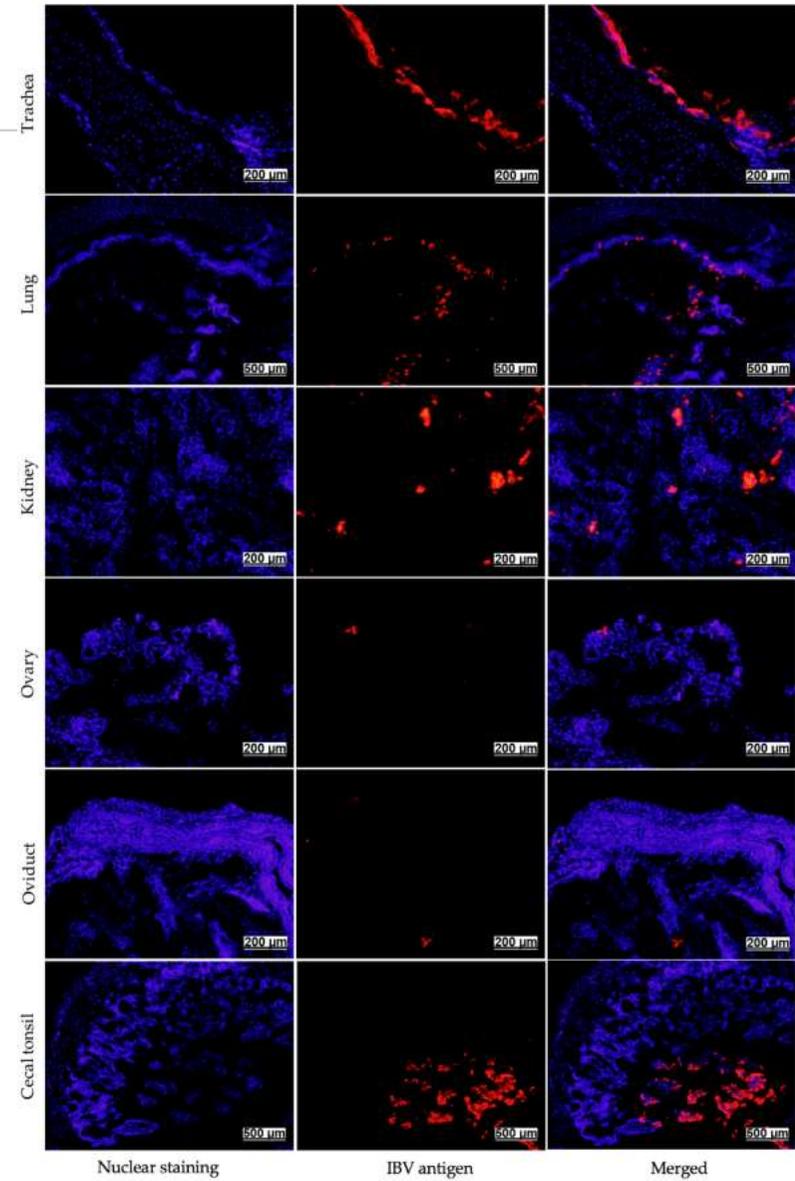
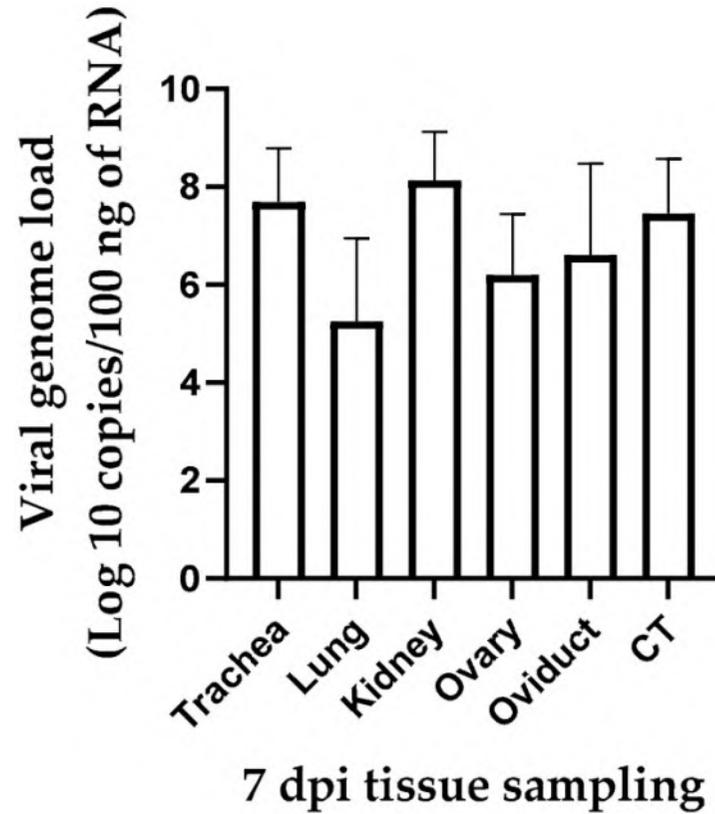
☉ The average clinical signs score was based on the following: Ruffled feathers=1, dropped wings=1, depression=1, mild resp. signs=1, moderate=2, and severe=3



Necropsy/ Genome Load/ IBV Antigen



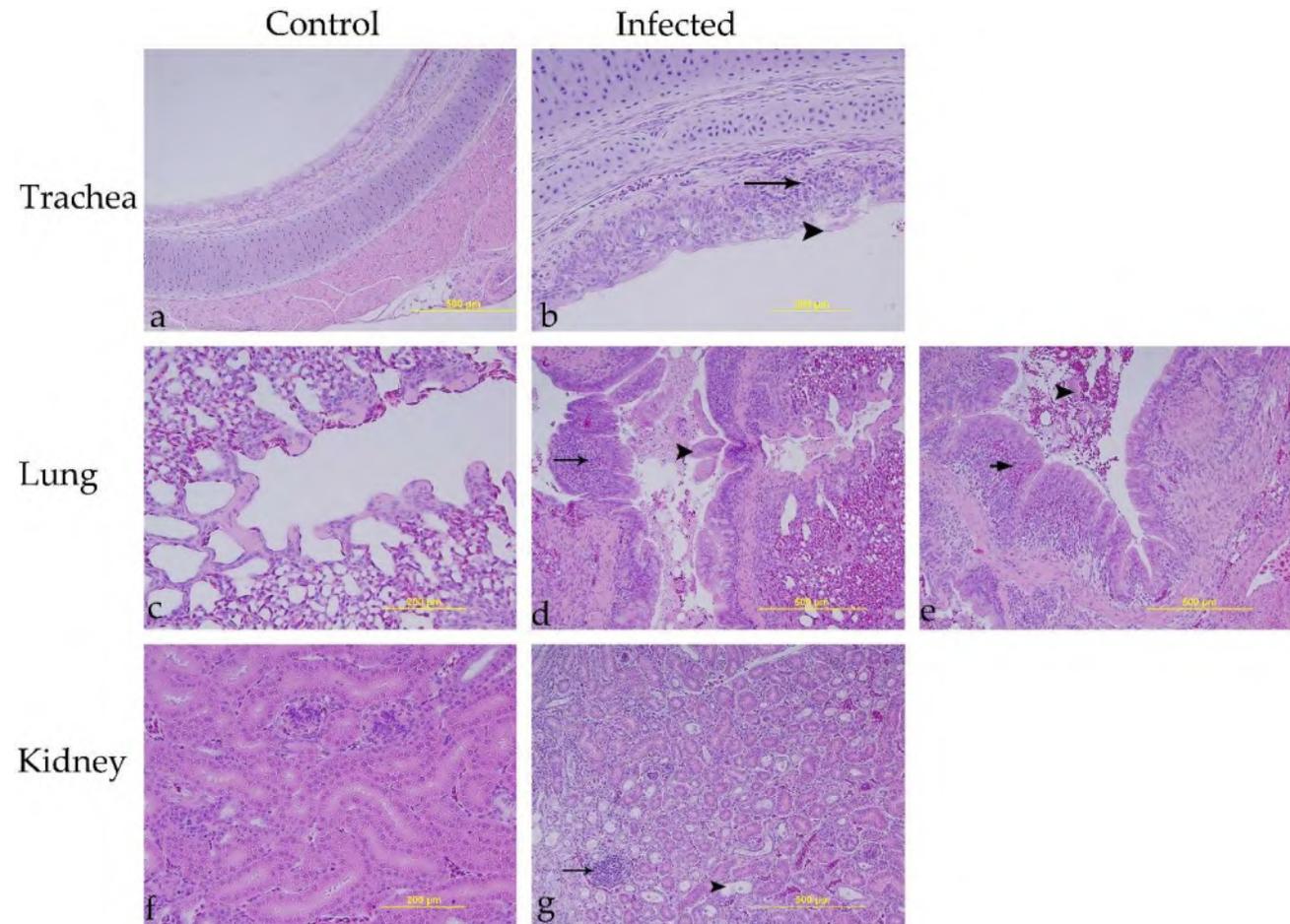
5-12 dpi





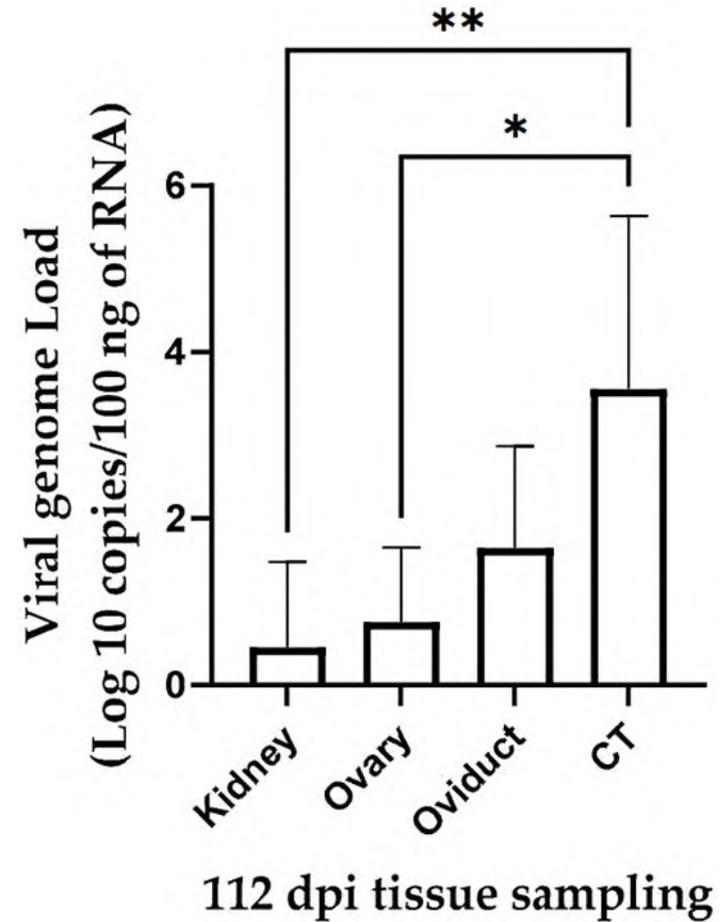
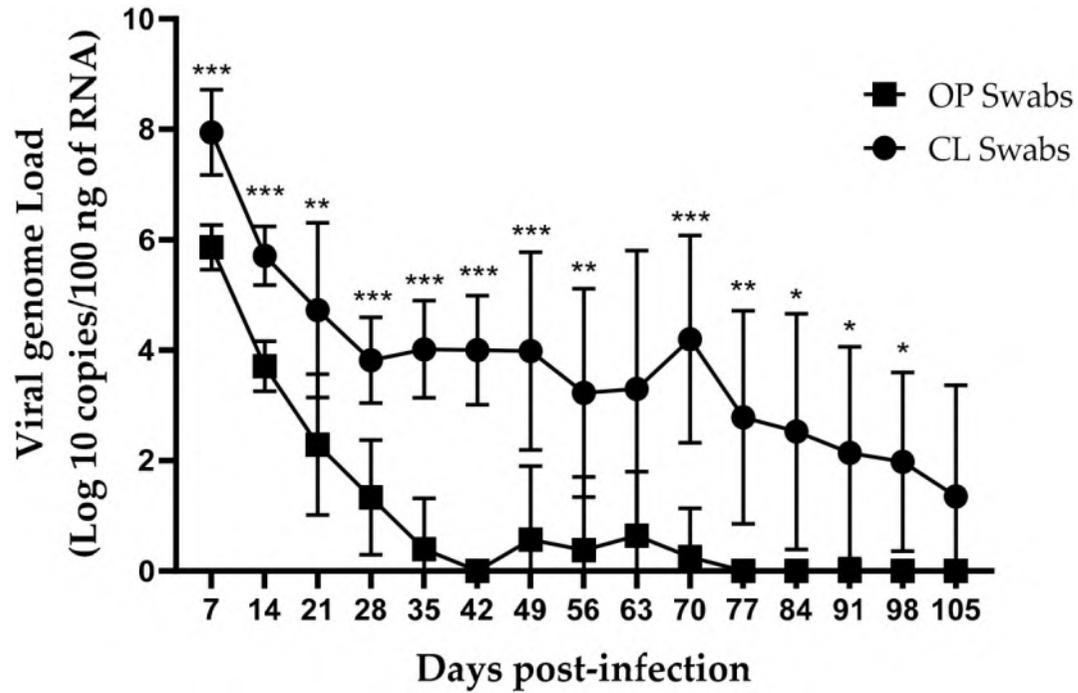
Histopathology

7 dpi (1 week)





Virus Shedding / Genome Load





Necropsy

112 dpi (16 weeks)





Cystic Oviduct

Group	# of Chickens	Lesion Score (cystic formation) in Oviduct ^A			
		-	+	++	+++
Infected	13	7	1	4*	1
Control	15	15*	0	0	0

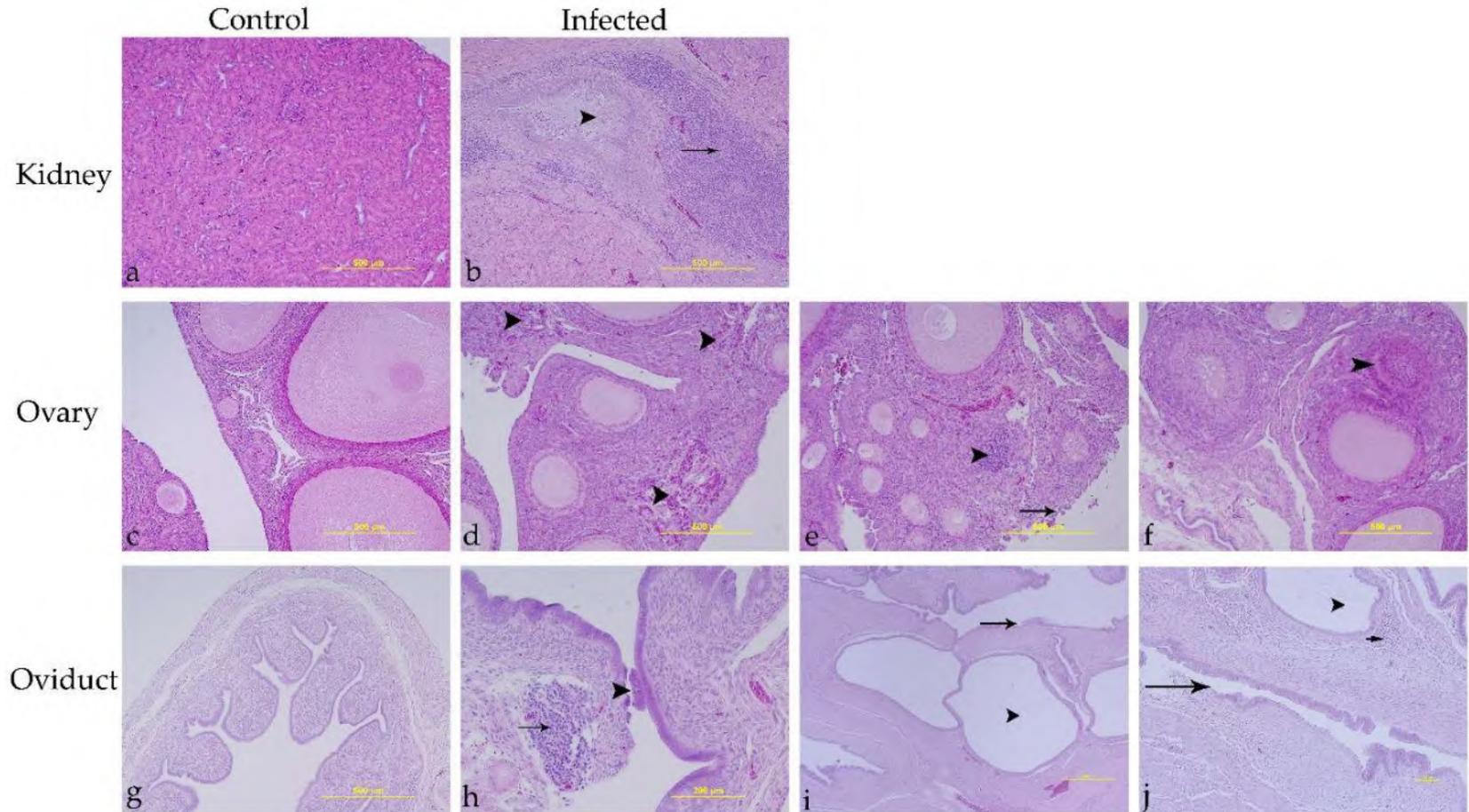
^A: Four-grade-scoring:

1. negative (no cyst),
2. moderate (cyst covering less than 20% of oviduct; +),
3. marked (cyst covering 20% to 50%; ++), and
4. severe (cyst covering more than 50% of oviduct; +++).

*: Significantly different ($p < 0.05$)



Histopathology



112 dpi (16 weeks)



Experiment 2

Birds/Challenge

29-week old
females



Oculo-nasal
DMV/1639 10^6 EID₅₀
n= 10



PBS
n= 10

Clinical observation

Twice daily/clinical signs/ egg production

Euthanasia

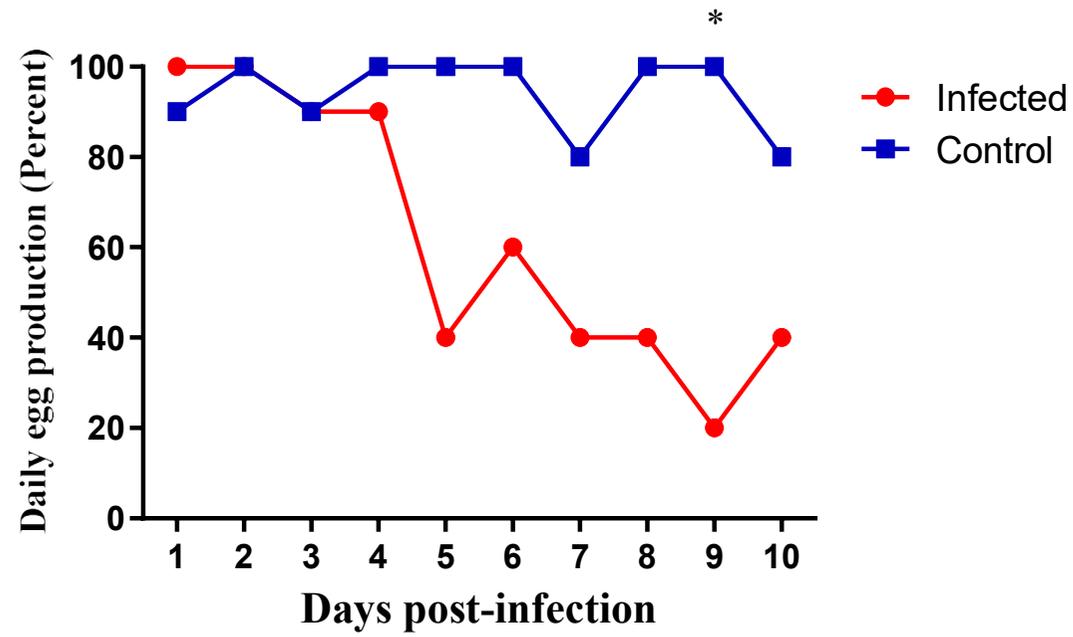
5 and 10 dpi (n=5)

Sampling

Portions of ovary and oviduct (magnum, isthmus and uterus) RNASave[®], formalin, and OCT med.

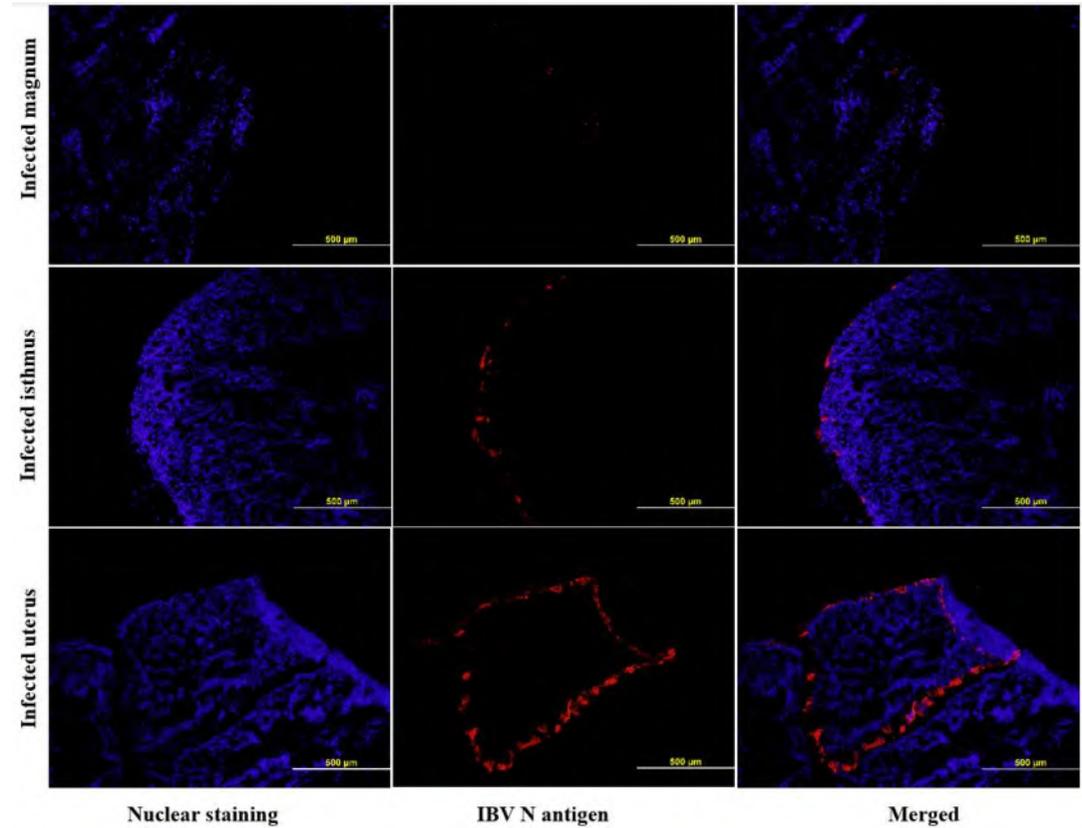
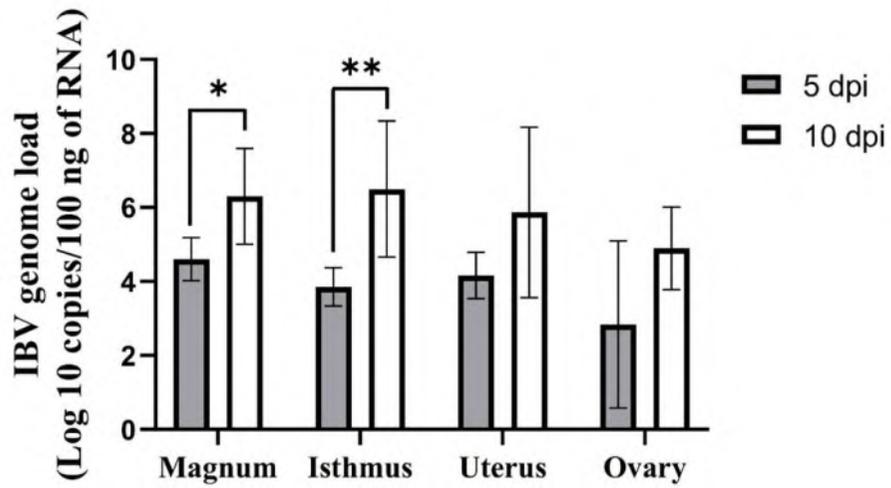


Egg Production





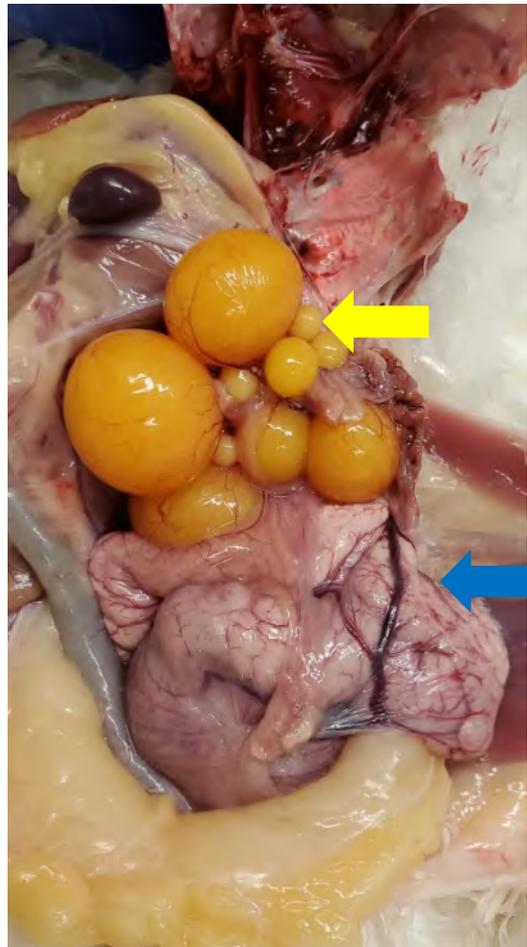
Genome Load/ IBV Antigen



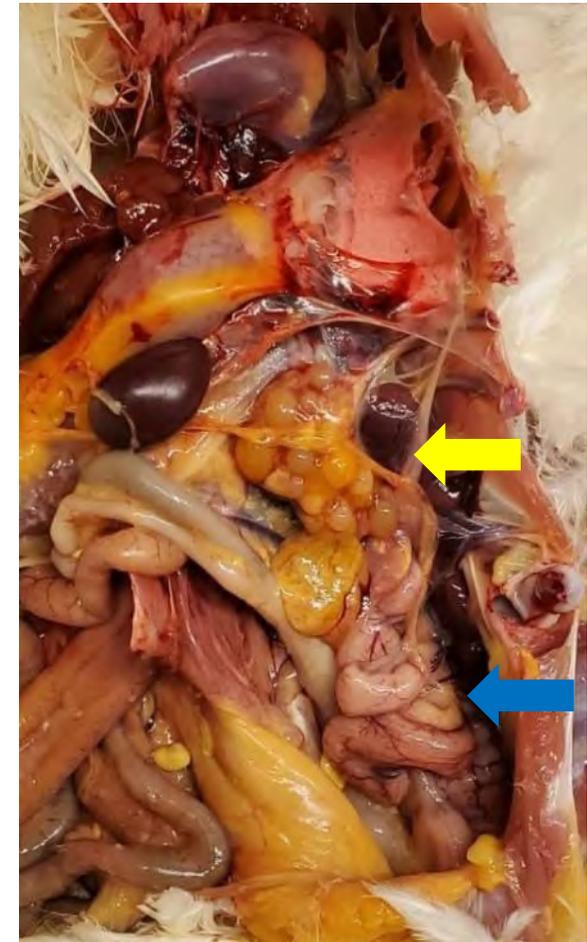


Necropsy

10 dpi



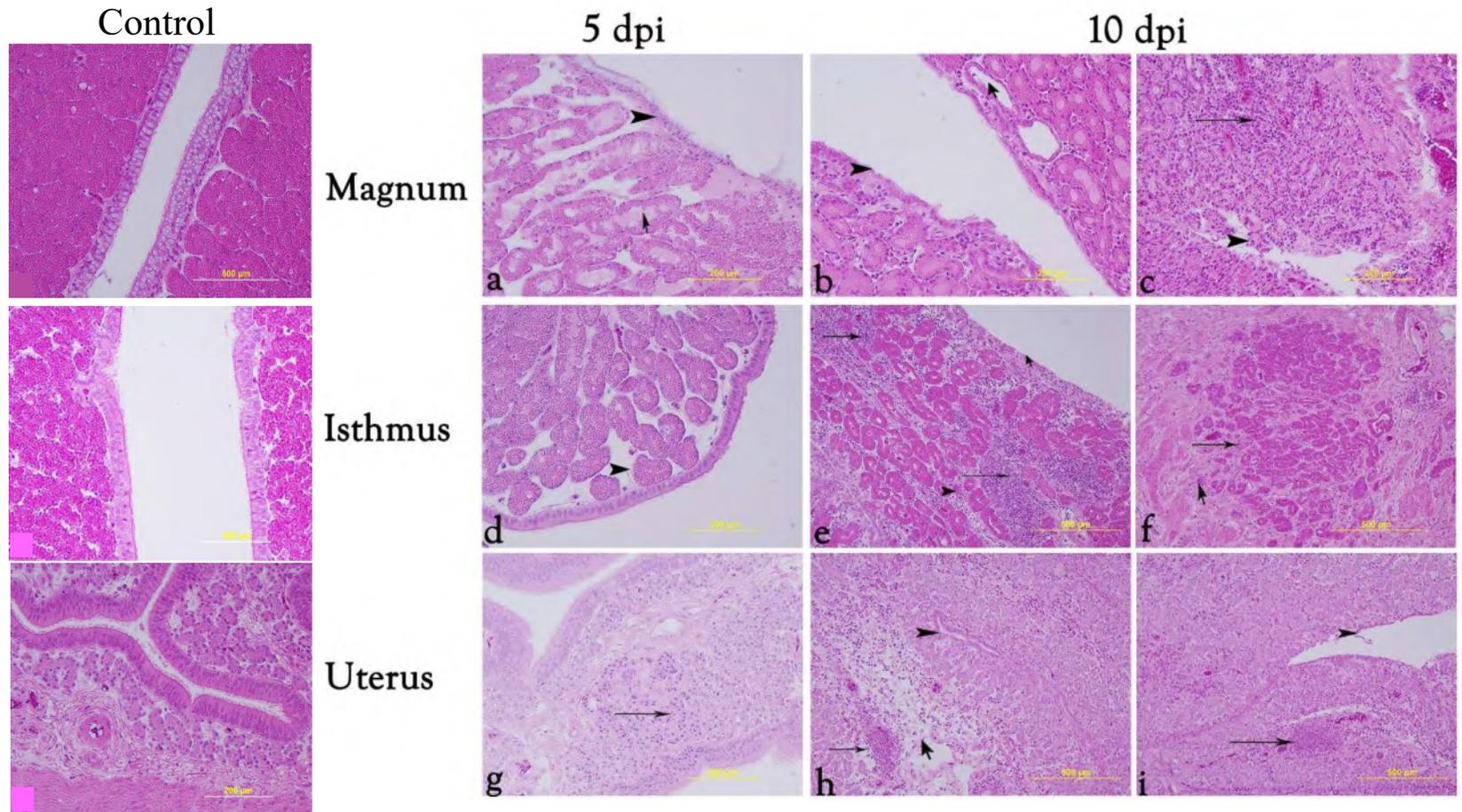
Control



Infected



Histopathology





Conclusions

- ◎ **The Canadian IBV DMV/1639 strain:**
 - ◎ Wide tissue tropism (respiratory, urogenital, and alimentary tracts)
 - ◎ Infection of **young chicks** causes cystic oviduct (false layer syndrome)
 - ◎ Persists for a long time in the cecal tonsils (cloacal viral shedding)
 - ◎ Infection of **adult chickens** causes pathological changes in the reproductive organs / adversely affects egg production



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Thanks!

Any questions ?

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