



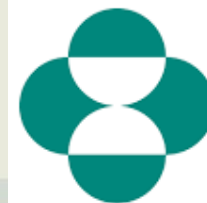
Infectious Bronchitis – History of Variants and Strategies for Control

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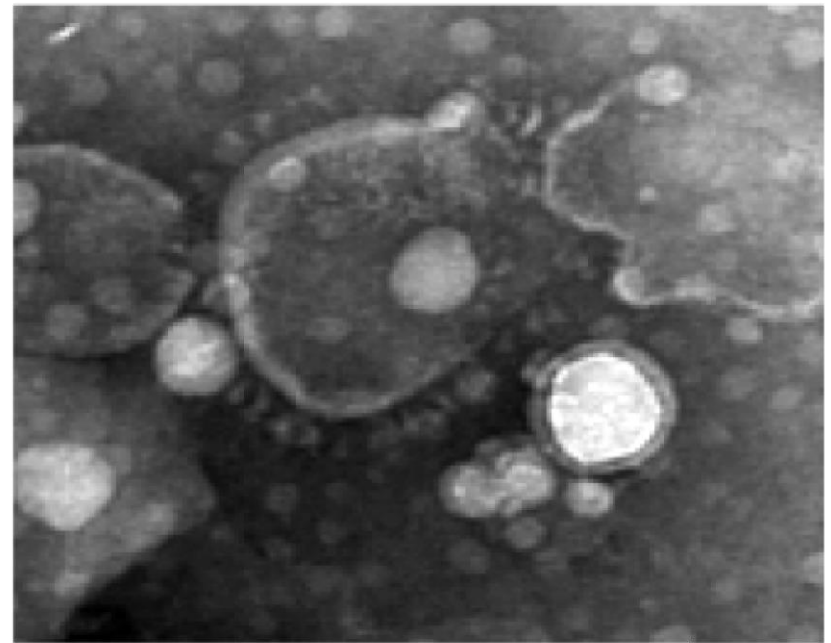
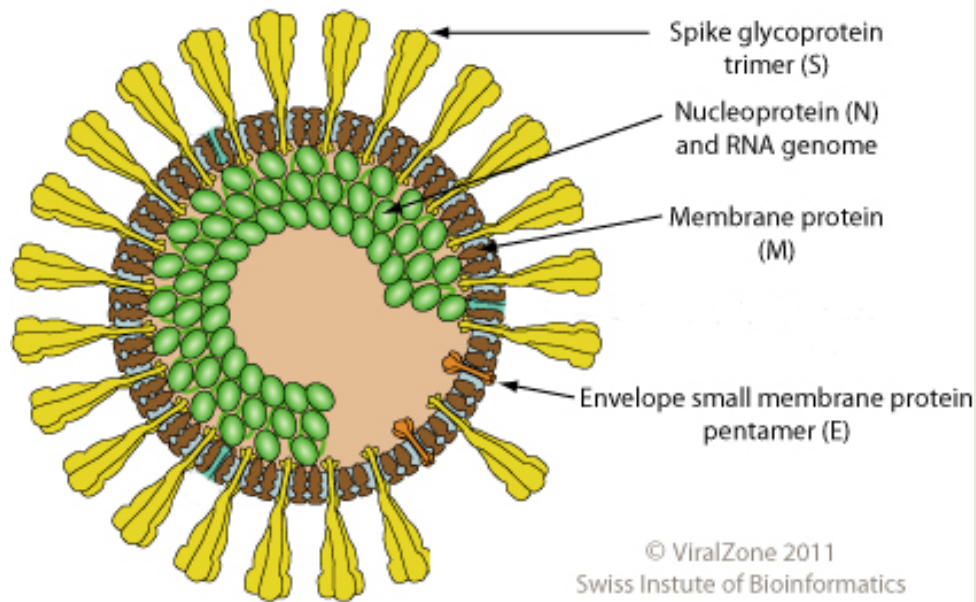
Infectious Bronchitis Virus (IBV)

- Causes disease infectious bronchitis (IB)
 - IB is most often a respiratory and reproductive tract infection, though some strains of IBV can be nephropathogenic
- Does not cause mortality in singularity
- Does cause ciliostasis
 - Ciliostasis is where the cilia do not beat, thereby not moving mucus or anything trapped in the mucus out of the trachea





IBV

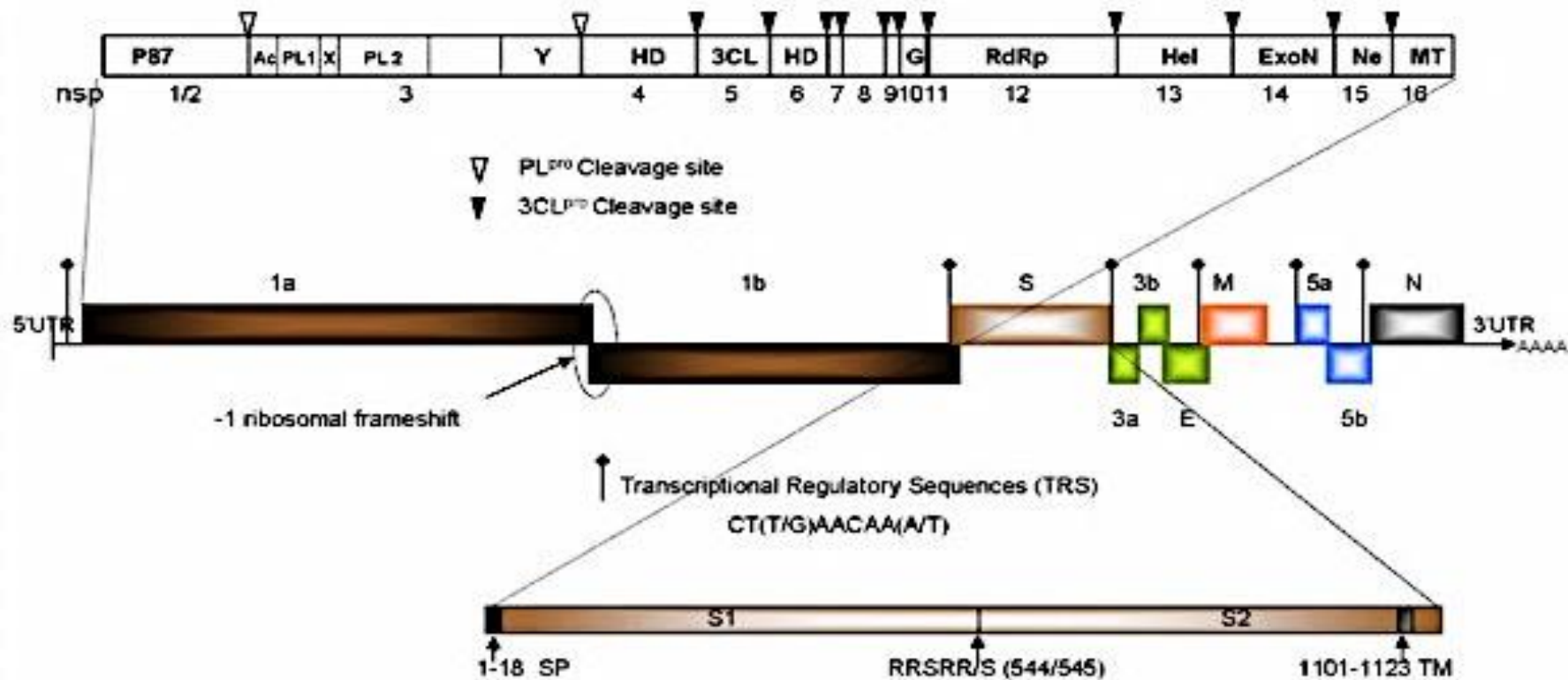


(Roh et al, Avian Diseases, 2014)



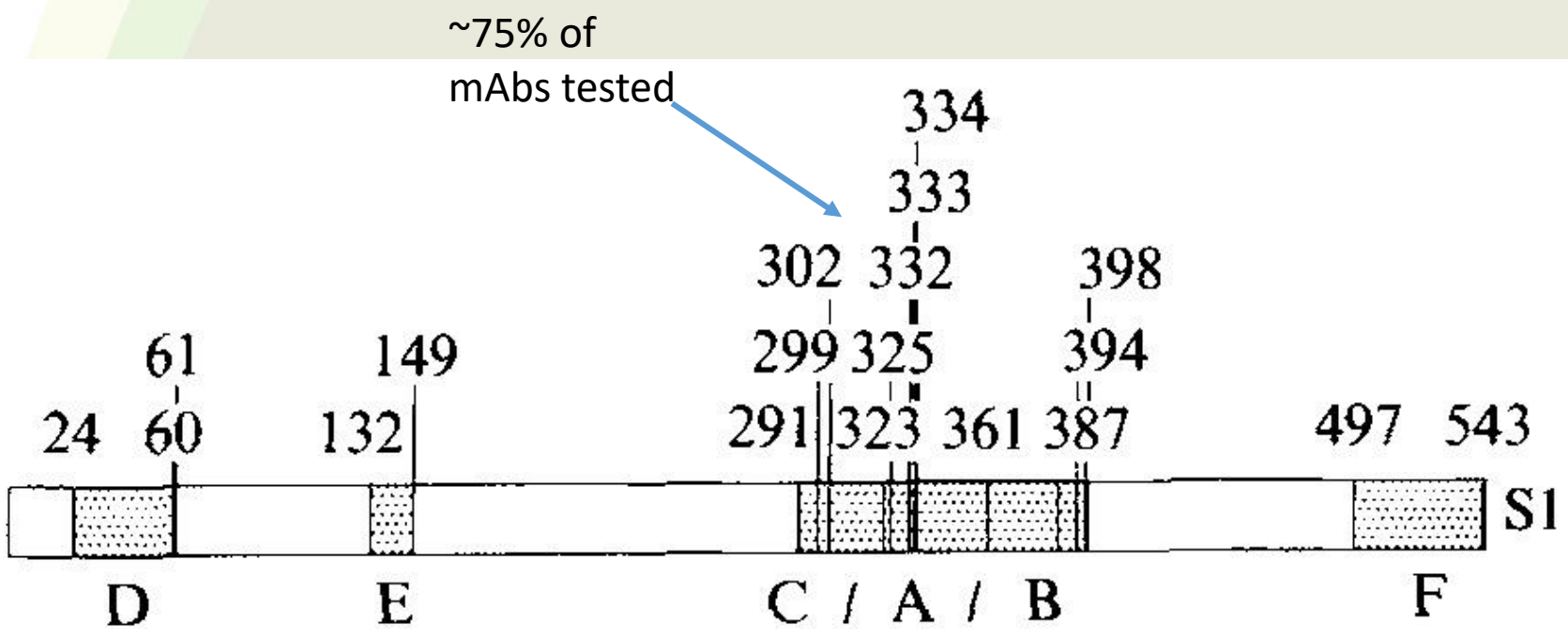


IBV Genome





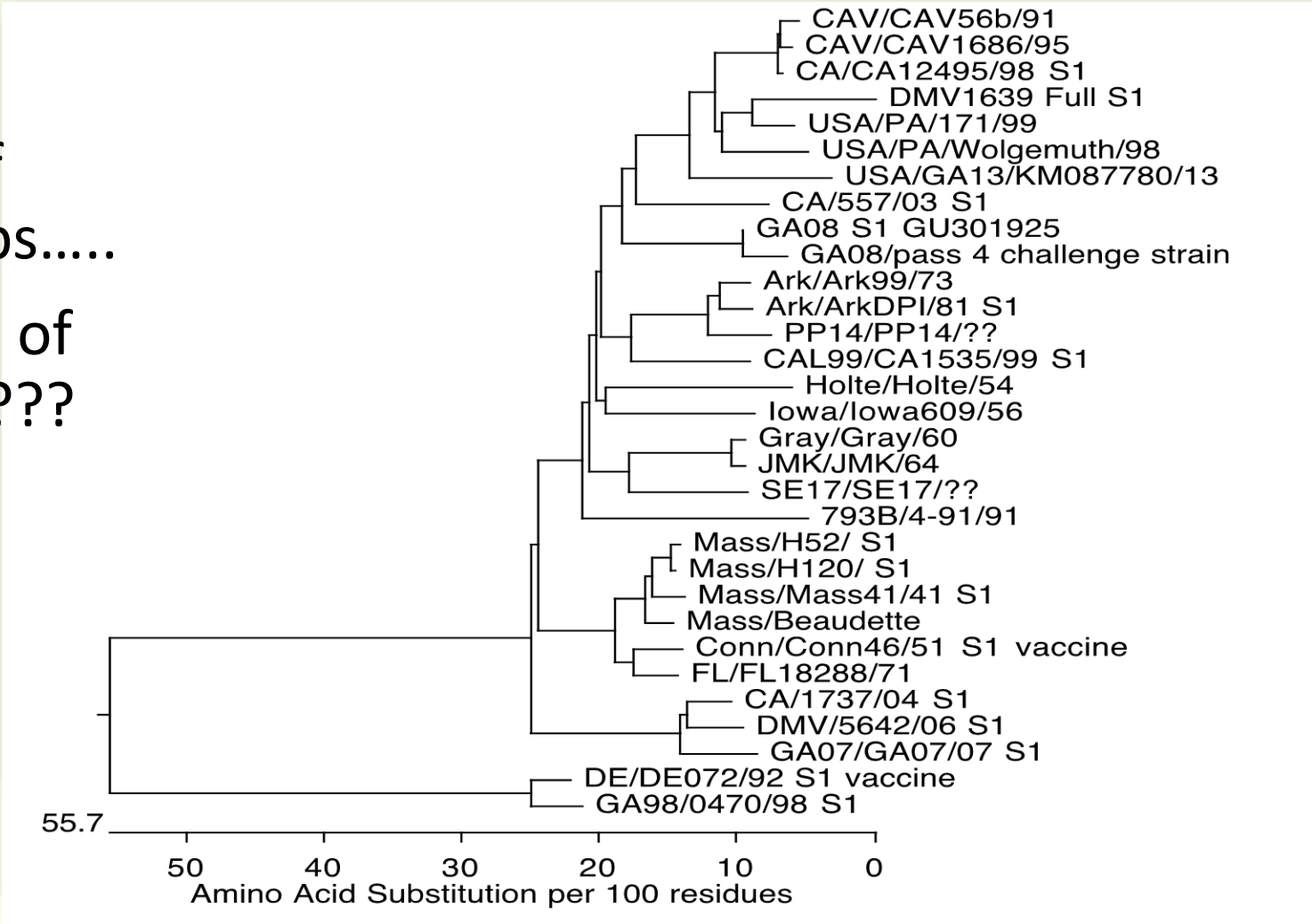
Relating Genotype to Serotype





How Many IBV Serotypes?

- Dozens of serogroups.....
- Hundreds of variants????





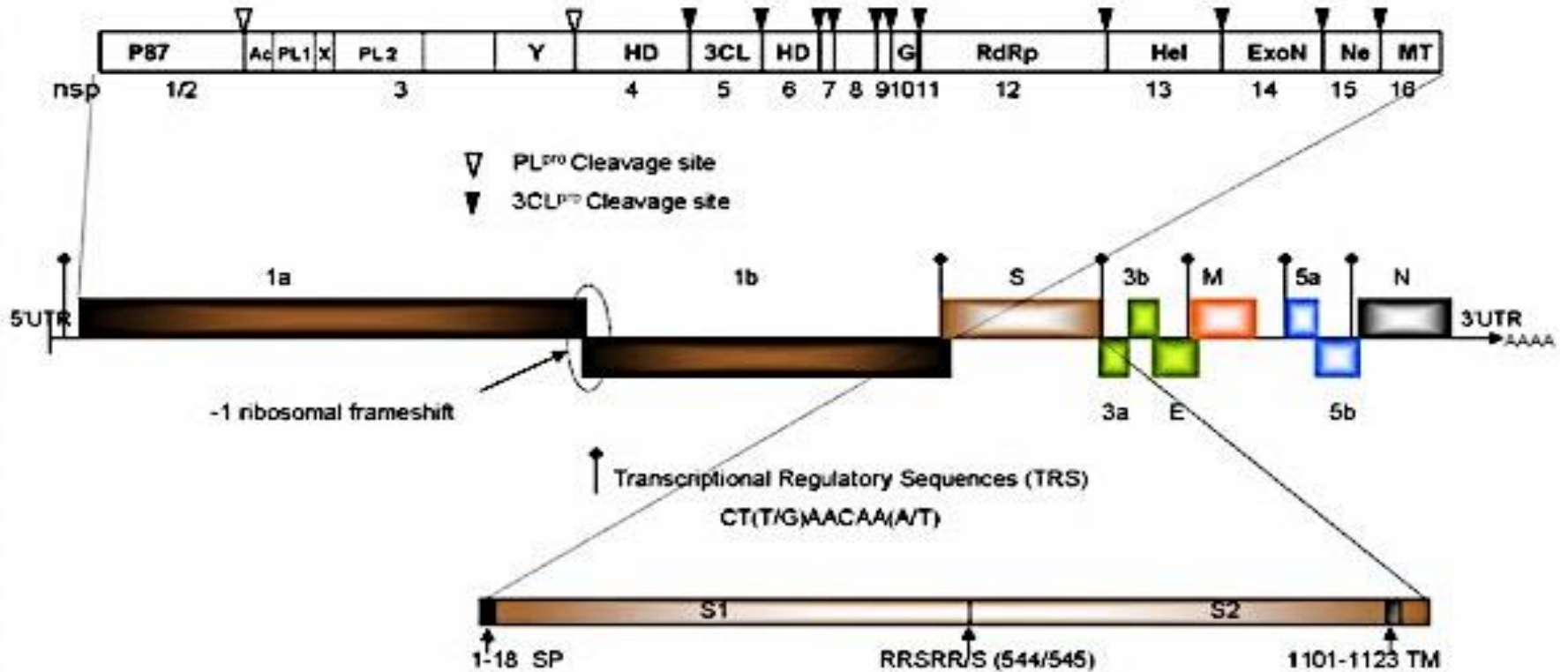
How Do Variant IBVs Emerge?

- Novel introductions
 - Can be legal or illegal, field virus or vaccine
- Recombination is a real phenomenon with IBV, BUT it is not how problem variants have emerged (so far)





IBV Genome





How Do Variant IBVs Emerge?

- Most all variants emerge from genetic drift
- The accumulation of point mutations in the genome (specifically in the spike gene) cause the protein structure to change
- This changes the epitopes on the protein and makes it “novel” to the bird





Why Do Variant IBVs Emerge?

- IBV has poor proof-reading capability and a high error rate when replicating
 - When the genome is copied, mistakes are introduced (genetic drift)
- Positive selection through immune pressure
 - We vaccinate for a certain serotype, so the viruses that have changed enough to be undetected by the bird will persist
- Persistence is the key





How Do We Control IBV??

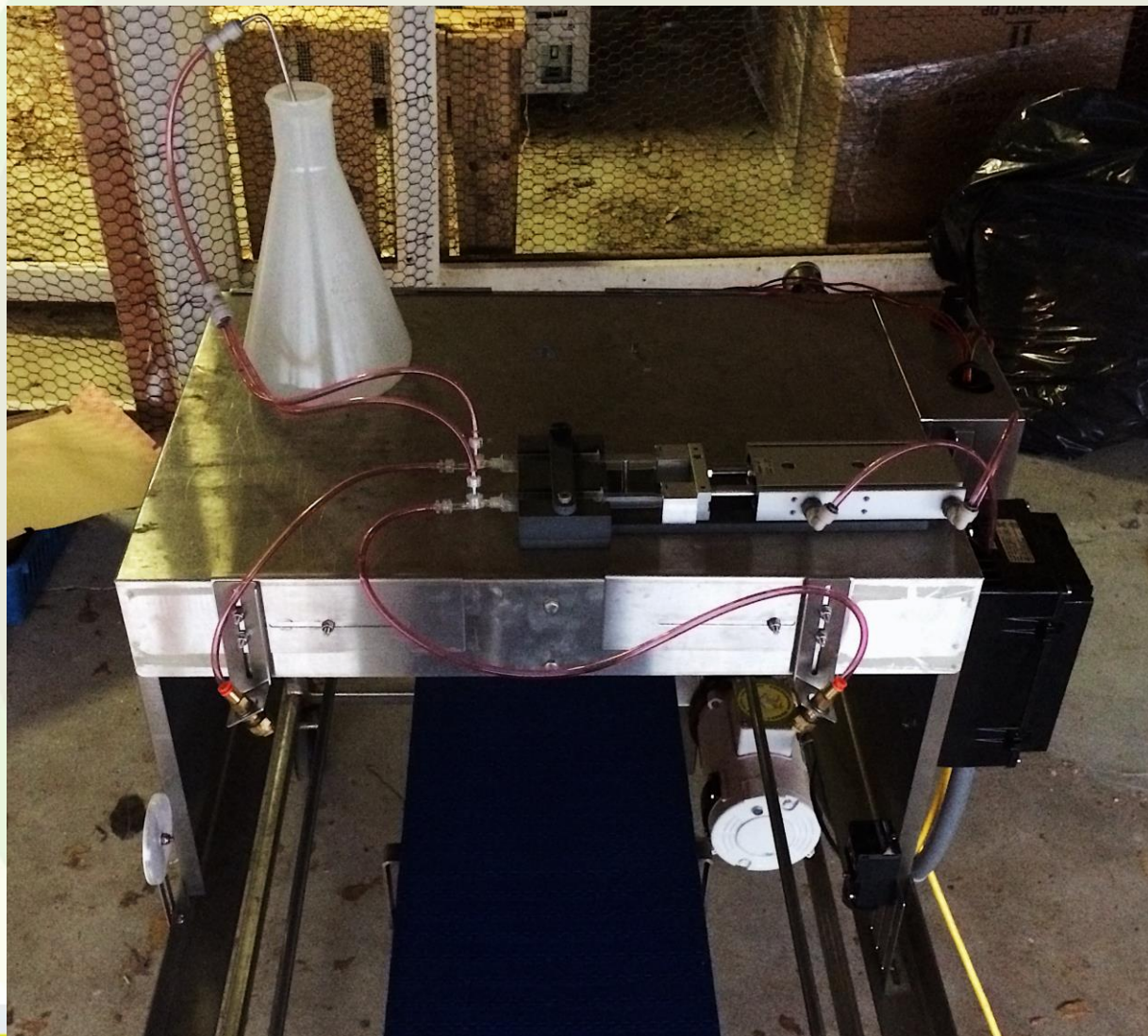
- Vaccinate.....
- Many factors can influence vaccination
 - Application method, timing, combination, age of bird, type of bird, etc....
- Broilers typically only get a live prime in the hatchery, and then a live boost in the field (if they are long-lived)





[COMPARTIENDO LA VISION]

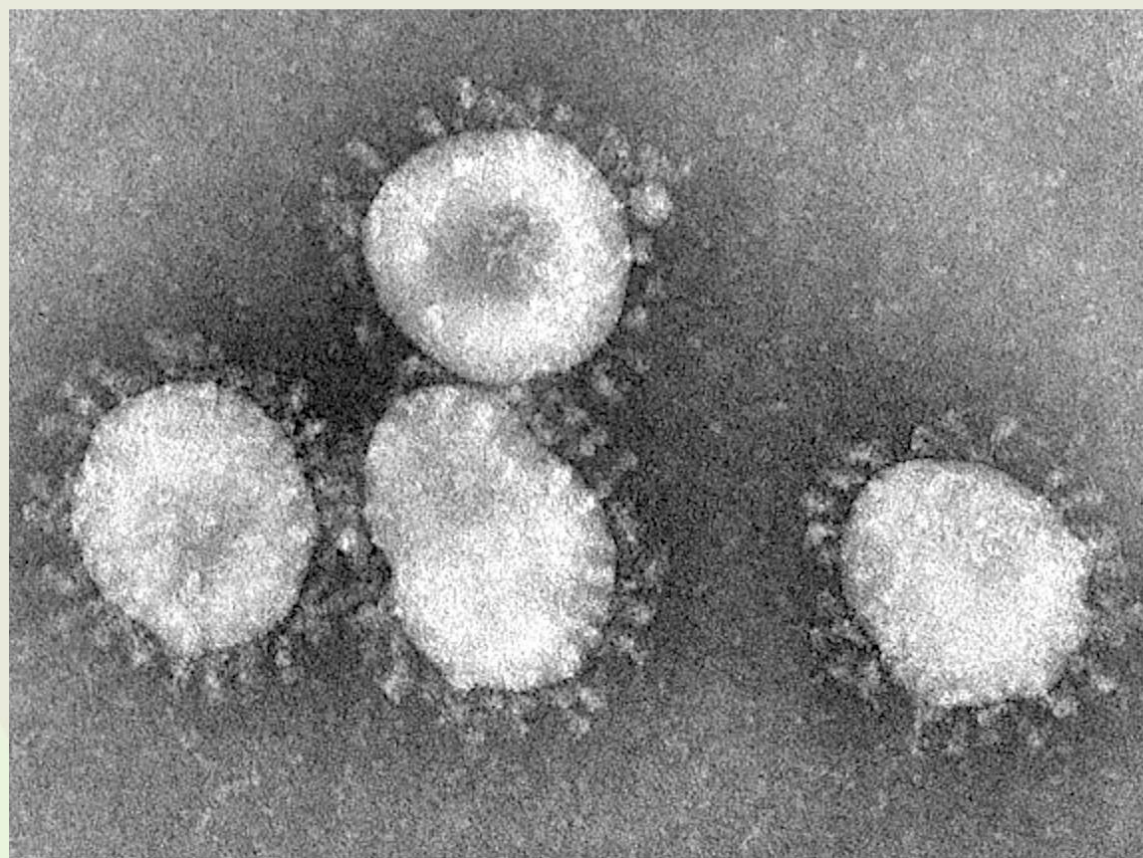
IBV Vaccination





[COMPARTIENDO LA VISIÓN]

Destruction of IBV Vaccine Virus





IBV Vaccine Storage and Preparation

- IBV vaccine is manufactured as a frozen in liquid nitrogen product or lyophilized
- Frozen in liquid nitrogen vaccines need more maintenance
 - Liquid nitrogen tanks must constantly be checked, filled, and maintained
- Lyophilized vaccines are easier to store, they only need refrigeration temperature





IBV Vaccine Dilution for Application

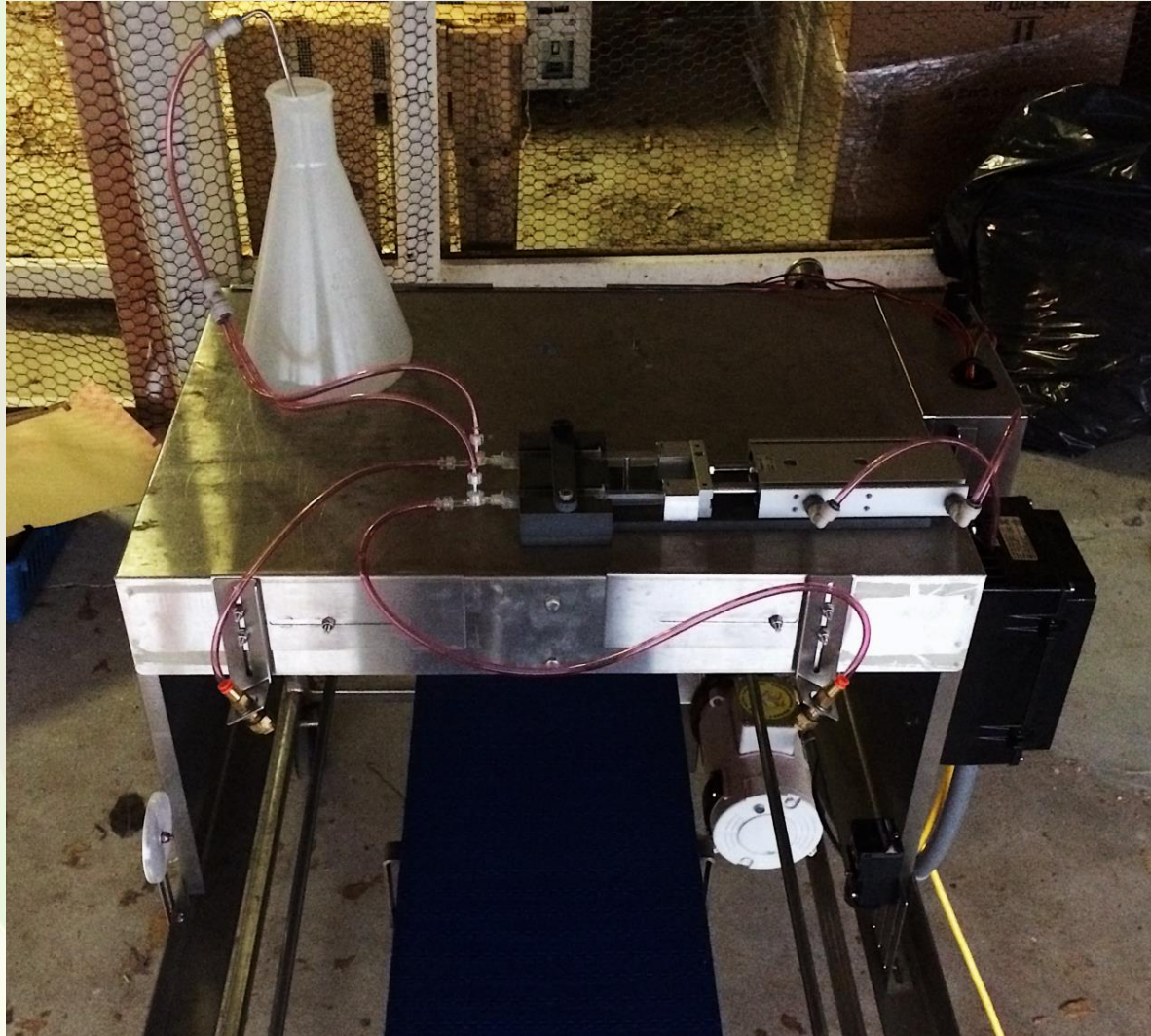
- Vaccine is still temperature dependent
- When mixed with cold H₂O and kept cold (4C), titer is stable at least 4 hours
- When mixed with cold H₂O and allowed to warm, titer begins to drop when vaccine reaches 18C
- When mixed with warm H₂O (>20C), titer drops immediately and will decrease to 0





[COMPARTIENDO LA VISION]

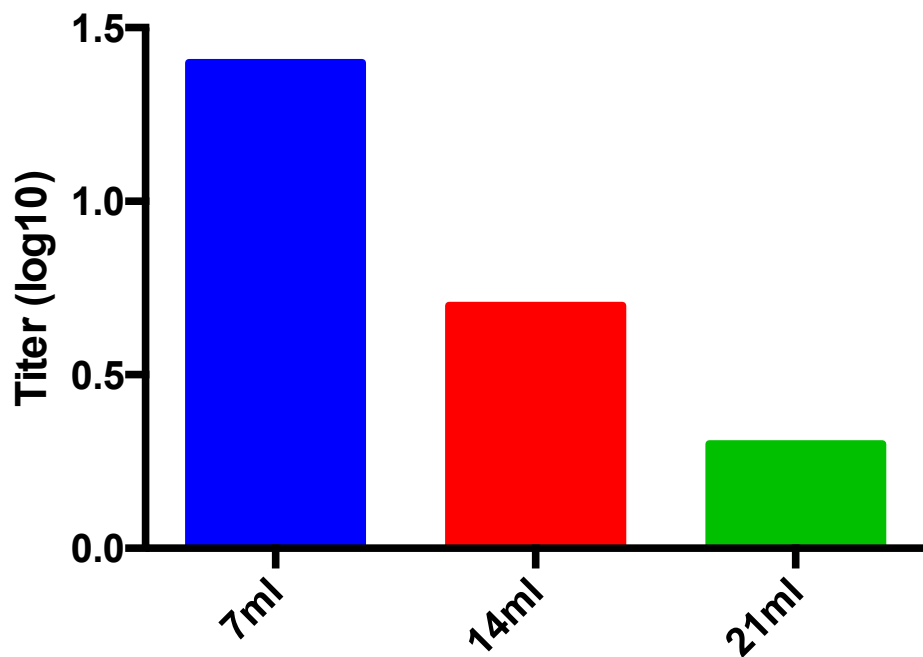
IBV Vaccination



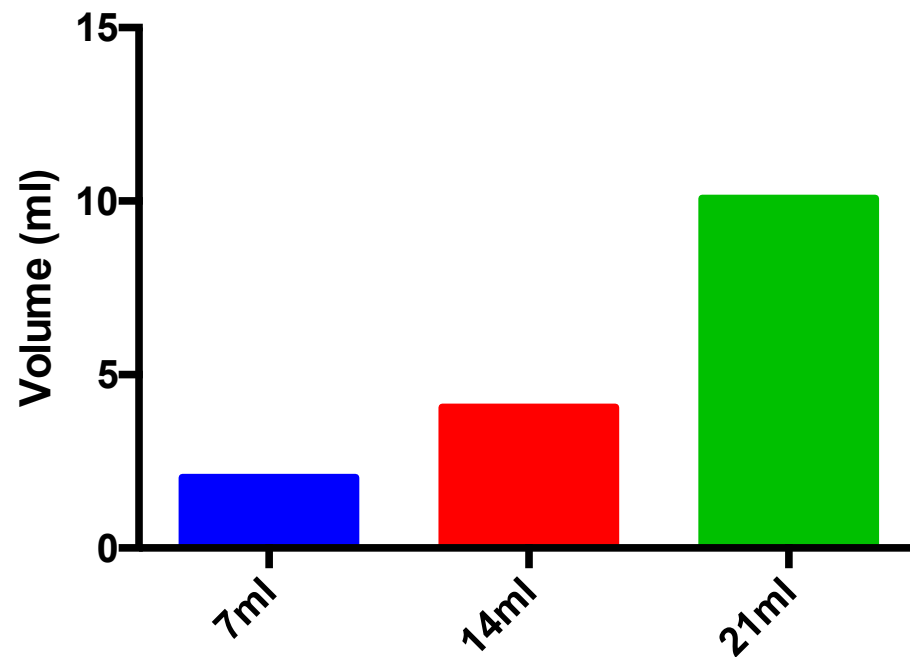


IBV Spray Vaccination Summary:

Titer Loss from Nozzle to Chick



Spray Volume Reaching Chicks





The Serotype of IBV Vaccine is Critical

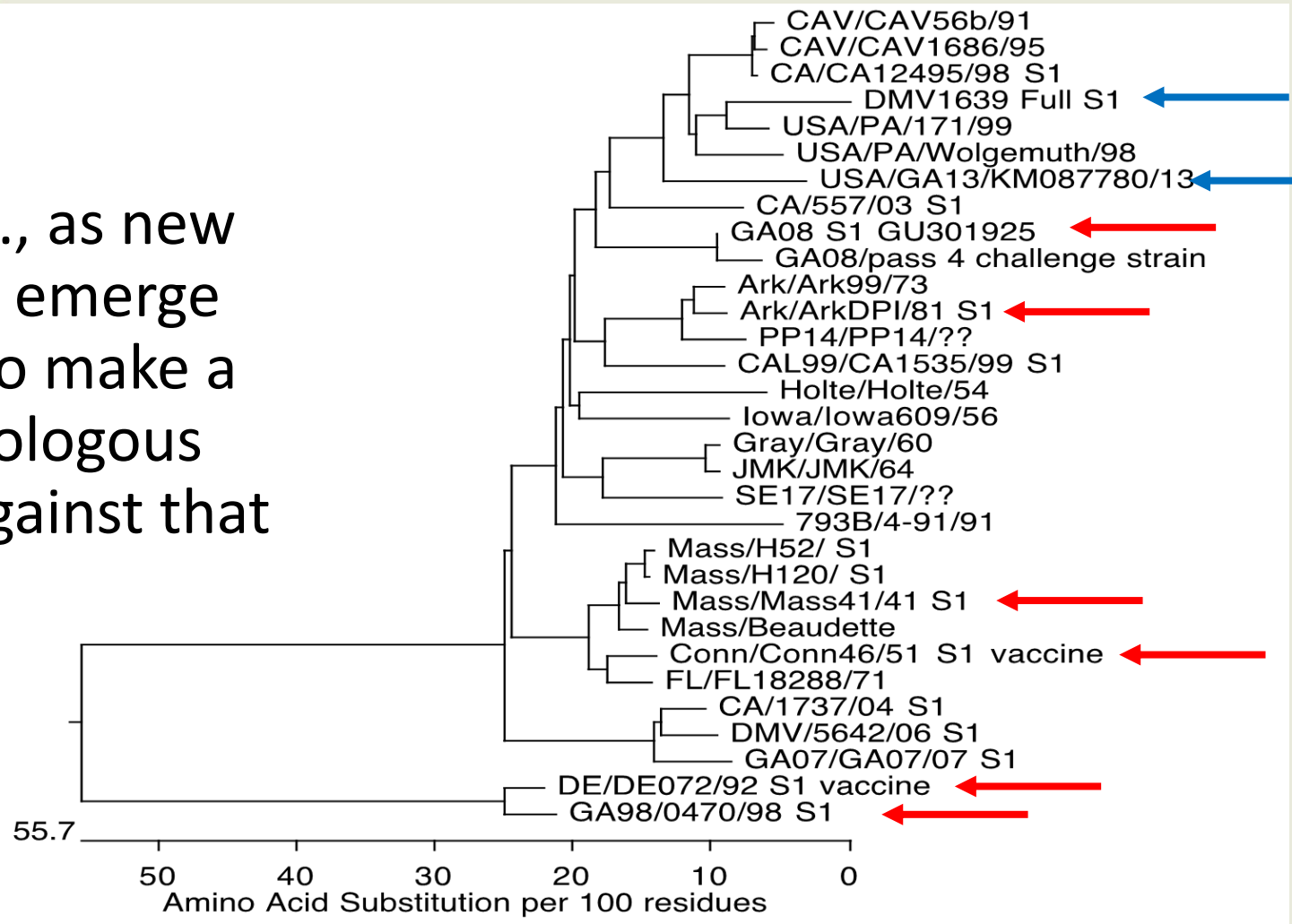
- Most common question is "What IBV vaccine do I use?"
 - The more accurate question to ask is "What serotype IBV vaccine should I use?"
- Vaccination programs can focus around two different philosophies





Multi-Monovalent Vaccinations

- In the U.S., as new serotypes emerge we tend to make a new homologous vaccine against that serotype





Multi-Monovalent Vaccinations

- For most vaccines, this has worked well
 - Mass, Conn, Del/GA98
- For others, the vaccines have not been as good
 - ArkDPI
- It is critical to know what is in your area/flock and use that knowledge to influence your vaccine program
 - Whatever your neighbor is using is in your area...





Strategy of Cross-Protection

- Protection from IBV is serotype specific
 - No one IBV serotype vaccine can protect against another
 - You can have reduction in clinical signs, but not necessarily a reduction in viral replication. This will “hide” the presence of the virus
- Combinations of vaccines can be applied together to provide a broader level of protection - protectotype





Protectotype



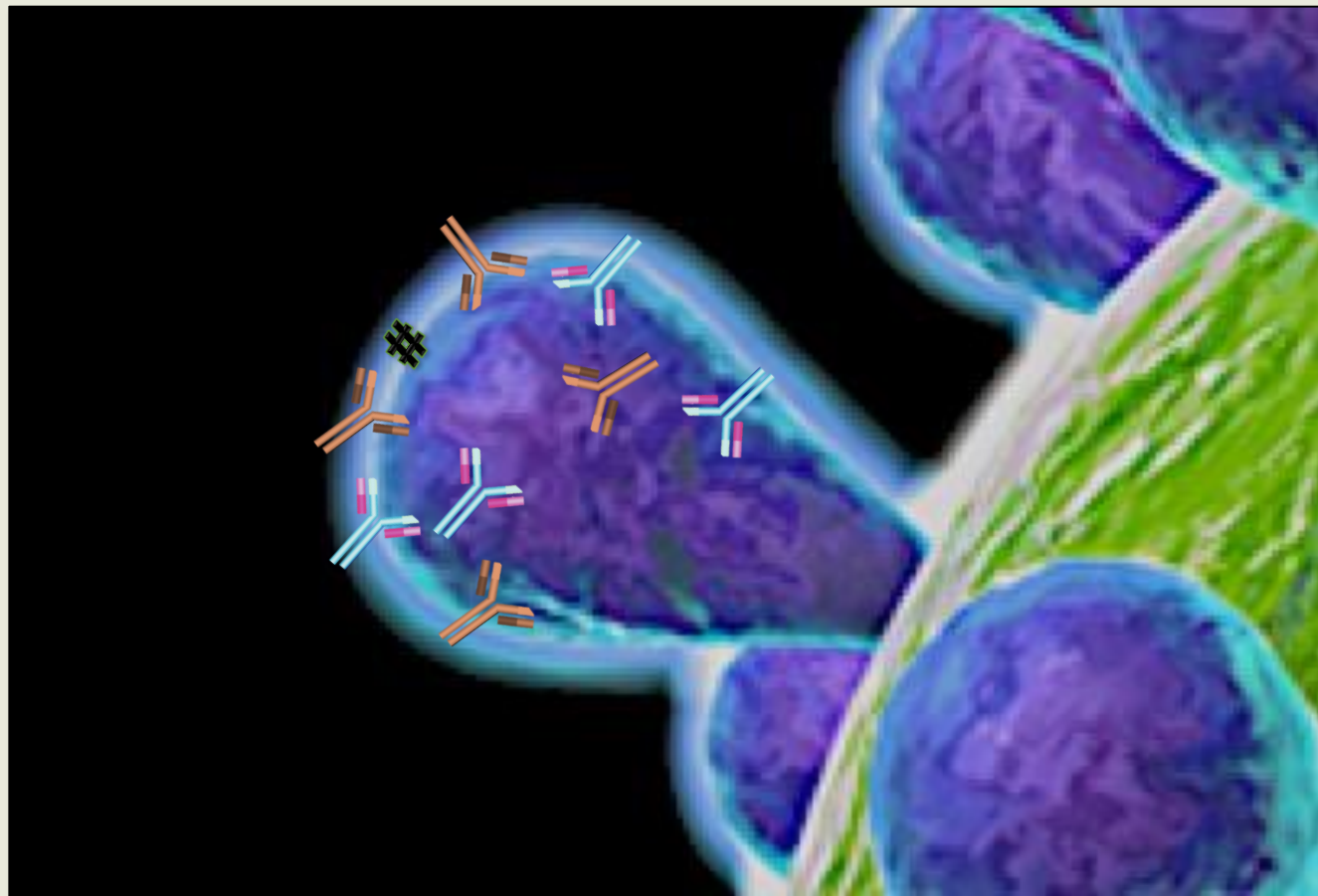
= Type C epitope



= Type A antibodies



= Type B antibodies





Published Work

Breadth of protection of the respiratory tract provided by different live-attenuated infectious bronchitis vaccines against challenge with infectious bronchitis viruses of heterologous serotypes

Jane K. A. Cook*, Sarah J. Orbell, Martyn A. Woods & Michael B. Huggins

Intervet UK, The Elms, Thicket Road, Houghton, Huntingdon, Cambs. PE17 2BQ, UK





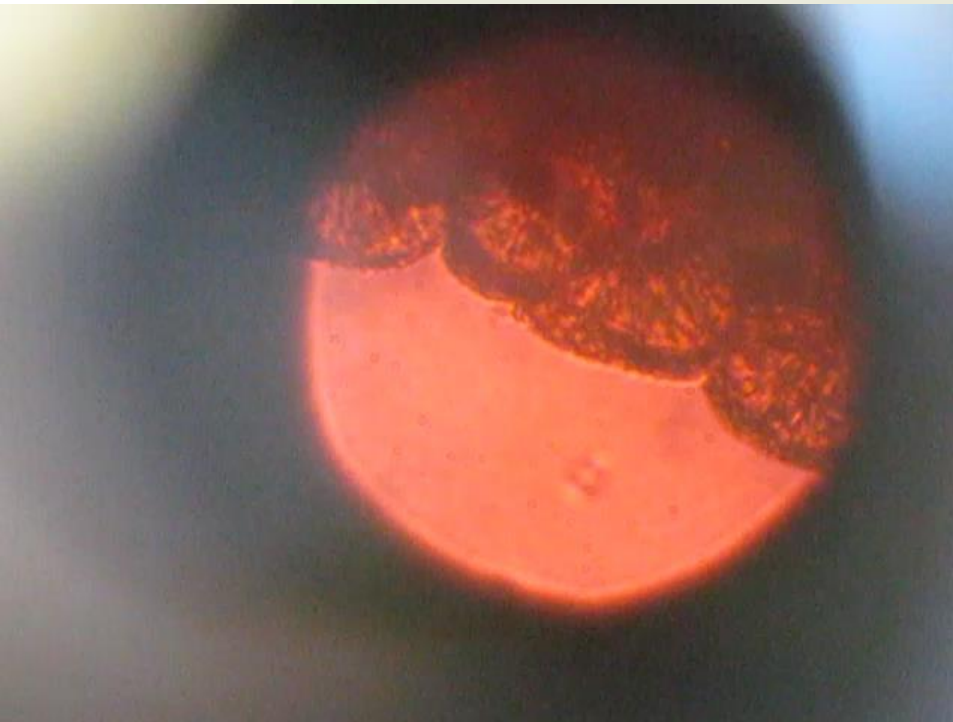
Ma5 & 4/91

- Every trial we have performed with Ma5 and 4/91 protected against ciliostasis, no matter the challenge virus serotype





What is Ciliostasis?





[COMPARTIENDO LA VISIÓN]

Preventing Ciliostasis Prevents Secondary Infection

Avian Dis. 2015 Sep;59(3):368-74.

Evaluating Protection Against Infectious Bronchitis Virus by Clinical Signs, Ciliostasis, Challenge Virus Detection, and Histopathology.

Jackwood MW, Jordan BJ, Roh HJ, Hilt DA, Williams SM.

Abstract

In this study, we examined the association among clinical signs, ciliostasis, virus detection, and histopathology for evaluating protection of vaccinated chickens against homologous and heterologous infectious bronchitis virus (IBV) challenge. At 5 days following challenge with IBV, we found a good correlation among clinical signs, ciliostasis in the trachea, challenge virus detection, and microscopic lesions in the trachea, with all four criteria being negative in fully protected birds and positive in fully susceptible birds. In partially protected birds we observed clinical signs and detected challenge virus; however, the ciliated epithelium was intact. In a second experiment, we challenged fully protected, partially protected, and fully susceptible birds with IBV, and then at 5 days postchallenge we gave the birds an opportunistic bacterium intranasally. Twenty *Bordetella avium* colonies were recovered from one of five fully protected birds, and only five colonies were isolated from two of five partially protected birds without ciliostasis, whereas in birds with ciliostasis, numerous colonies were isolated. Obviously, decreasing IBV infection and replication in the upper respiratory tract will decrease transmission and mutations, leading to variant viruses, and herein we demonstrate that protection of the cilia will decrease secondary bacterial infections, which have been shown to lead to condemnations and increased mortality. Thus, it appears that examining both criteria would be important when evaluating IBV vaccine efficacy.





Ma5 & 4/91

- Every trial we have performed with Ma5 and 4/91 protected against ciliostasis, no matter the challenge virus serotype
- Combination has been used in many other countries in Europe and Latin/South America





Ma5 & 4/91

Vaccination		Challenge Viruses							
1 DOA	14 DOA	PA/Wolgemuth/98	GA13 (Early)	UK/793B/4/91	DMV/1639/11	4/91 Canada	GA13 (Late)	Qu MV	None
4/91	4/91	77.5	40.7	78.5	69	94	78	57	92
MA5 + 4/91	MA5 + 4/91	-80	79.7	77.7	65	78	88	80	89
--	--	27.7	0	9	0	18	0	29	86

Ciliostasis scores: Any score above 50 is protected; higher scores indicate better protection





National Case Studies

- Italy
 - Presence of Italy02 led country to use Ma5 and 4/91; Italy02 disappeared
- Chile
 - Emergence of Q1 prompted the country to bring in 4/91 and use it with Ma5; problem with Q1 disappeared
- Mexico
 - High mortality prompted a company to perform two separate Ma5 and 4/91 protectotype trials
 - Mortality dropped by at least 50% and up to 75% depending on complex





Summary

- IBV is always present, even if you are not having problems
- In a perfect world, we would use a vaccine when a problem arises, and then stop when it goes away
 - Requires careful planning, monitoring and communication
- Vaccination programs must be effective against the challenge in the area
 - Protectotype is effective....but you have to ask the bird





Questions?



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