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Innovating Poultry Health: Multriva's Role in ARV Management

04-Dec-2025

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MSD Animal Health

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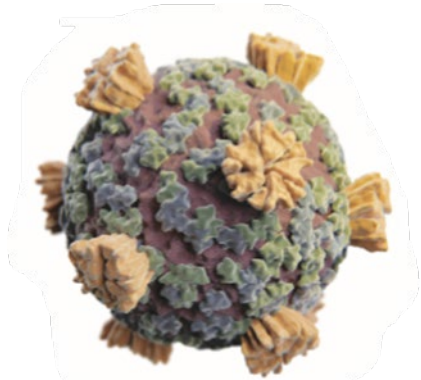
ARV – major poultry pathogen

- ARV is a widespread pathogen in poultry, primarily affecting young birds and causing diseases like viral arthritis (tenosynovitis) and enteritis, leading to economic losses.

- Some strains also linked with:
  - Hepatitis – Polish strains
  - Respiratory disease
  - Hydropericardium?

- ARV spreads both vertically (from hen to egg) and horizontally (bird-to-bird), making early-life protection critical.



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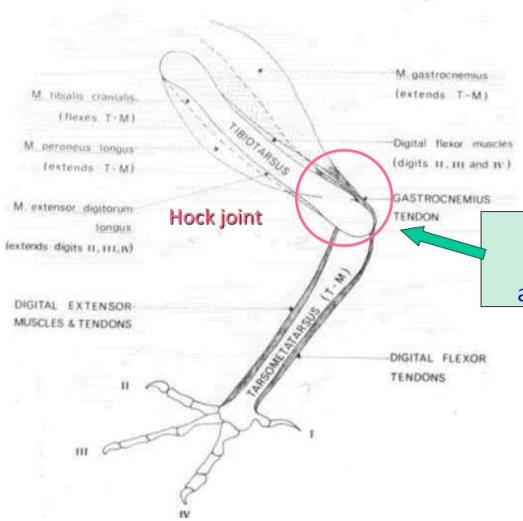
ARV – major poultry pathogen

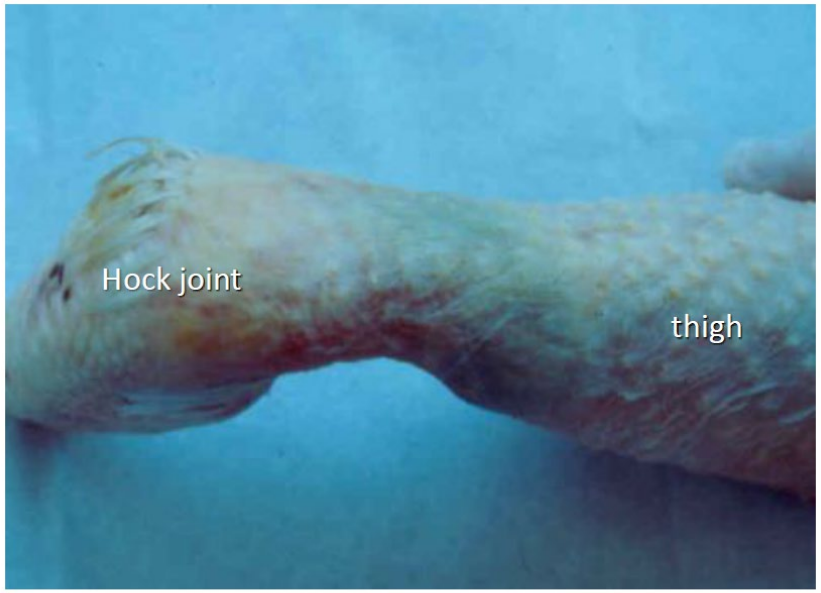
Lame broilers: viral arthritis due to reovirus infection

The tibiotarsal-tarsometatarsal 'hock' joint



The target joint for avian reoviruses

The main weight-bearing joint of the chicken



Green leg' due to reovirus infection (TS)

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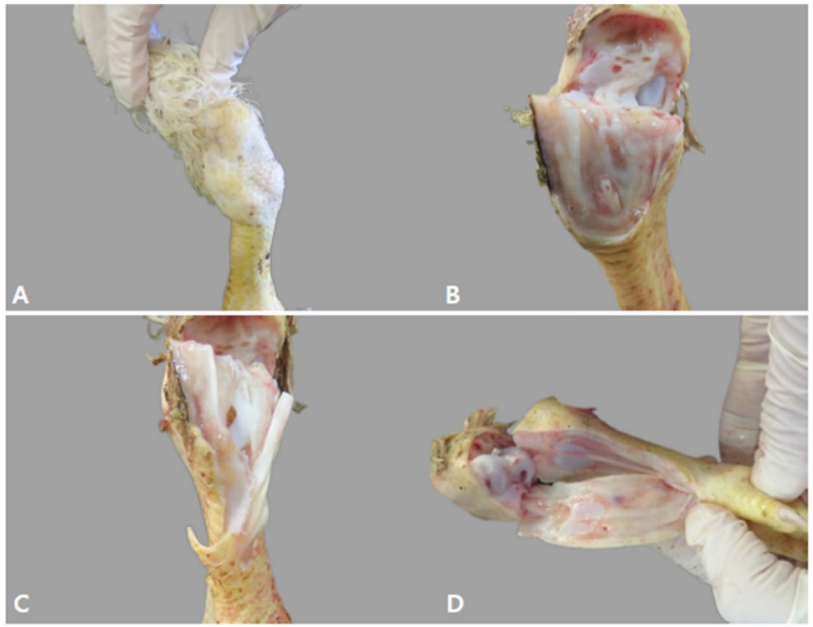
REO in the field: BE

veescoop

Nr.011 EERSTE SEMESTER 2023

IN DE KIJKER

Reovirus-infecties veroorzaken veel leed bij pluimvee



Foto's van een autopsiecasus waar duidelijk Reovirus-infectie is uitgekomen: merk de sterke verdikking op van het weefsel om en rond het hakgewricht (A) evenals het troebel oedemateus tot fibrineus materiaal in het hakgewricht en rondom de aansluitende pezen (B, C & D).

veescoop

Nr.013 EERSTE SEMESTER 2024

Reovirus: In vergelijking met de voorgaande jaren werden dit voorjaar meer reovirus-analyses via PCR uitgevoerd, waarbij we eveneens een stijging zien in het aandeel ongunstige resultaten, waarbij de aanwezigheid van het virus effectief werd aangetoond.

slide from Kristof Mullem & Just Winterink

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REO in the field: NL

monitoring

Nieuw genotype veroorzaakt uitbraak reovirus

In 2023 zagen we een opmerkelijke toename van het aantal sectie-inzendingen van kippen met peesschede-infecties (tenosynovitis), veroorzaakt door het reovirus. In de loop van het jaar bleek dat er sprake was van een nieuw genotype, dat zich ongebruikelijk snel verspreidde.

met het nieuwe genotype, vooral van bedrijven met trager groeiende vleeskuikens. Tien keer was het een terugkerende infectie bij een nieuw koppel op bedrijven waar dit genotype eerder speelde. Elf keer ging het om meerdere stallen van hetzelfde bedrijf. Dat wijst op een nieuwe virusstam, die zich snel

slide from Kristof Mullem & Just Winterink

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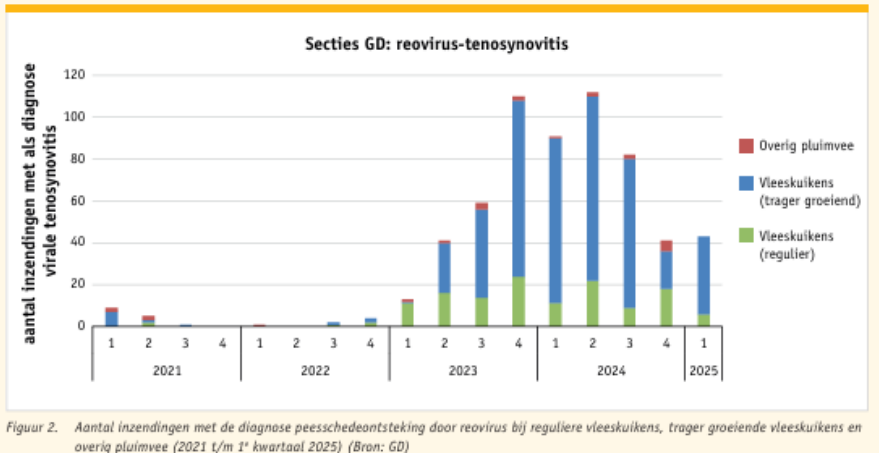
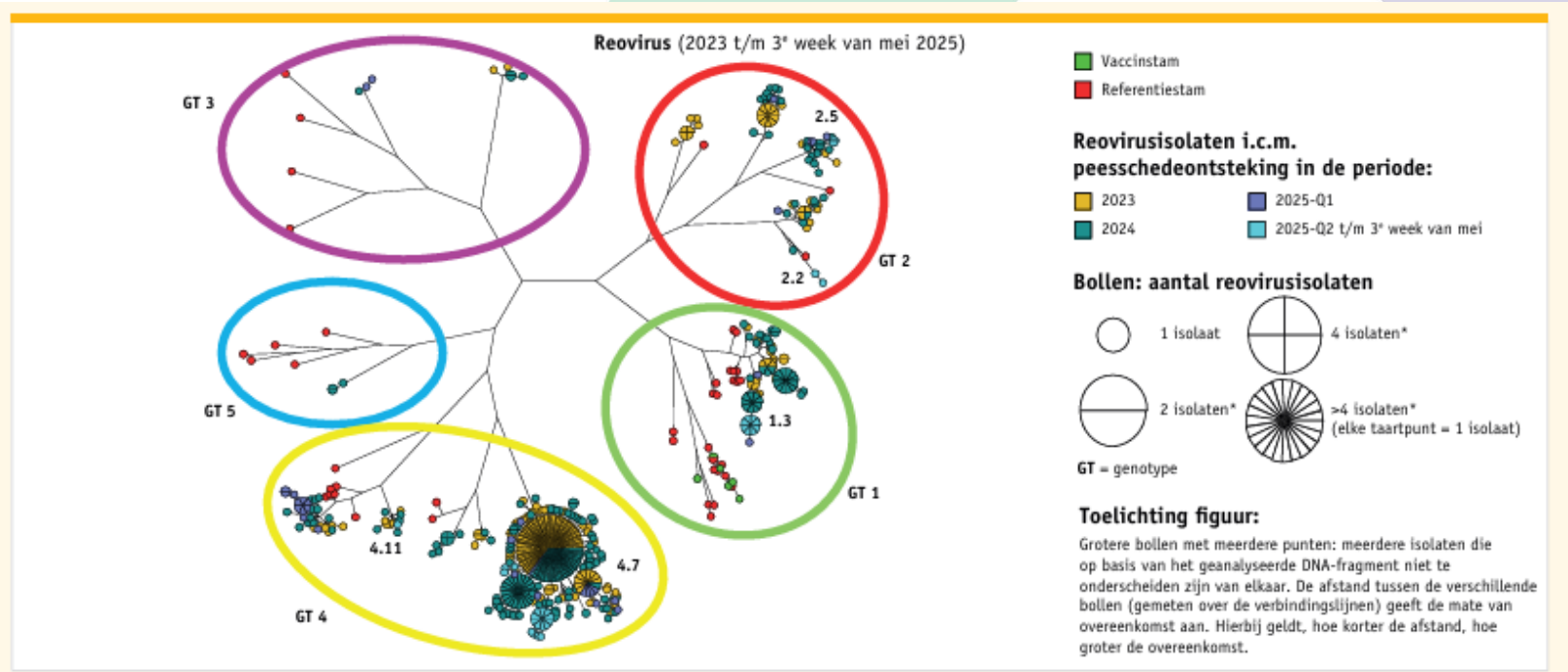
REO in the field: NL

Veekijker NIEUWS

Pluimvee | juli 2025



Figuur 2. Aantal inzendingen met de diagnose peesschedeontsteking door reovirus bij reguliere vleeskuikens, trager groeiende vleeskuikens en overig pluimvee (2021 t/m 1e kwartaal 2025) (Bron: GD)



Figuur 3. Fylogenetische boom van de door GD aangetoonde reovirussen in geval van peesschedeontsteking (2023 t/m 3e week van mei 2025) (Bron: GD)

slide from Kristof Mullem & Just Winterink

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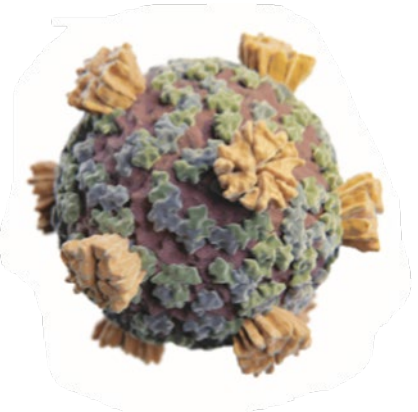
ARV – avian reovirus

- Respiratory Enteric Orphan (REO): viruses isolated from respiratory and enteric tracts with no disease in parental birds
- Avian reovirus (ARV) possess a segmented double-stranded RNA genome which encodes for eight primary structural proteins including Sigma C.



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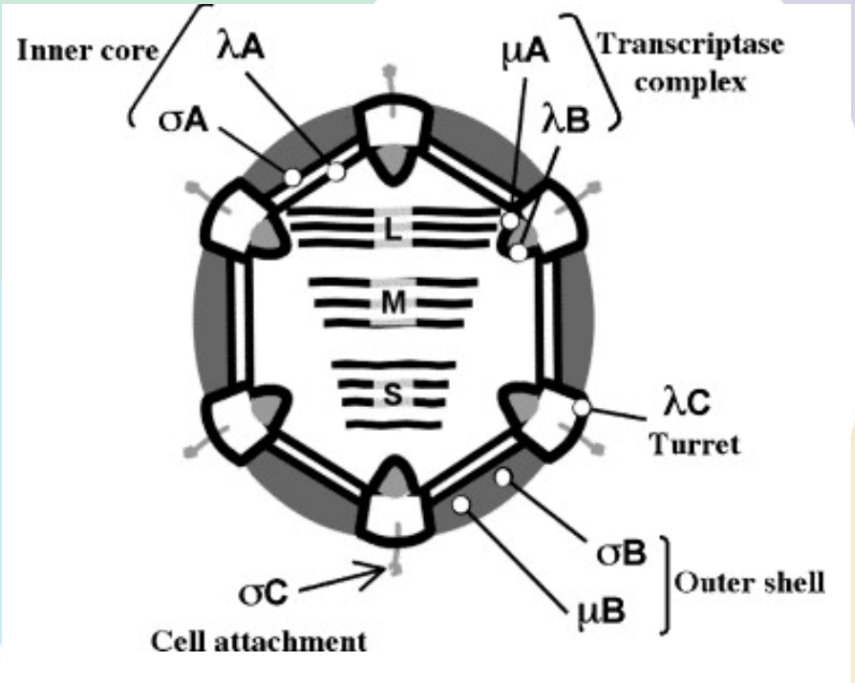
ARV structure

- Reovirus belongs to the genus *Orthoreovirus* which is one of the genera of reoviridae family

- Reovirus
  - 10 double-stranded RNA segments encased in two protein capsids
  - L, M and S genome segments

Protein	Function
λA	Core shell scaffold
λB	Putative transcriptase
λC	Capping enzyme
μA	Putative transcriptase co-factor
μB, μBN, μBC	Penetration
μNS, μNSC, μNSN	Formation of viral factories and protein recruitment
σC	Cell attachment
p10	Permeabilising/fusogenic
p17	Unknown
σA	dsRNA binding, anti-interferon activity
σB	Unknown
σNS	ssRNA binding



Slide adapted from Wilbert Bouwman;
https://www.sciencedirect.com/science/article/pii/S0168170206002772

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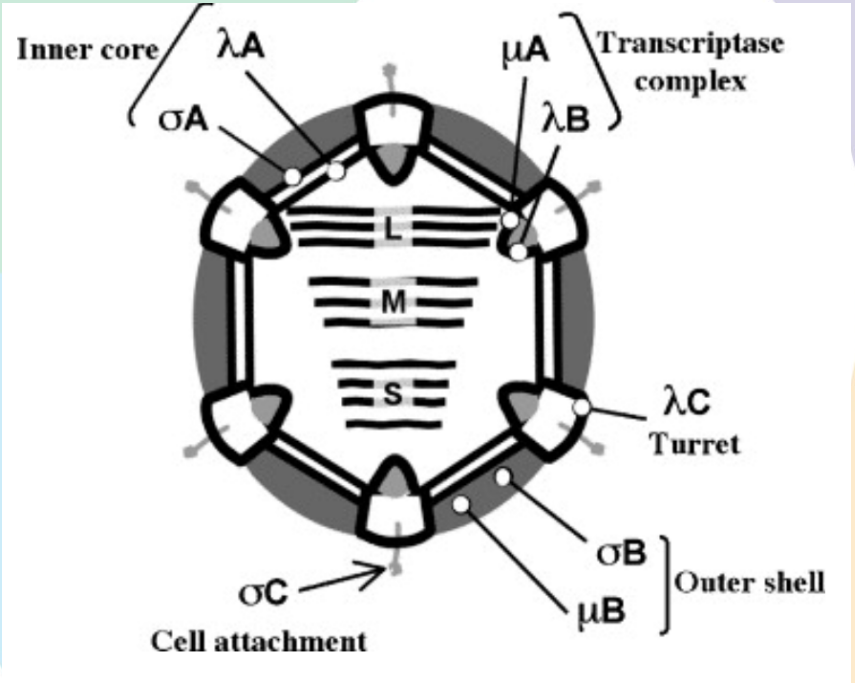
ARV – key role of sigma C

Sigma C of ARV:

- Mediates host cell attachment,
- Acts as a major antigenic determinant that elicits protective antibodies, and
- Is the most variable protein within the ARV genome



https://www.sciencedirect.com/science/article/pii/S0168170206002772

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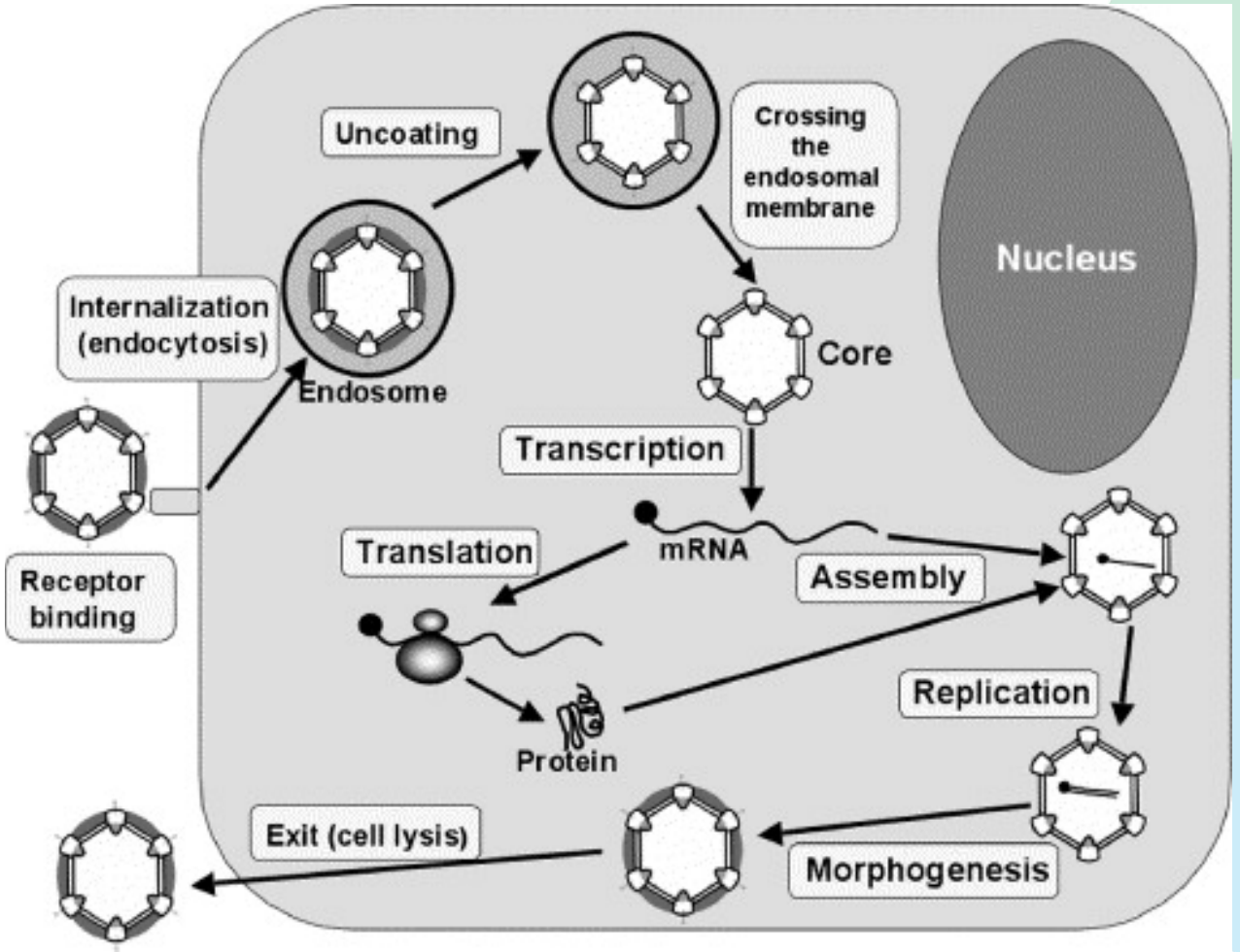
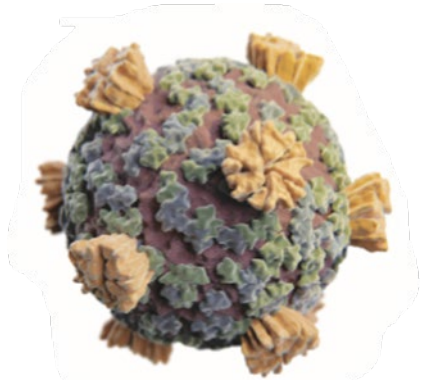
ARV infection – cellular-level





https://www.sciencedirect.com/science/article/pii/S0168170206002772

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ARV infection – micro-level

Oral infection → Enteric replication

↓

Viraemia

↓

All tissues

Targets: **GUT** **LIVER** **HOCK JOINTS**

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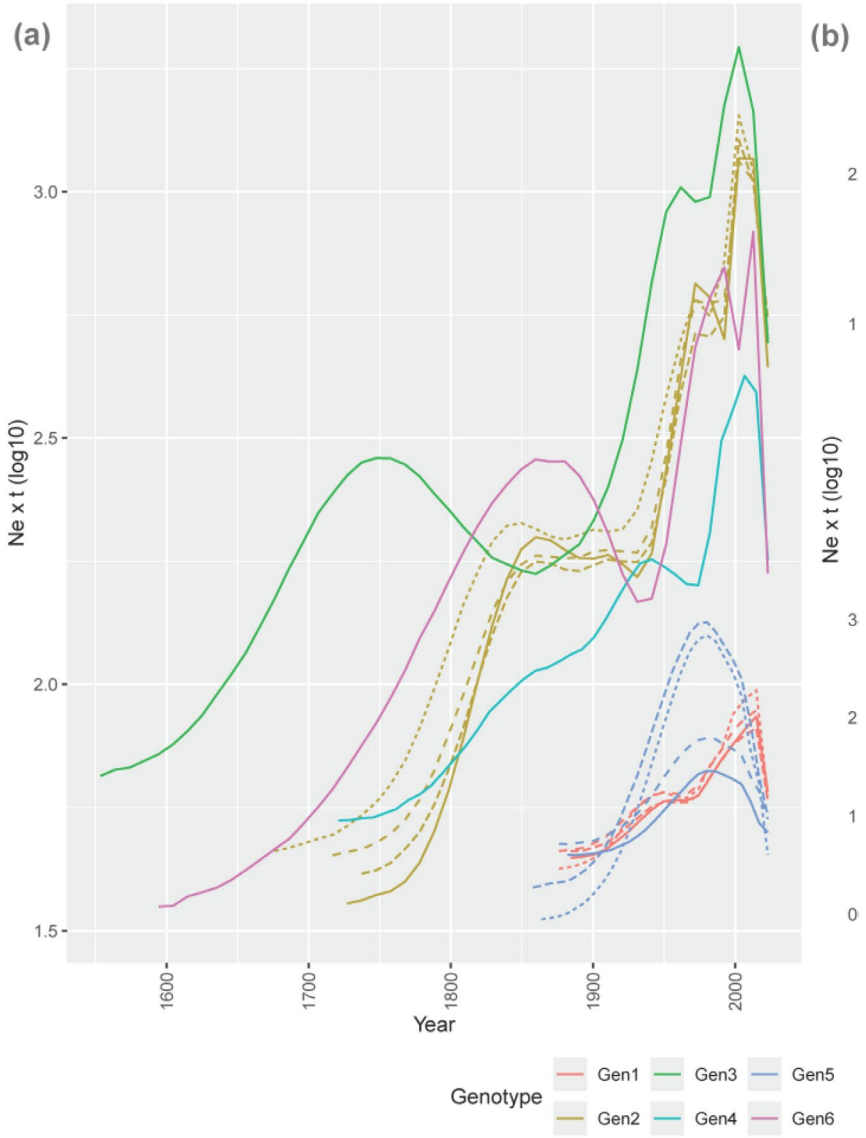
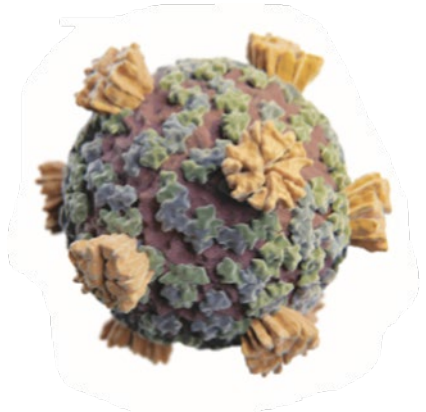
ARV – not a new pathogen





Franzo G et al., Viruses, 2024
https://www.mdpi.com/1999-4915/16/5/796

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ARV shows high genetic diversity

ARV high genetic diversity is (mainly) caused by:

- Inherent genetic instability (segmented RNA genome, which facilitates gene reassortment and recombination events, leading to rapid accumulation of point mutations)
- Widespread use of vaccines that are ineffective against emerging variants
- Resistance to disinfection

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ARV shows high genetic diversity

- Current commercial vaccines, based on strains from Genotype 1, show reduced efficacy due to emerging antigenic variants.
- ARV's high genetic diversity and ongoing evolution complicate vaccine development, requiring broad-spectrum approaches.

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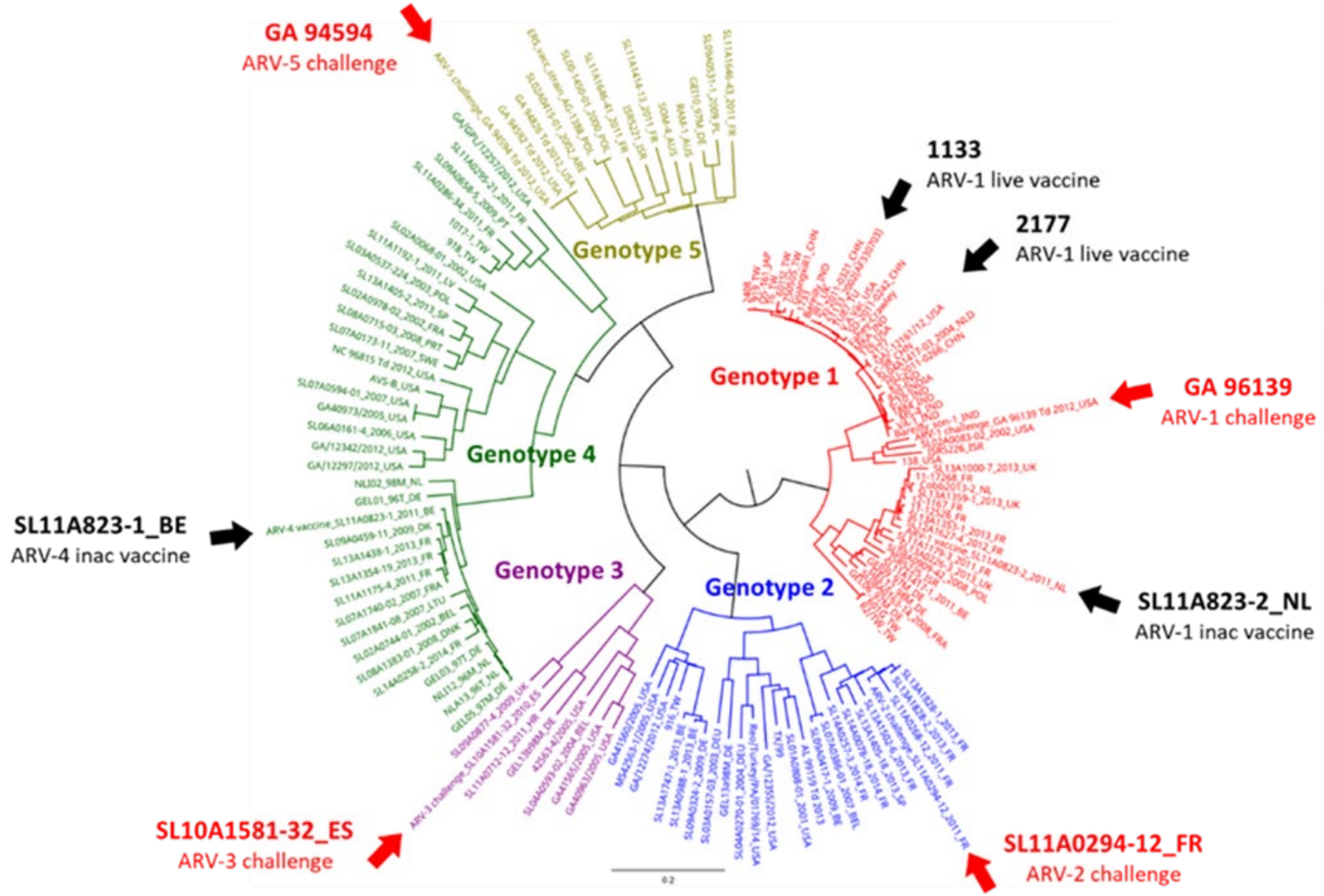
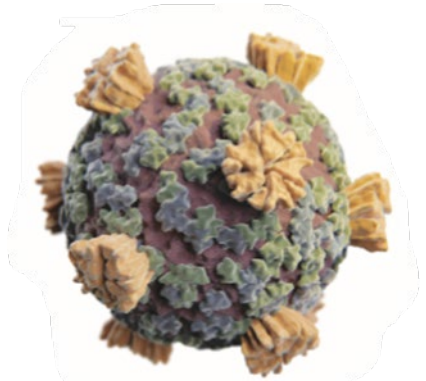
ARV shows high genetic diversity





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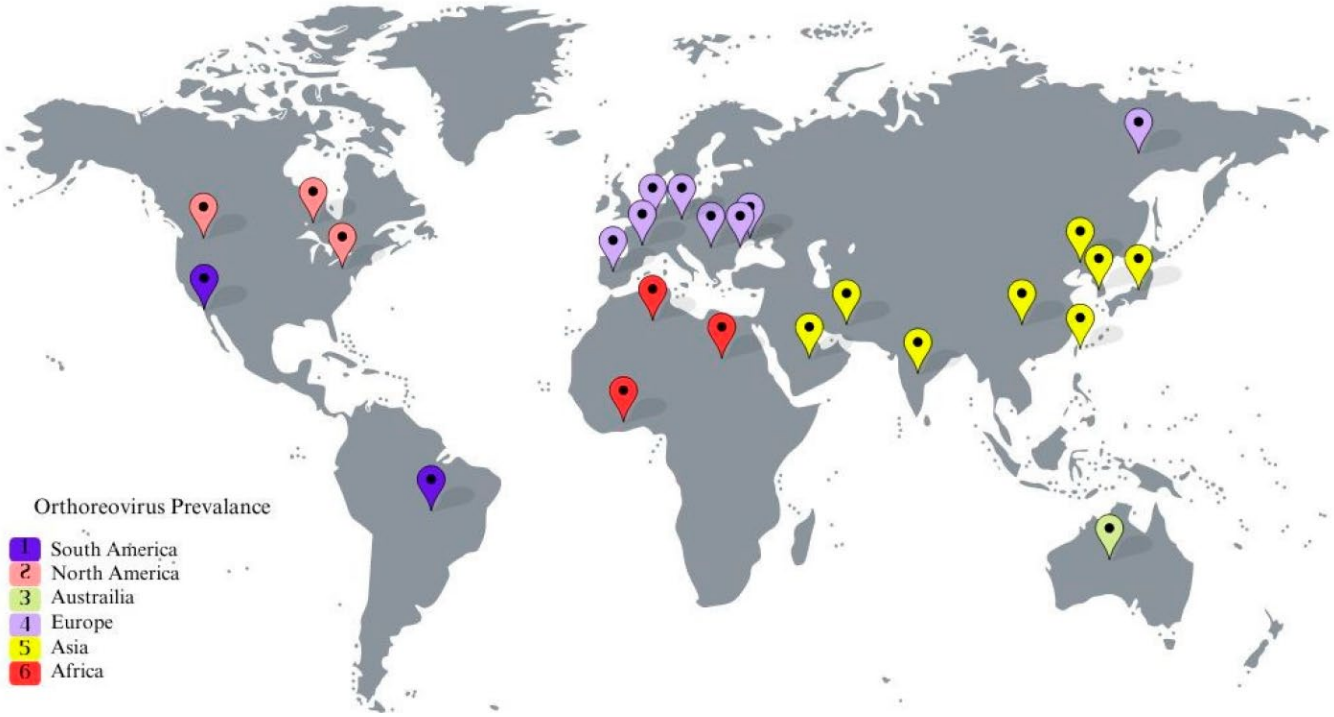
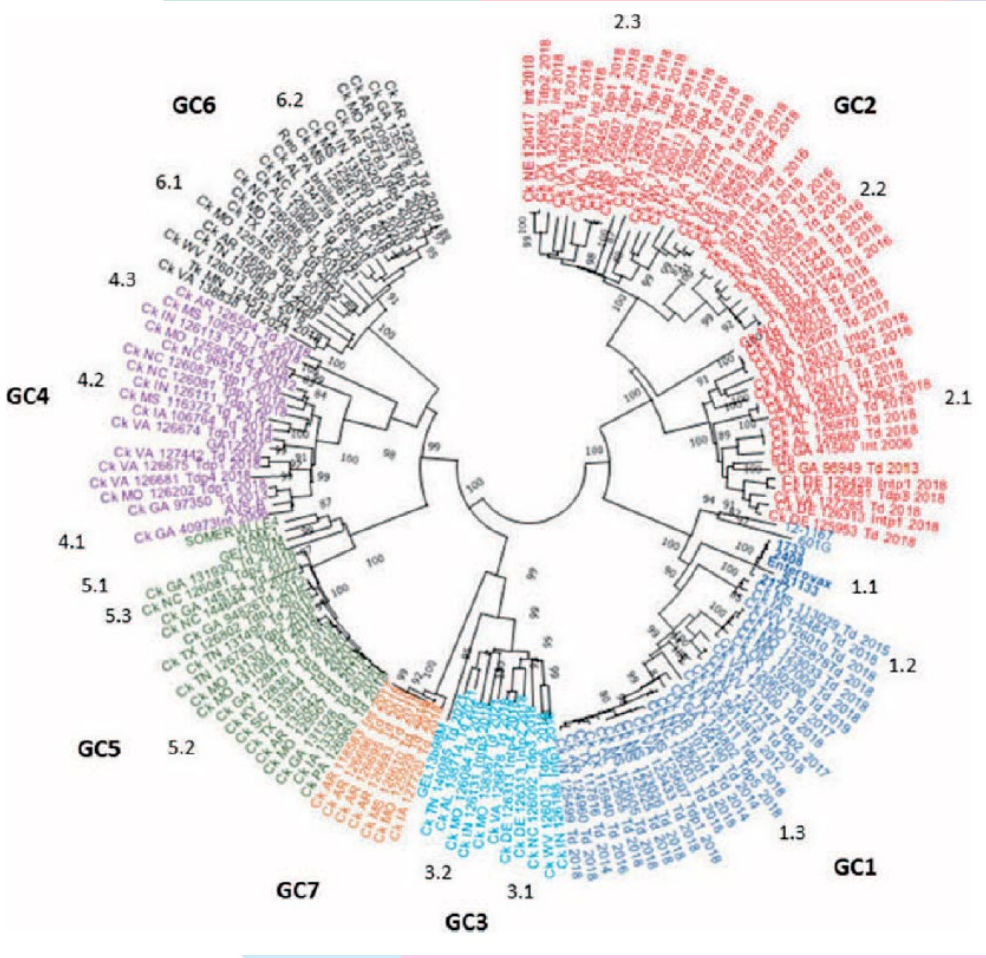
ARV – how many genotypes?





Rafique S et al., Viruses, 2024

Sellers H, Avian Diseases, 2022

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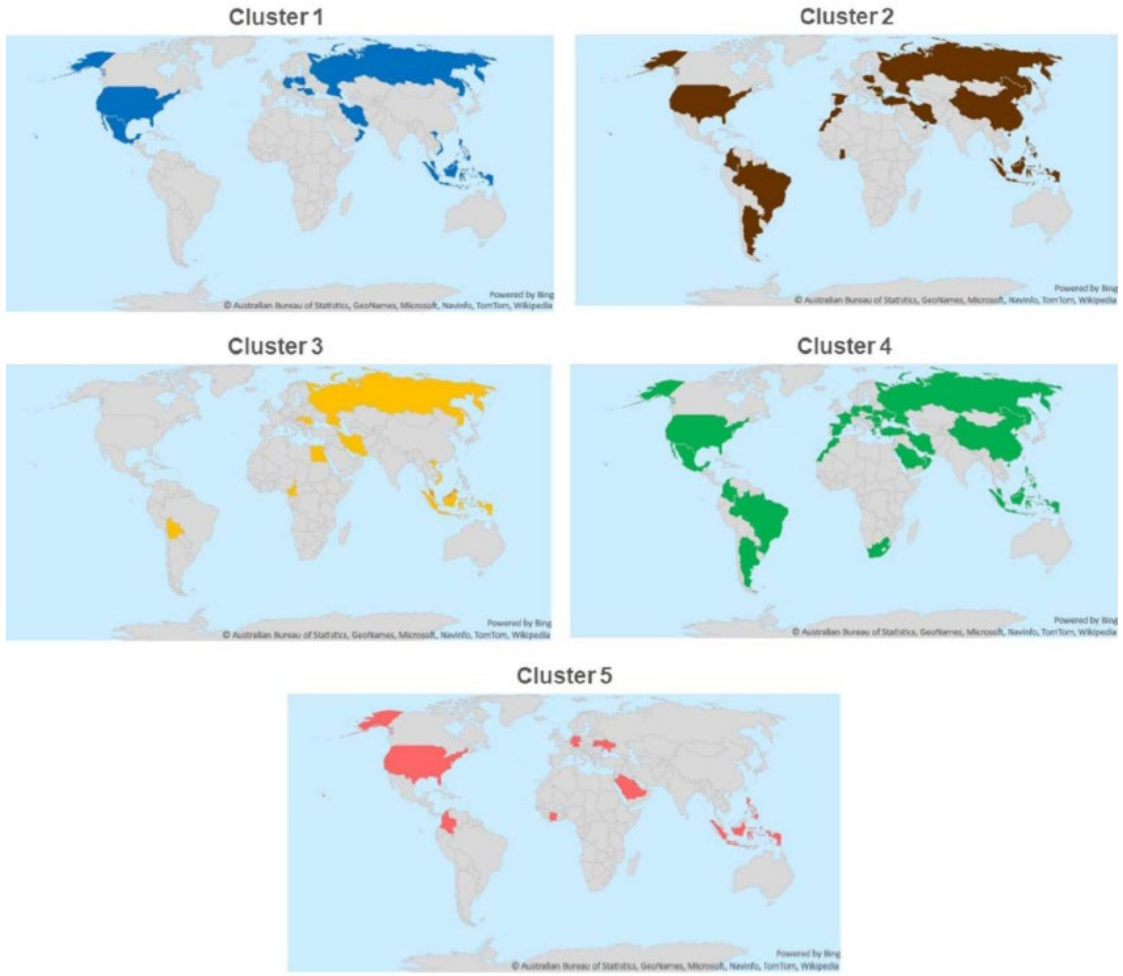
Global distribution of ARV genotypes



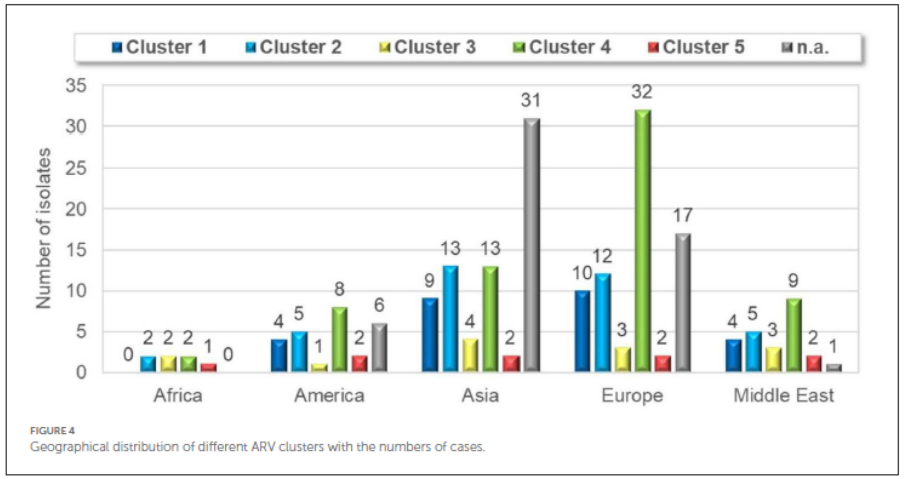


FIGURE 4
Geographical distribution of different ARV clusters with the numbers of cases.

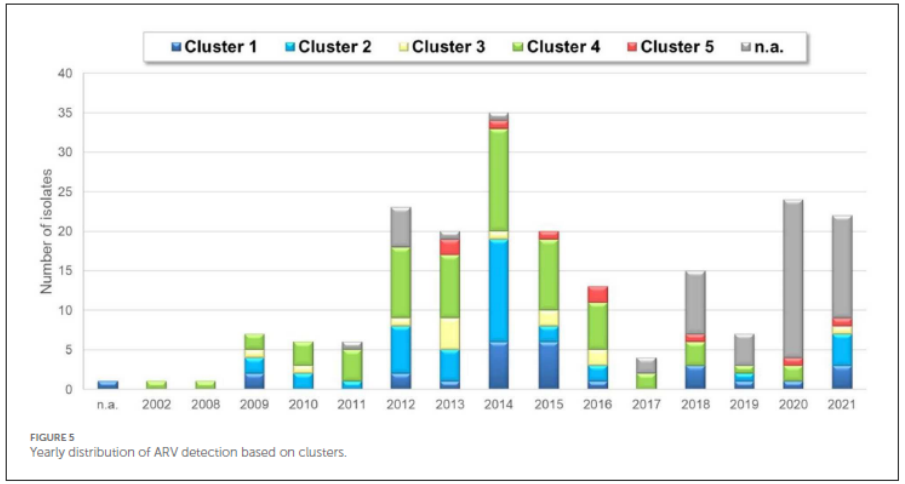


FIGURE 5
Yearly distribution of ARV detection based on clusters.

Kovacs E et al., Frontiers in Vet Sci, 2023

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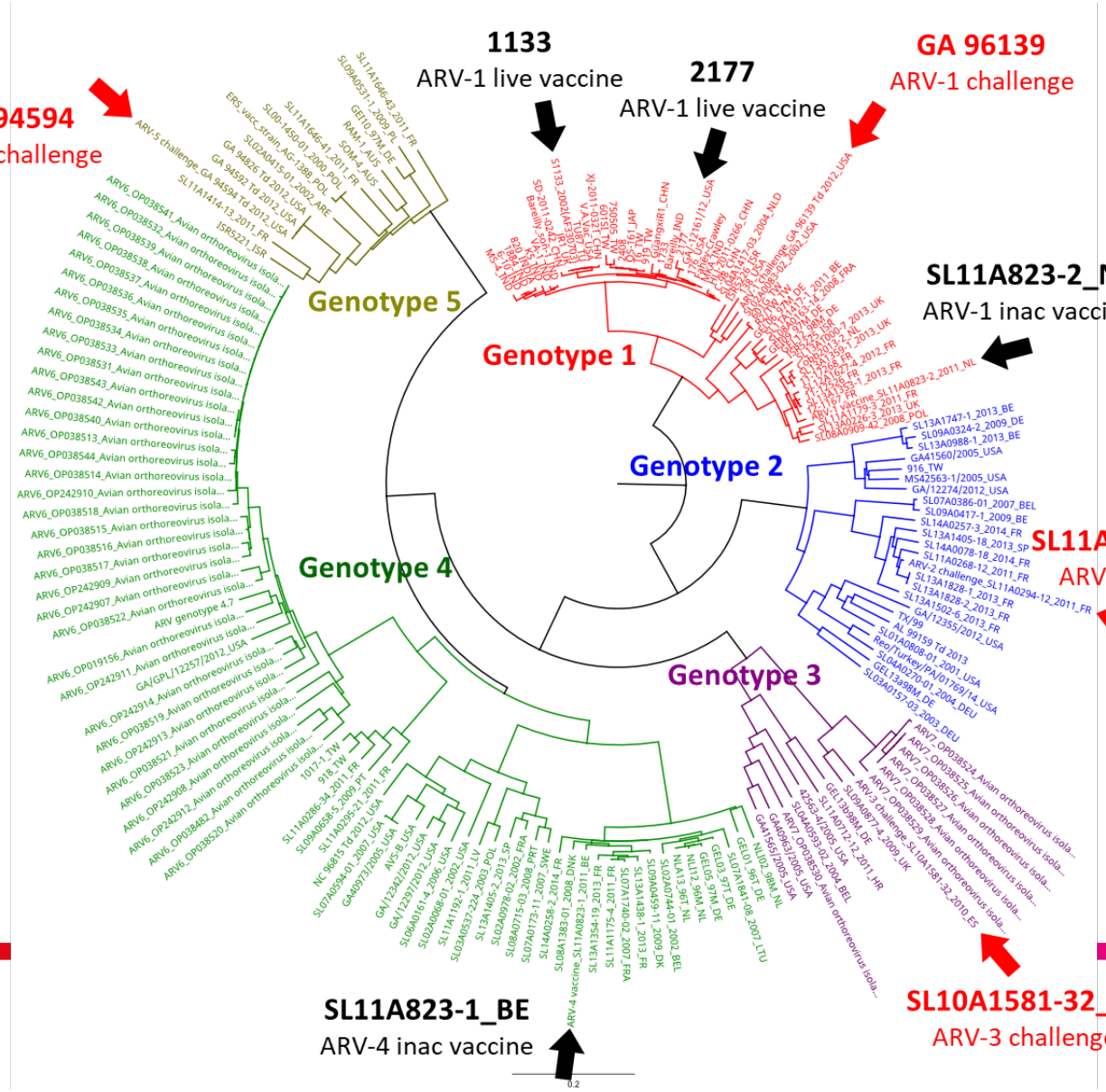
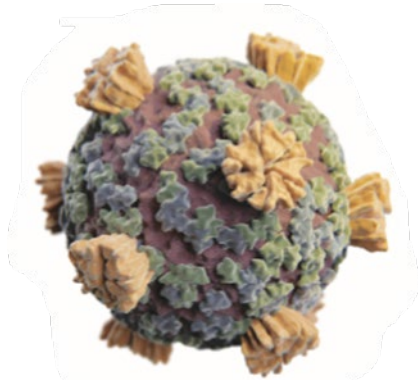
ARV – 5 main genotypes





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How to protect poultry against ARV in the field?

Available vaccines against ARV

Vaccine (Brand)	Type	ARV Strain(s) and genotypic cluster (GC)	Manufacturer
Nobilis® Reo 1133	Live	1133 (GC1)	MSD Animal Health
ENTEROVAX®	Live	S1133 (GC1)	Merck Animal Health
Nobilis® Reo 2177	Live	2177 (GC1)	MSD Animal Health
Tri-Reo®	Inactivated	1133 (GC1), 2408 (GC1) and 3005 (GC1)	Zoetis
Nobilis® REO Inac	Inactivated	1733 (GC1) and 2408 (GC1)	MSD Animal Health
BREEDERVAC® REO-PLUS	Inactivated	1733 (GC1) and 2408 (GC1)	Merck Animal Health
NOBILIS® MULTRIVA REOm	Inactivated	ARV1 (GC1) and ARV4 (GC4)	MSD Animal Health
Reomune® 3	Inactivated	S1133 (GC1), 2408 (GC1) and SS412 (GC2?)	Ceva Santé Animale
Poulvac Maternavac® IBD-Reo	Inactivated	1733 (GC1) and 2408 (GC1)	Zoetis
Poulvac Maternavac® 4	Inactivated	1733 (GC1) and 2408 (GC1)	Zoetis
Bursa Guard N-B-R	Inactivated	S1133 (GC1), 2408 (GC1) and MSB (?)	Boehringer Ingelheim
Avipro 431 ND-IB-BD3-Reo	Inactivated	1733 (GC1) and S1133 (GC1)	Elanco

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New vaccines should aim for broad-spectrum protection against ARV strains, by inducing strong, broad antibody responses, guided by genetic analysis of ARV.

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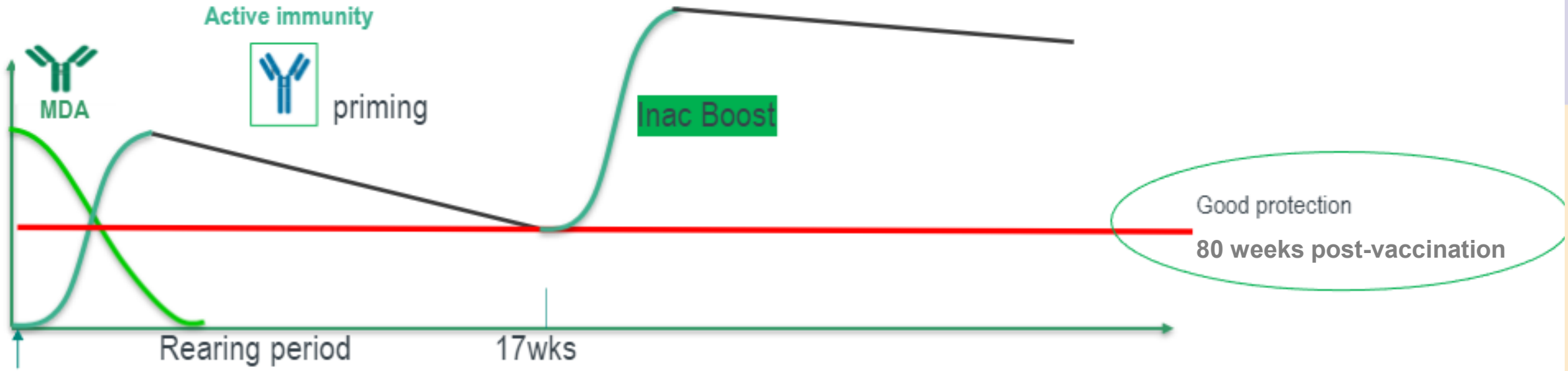
Setting up optimal vaccination scheme for ARV



Slide from Corrado Longoni

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Optimizing ARV strain combinations for next-generation vaccines

Group	Parental vaccine	Reduction of infection in progeny by different avian reovirus challenge strains (no. of chicks per total positive for reovirus in serum at 3 dpi)			
		Genotype 1	Genotype 2	Genotype 3	Genotype 4
1	ARV4	no (3/5)	nd	nd	yes (0/5)
2	ARV1	yes (0/5)	nd	nd	no (3/5)
3	ARV1 + ARV4	yes (1/5)	yes (0/4)	yes (1/5)	yes (0/5)
4	mock vaccine	no (5/5)	no (5/5)	no (5/5)	no (5/5)
5	ARV1 + ARV1	yes (1/5)	yes (0/5)	no (3/5)	no (4/5)
6	ARV1 + ARV1 + ARV5	yes (0/5)	yes (1/5)	no (5/5)	no (3/5)

nd *not done*

Cut-off criteria for ARV challenge virus infection:

- ≥ 3 animals positive → no reduction of challenge virus infection
- 2 animals positive → doubtful reduction of infection
- 0 or 1 animal positive:→ reduction of challenge virus infection

European patent; EP 3200820

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Nobilis Multriva REOm – novel inactivated vaccine for poultry

Nobilis Multriva REOm:

Novel inactivated vaccine for breeders, containing strains: ARV1 and ARV 4.

Key Benefits:

- Scientifically designed for field-relevant protection and antigen compatibility.
- Fewer injections through smart antigen combinations - simplifying field vaccination schemes.
- Low 0.3 mL dose supports welfare and efficient administration.

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Nobilis Multriva REOm claims

For the active immunisation of chickens for:

- passive immunisation of the progeny of the vaccinated chickens to
  - reduce viraemia and clinical signs of disease caused by Avian Reovirus genotypes 1 and 4.

Cross protection has been established for ARV genotypes 2, 3 and 5.

<u>Onset of immunity:</u>

- in parents: 4 weeks post-vaccination.
- in progeny: 1 day of age

<u>Duration of immunity:</u>

- in parents: 80 weeks post-vaccination
- in progeny: 3 weeks of age

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REOm
Efficacy data

 GL-MLT-230200002

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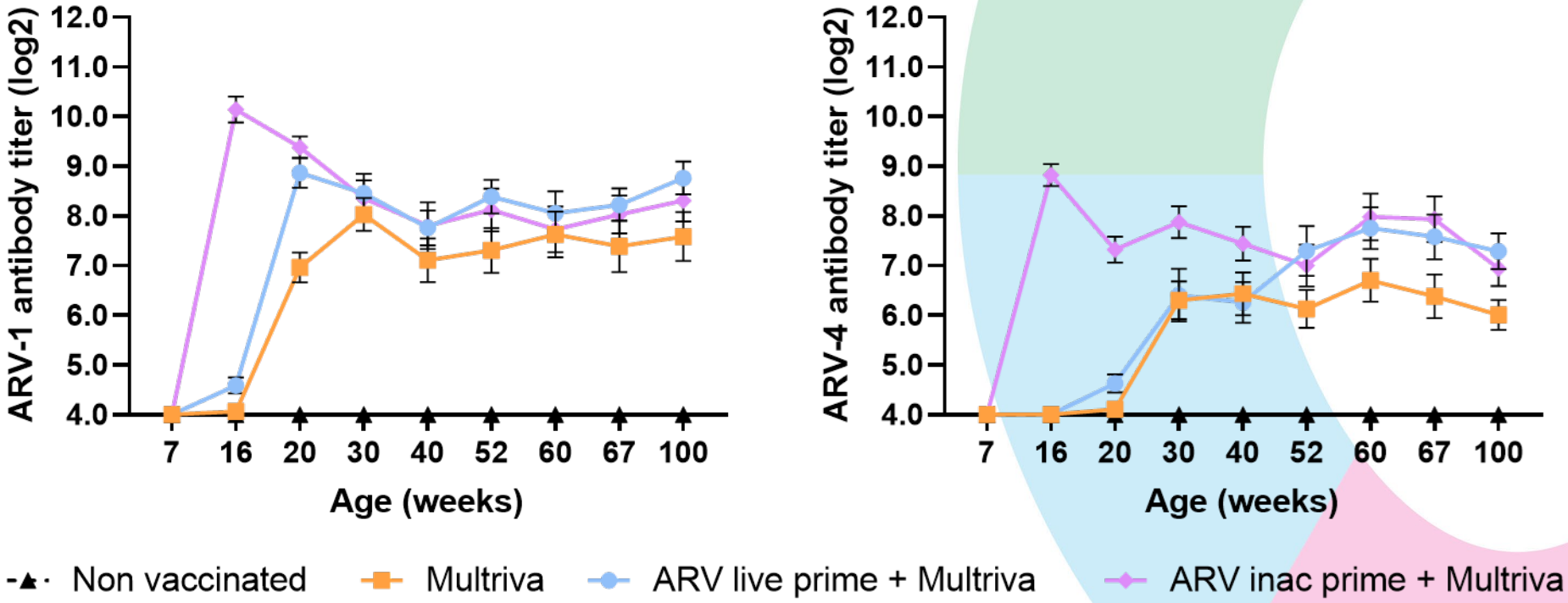
ARV-serology in SPF parental hens

Vaccination with nine-valent inactivated vaccine induces efficient and long-lasting ARV serological responses (against ARV1 and ARV4) in SPF chickens alone or in a prime-boost regime.



Prime at 7 woa (IM), boost at 16 woa (IM).

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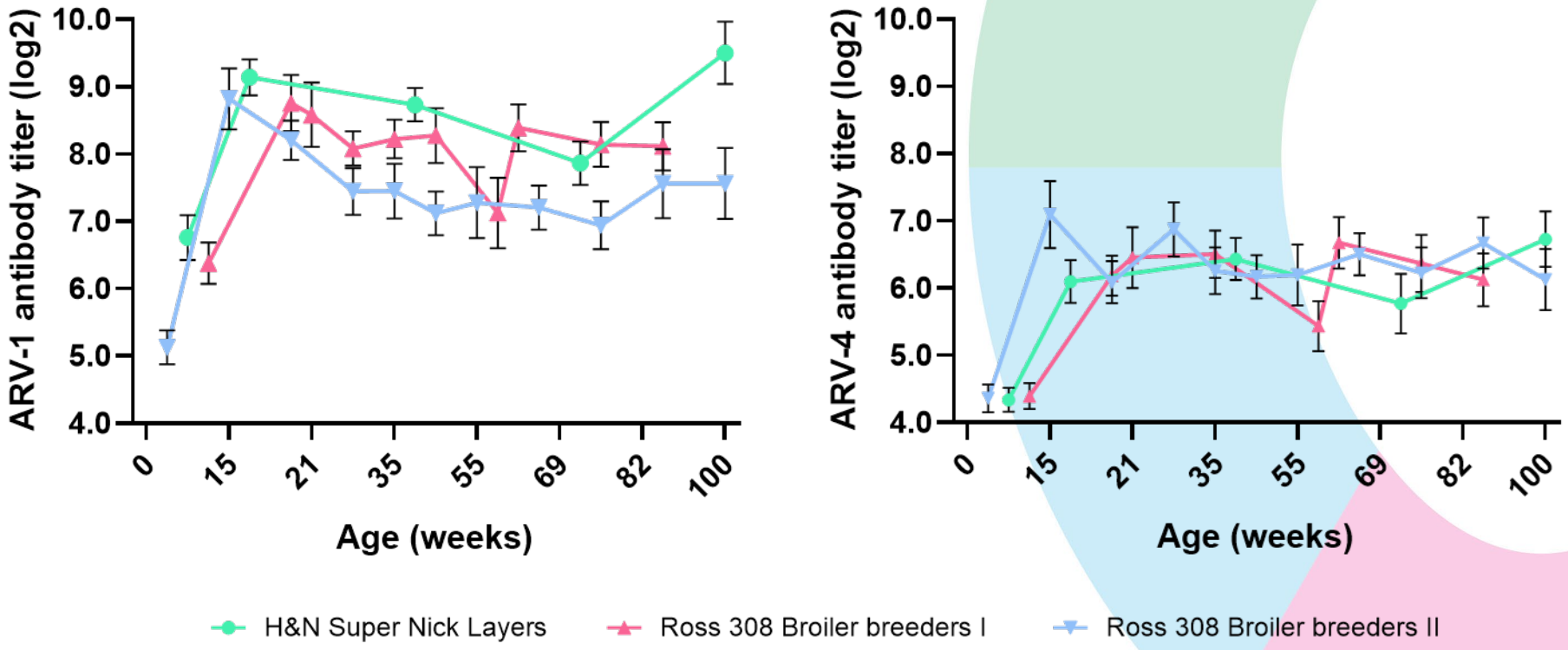
ARV-serology in parental field hens

Nine-valent inactivated vaccine induces strong and lasting ARV antibody responses (ARV1 and ARV4) under field conditions. This efficacy is consistent across both breeders and layers, regardless of genetic background.



Animals were ARV primed at approx. 8 woa (only Ross 308 groups) and boosted with inactivated vaccine at 12-15 woa (all groups).

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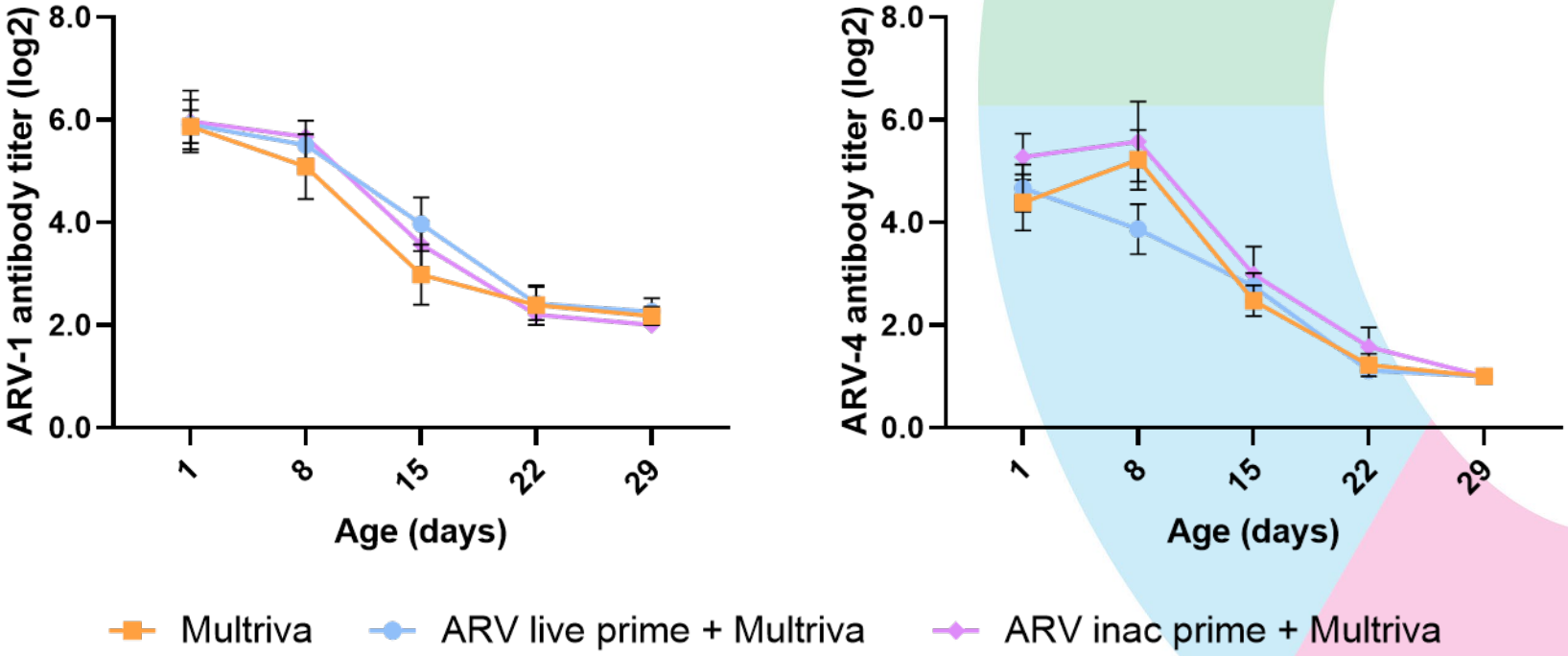
ARV-serology in progeny

Nine-valent inactivated vaccine induces strong ARV-specific antibodies in parental birds, which are efficiently transferred to progeny as maternally derived antibodies (MDAs). High protective MDA levels are especially evident during the first two weeks of life—when chicks are most susceptible to ARV infection.



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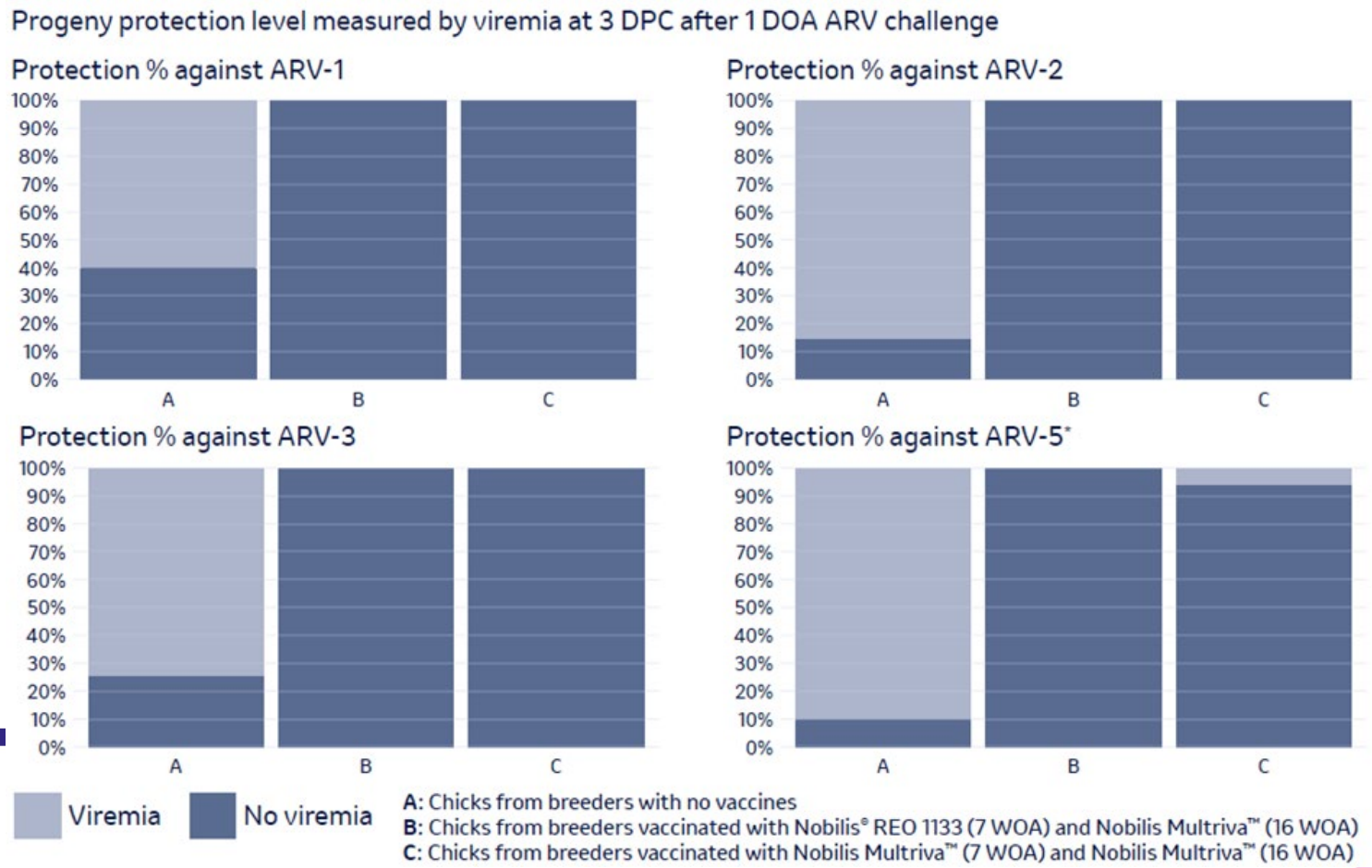
ARV efficacy parameter - viraemia

Nine-valent inactivated vaccine provides broad cross-protection against viremia across all major ARV genotypes in progeny of vaccinated hens, with both live- and inactivated-primed groups (B & C). Viremia levels in blood serve as a critical readout of vaccine efficacy, reflecting the ability to prevent systemic viral spread.



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ARV efficacy parameter – clinical signs

Nine-valent inactivated vaccine provides broad cross-protection against clinical signs in the progeny of vaccinated hens against all major ARV genotypes. Protection was measured by clinical signs (lameness or footpad swelling) after ARV challenges (ARV-2 and ARV-5 challenge significantly induced more severe lameness compared to other ARVs).

Breeder vaccine program	ARV-1 progeny protection against footpad swelling (challenge at 14 DOA)	ARV-2 progeny protection against lameness (challenge at 1 DOA)	ARV-5 progeny protection* against lameness (challenge at 1 DOA)
No vaccine	No	No	No
Nobilis® REO 1133 (7 WOA) Nobilis Multriva™ (16 WOA)	Yes	Yes	Yes
Nobilis Multriva™ (7 WOA) Nobilis Multriva™ (16 WOA)	Yes	N/T**	N/T**

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Conclusions

Nobilis Multriva REOm:

- protects against all major ARV genotypes in progeny.
- is an effective solution for broiler breeders and potentially for layers.
- supports global ARV control strategies through broad-spectrum efficacy.

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THANK YOU!

ANY QUESTIONS?

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