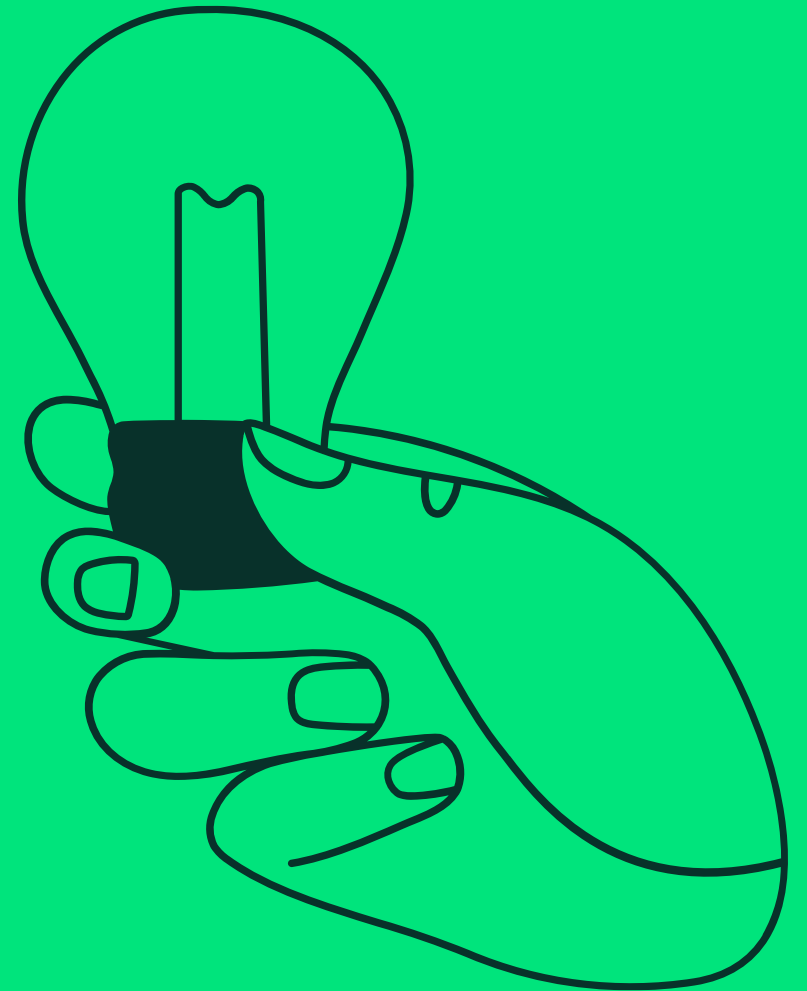




One Health Under Pressure: AMR, HPAI in Dairy Cattle, and the Future of FMD Vaccination

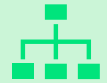
Dr. Mohamed Alnahrawy

Technical and Marketing Manager IMETA – Ruminants & VPH

Agenda



Integrating One Health: Why Vaccination Matters?



AMR: What direction are we heading?



HPAI in Dairy Cattle: A Rising Concern!



Gaps in Our Regional FMD Strategy: What Needs Attention?



Rinderpest Eradication:

A Vaccination Success Story

virus (ss-
th one
e and 3
lineages



The virus causes
acute, highly
contagious disease
of cattle, buffaloes
and variety wildlife
species



Lead to the
establishment of
the first vet
school in France
1762



In 1880, infected
cattle originating in
India introduced the
virus to the African
continent (Massawa
port, Eretria)



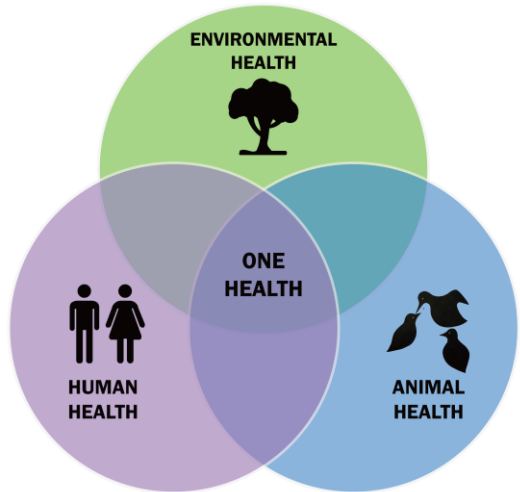
Death of 90% of
cattle in SSA
(including sheep
and goats)



Mass human starvation,
killing a third of human
population in Ethiopia,
and two-thirds of
Maasai people in
Tanzania



The drastic reduction in
grazing animals, thickets
formed in the Savannah
that served as breeding
ground for Tsetse flies, the
vector of the Human
African Sleeping Sickness
(HASS)



Certificate of Freedom of the City of London awarded to Jenner; 1803



***The world has successfully eradicated two diseases:
Smallpox was declared eradicated in 1980
Rinderpest was declared eradicated in 2011***



Opposition to vaccines has a long history!



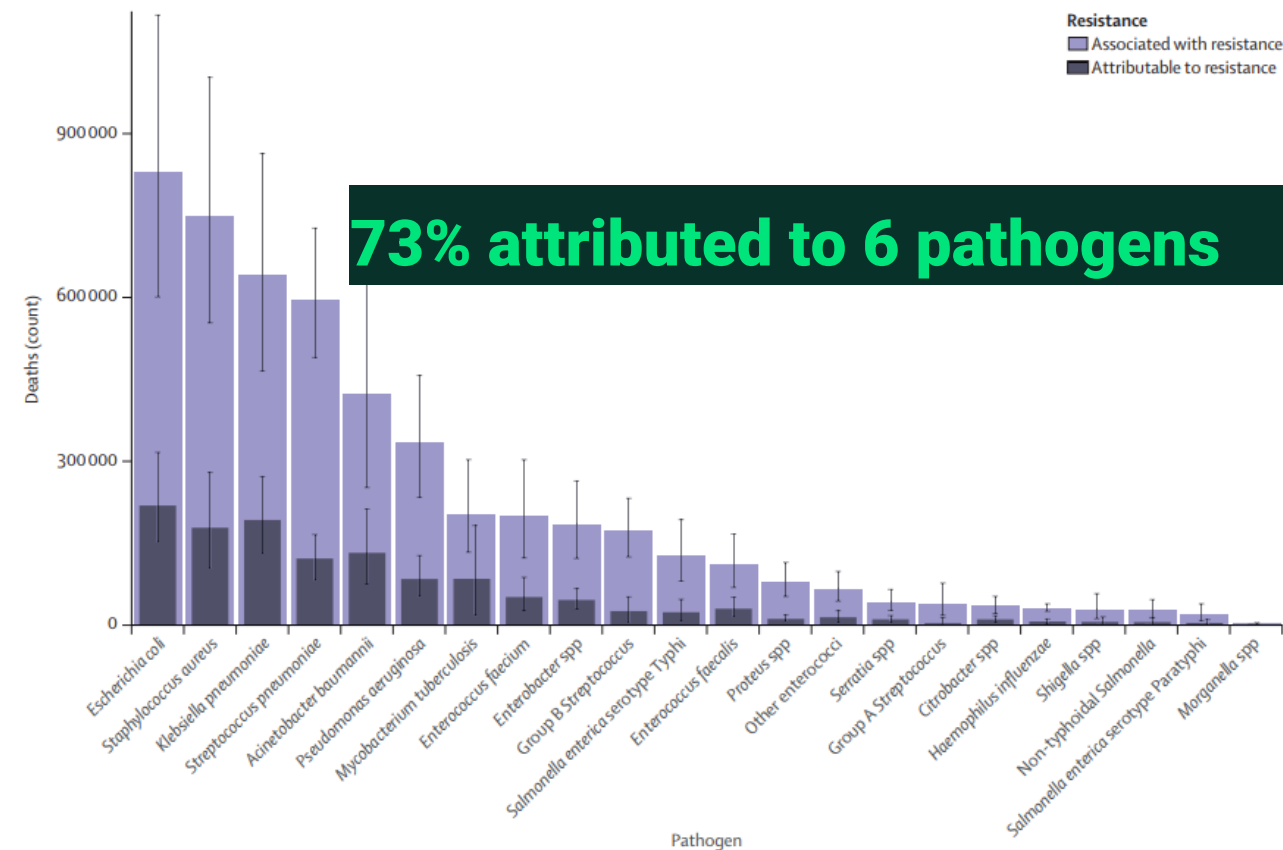
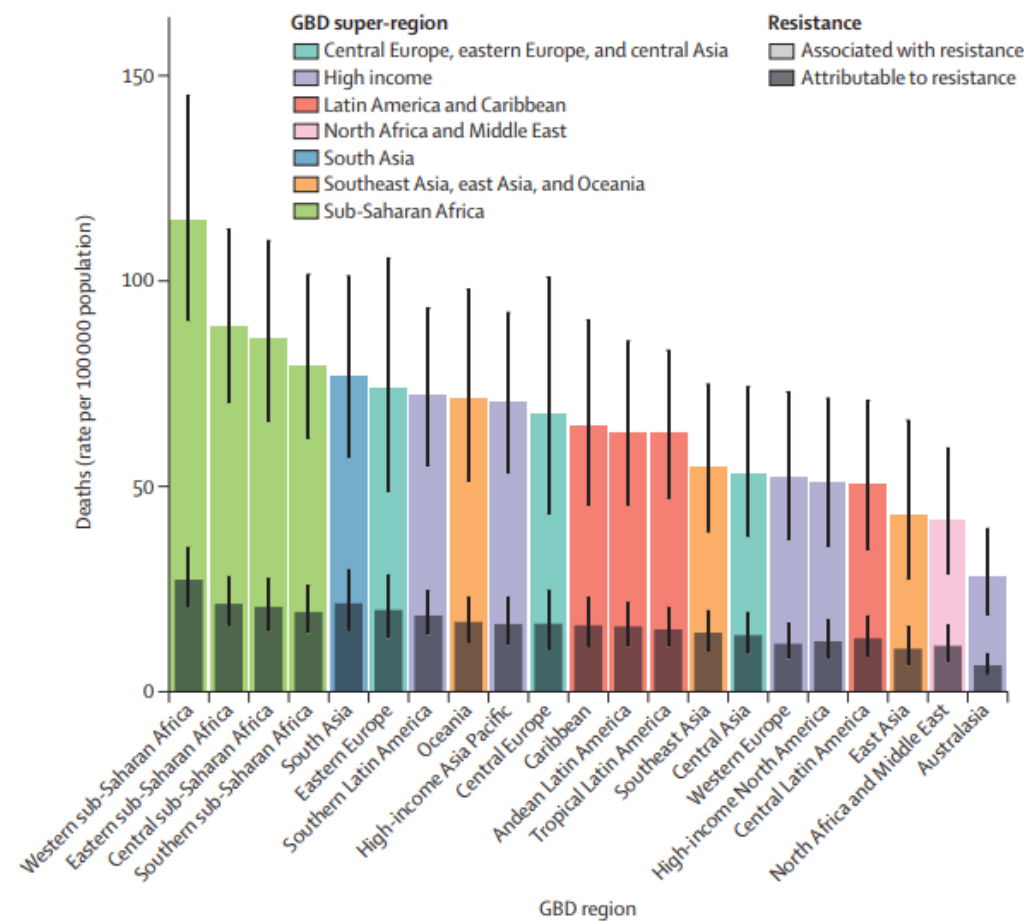
The English satirist John Gilray caricatured this vaccination scene in 1802!

AMR



Life forward

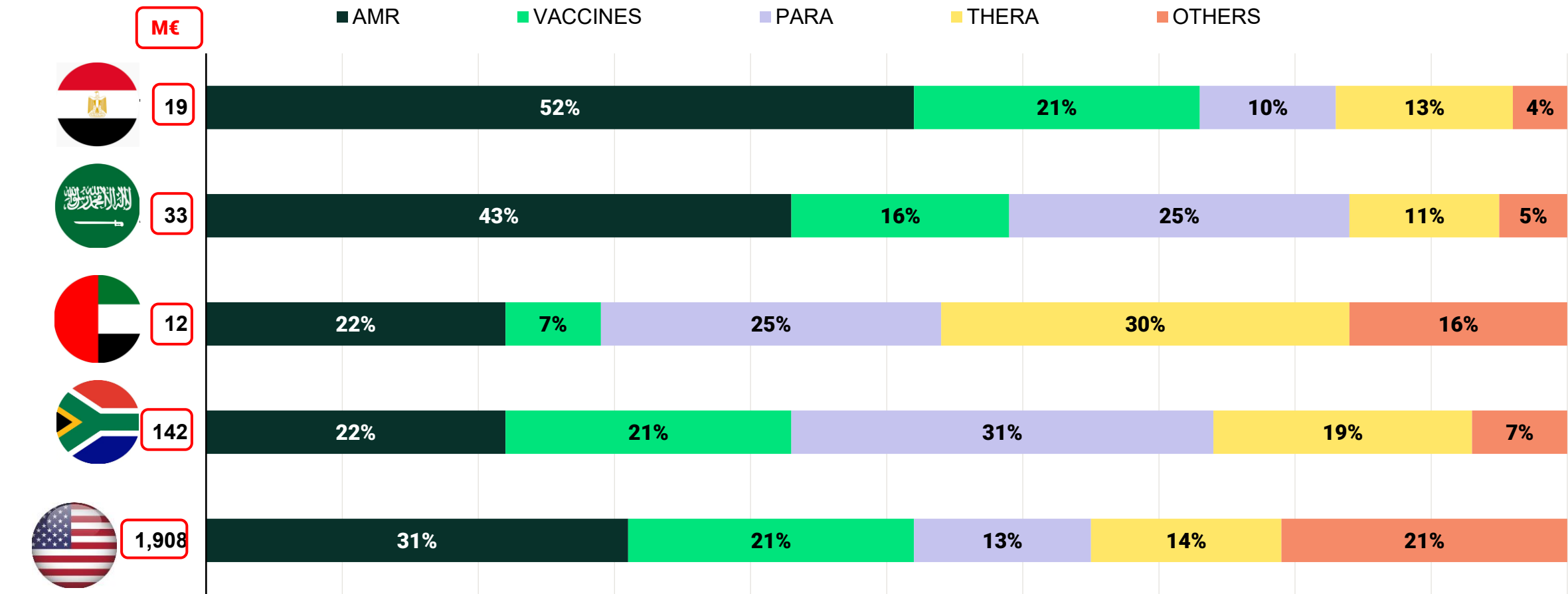
AMR: 4M human deaths linked to AMR, 20% of AM used in AH of highest priority and critical importance for human health



Murray CJL et al. The Lancet 2022, Vol. 399, Issue 10325. doi:10.1016/S0140-6736(21)02724-0

Total Market and Therapeutic Categories – Excluding FMD Vaccines

CEESA Q1 2025



https://bitableau-prod.eu.boehringer.com/#/site/AHGSMDataAnalyticsInsights/views/Ceesa_Ruminant/Ceesa_Ruminant_Overview?iid=1

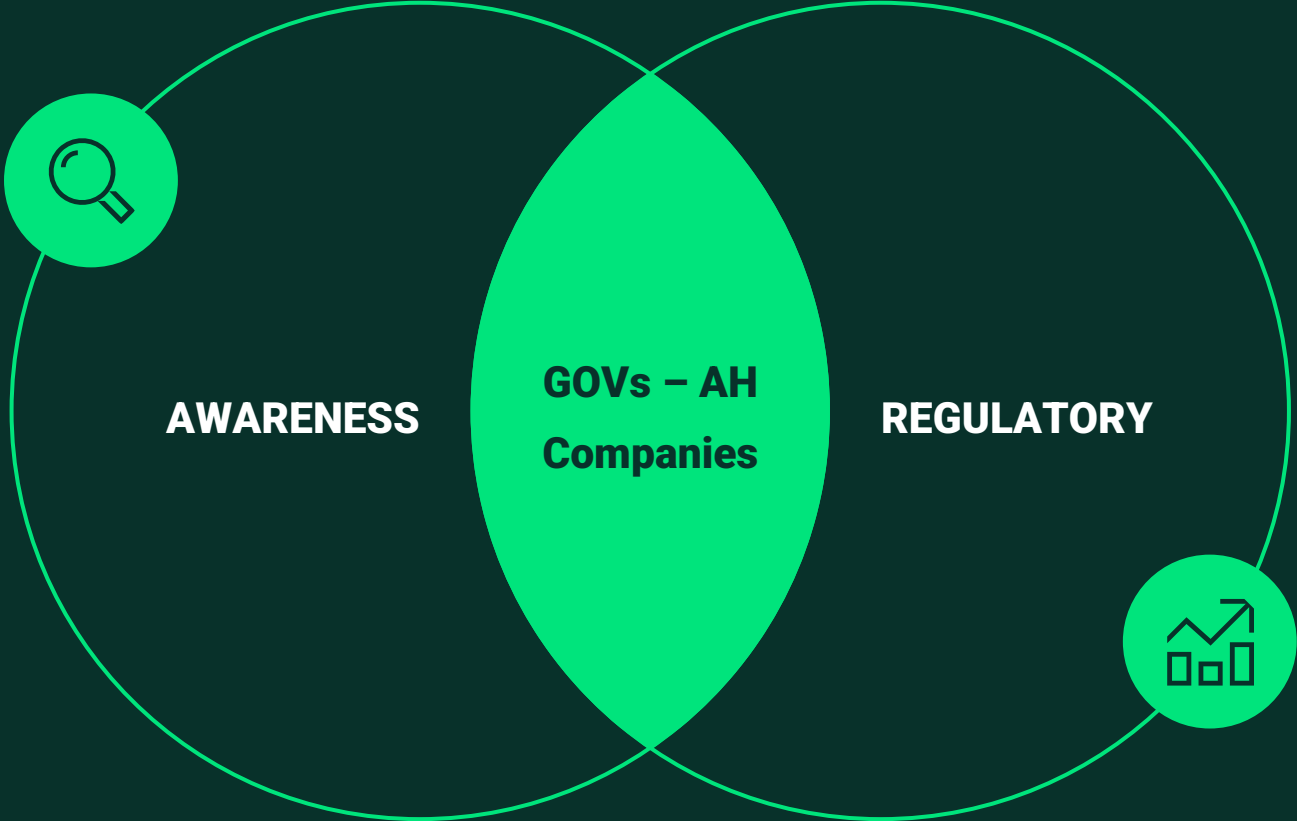


Mastitis Treatment



Pamela Ruegg • Following
David J. Ellis Chair of Antimicrobial Resistance and Large
Animal Clinical Sciences at Michigan State University Coll...
5d •

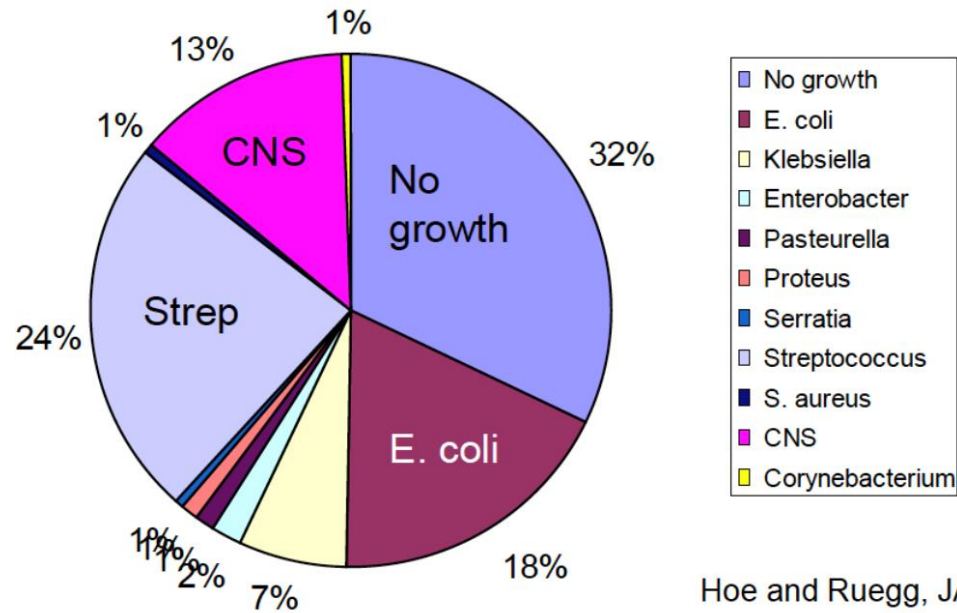
My grad students counting intramammary antibiotic doses
(used for several weeks) on a very large dairy farm..[Letícia Souza](#) ...



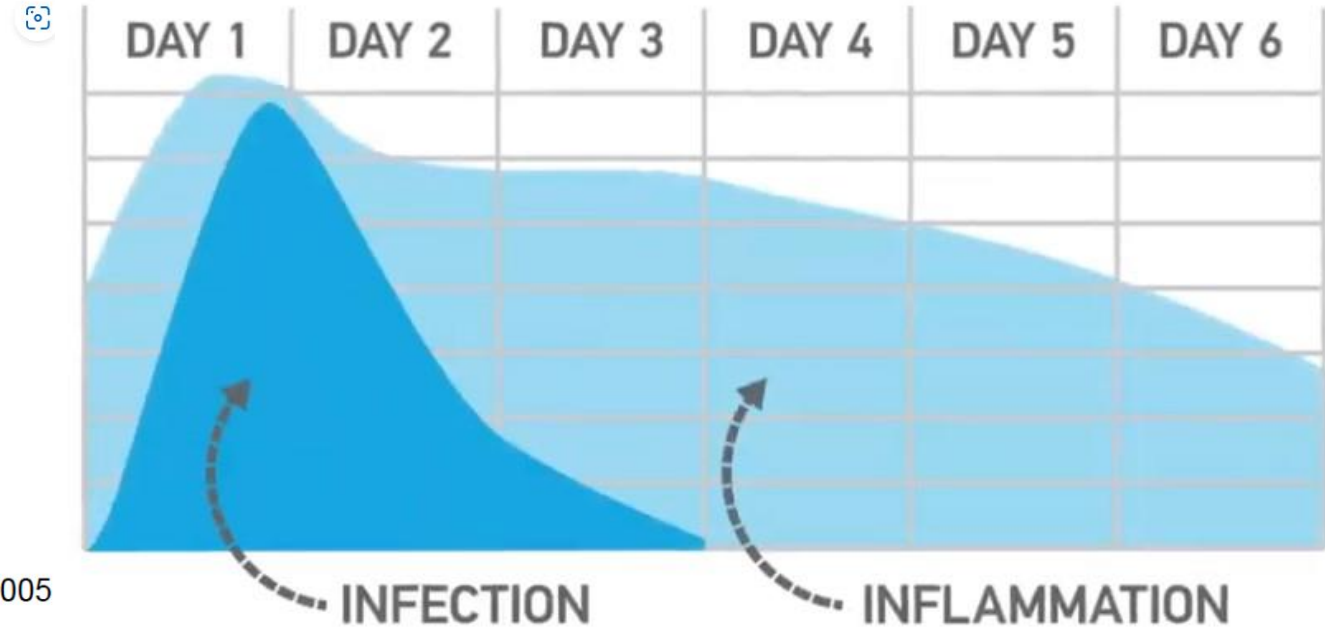
No Growth = No Treatment!

Gram Negative = No Treatment!

Selective Vs. Blanket Dry Cow Therapy!



Distribution of Mastitis Pathogens



Article

Spillover of highly pathogenic avian influenza H5N1 virus to dairy cattle

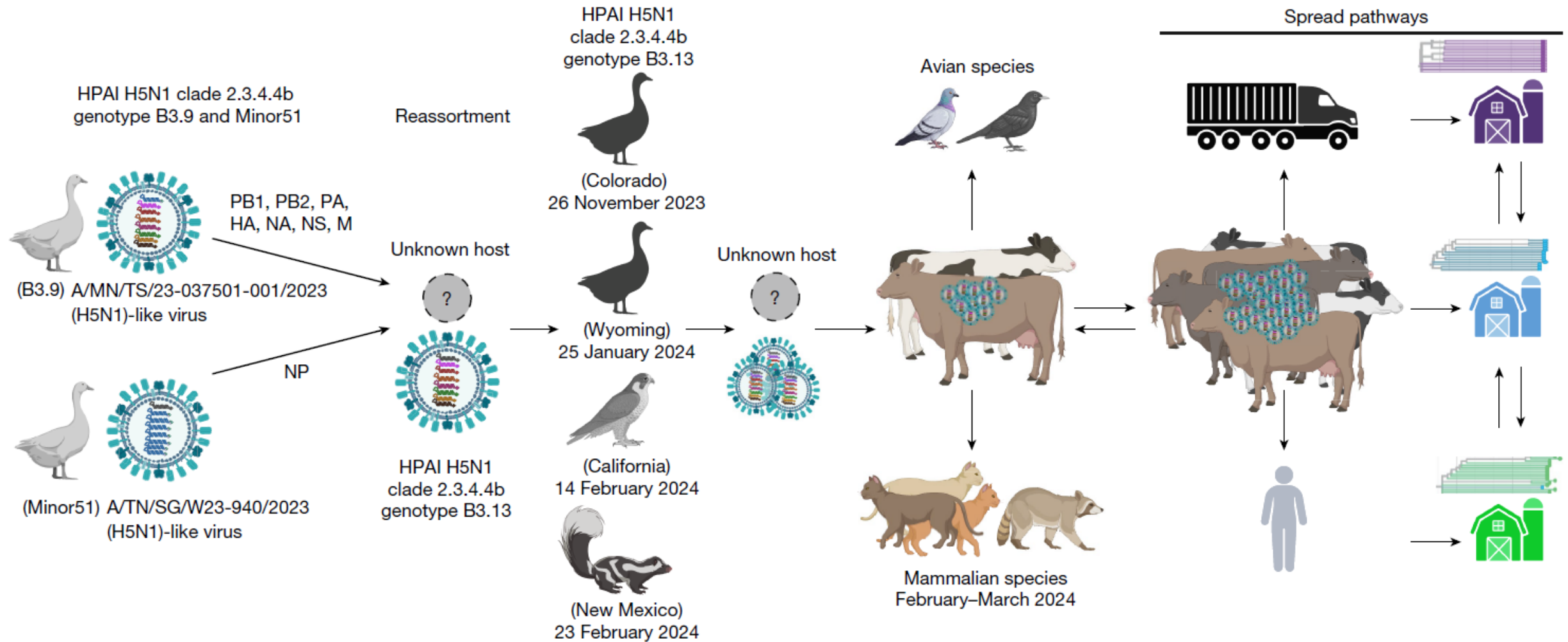
***Nature* volume 634, pages669–676 (2024)**

nature

Nature volume 634, pages669–676 (2024)

The highly pathogenic avian influenza (HPAI) H5N1 virus clade 2.3.4.4b has caused the death of millions of domestic birds and thousands of wild birds in the USA since January 2022 (refs. 1–4). Throughout this outbreak, spillovers to mammals have been frequently documented^{5–12}. Here we report spillover of the HPAI H5N1 virus to dairy cattle across several states in the USA. The affected cows displayed clinical signs encompassing decreased feed intake, altered faecal consistency, respiratory distress and decreased milk production with abnormal milk. Infectious virus and viral RNA were consistently detected in milk from affected cows. Viral distribution in tissues via immunohistochemistry and in situ hybridization revealed a distinct tropism of the virus for the epithelial cells lining the alveoli of the mammary gland in cows. Whole viral genome sequences recovered from dairy cows, birds, domestic cats and a raccoon from affected farms indicated multidirectional interspecies transmissions. Epidemiological and genomic data revealed efficient cow-to-cow transmission after apparently healthy cows from an affected farm were transported to a premise in a different state. These results demonstrate the transmission of the HPAI H5N1 clade 2.3.4.4b virus at a non-traditional interface, underscoring the ability of the virus to cross species barriers.

Model of spillover and spread of the HPAI H5N1 genotype B3.13 into dairy cattle

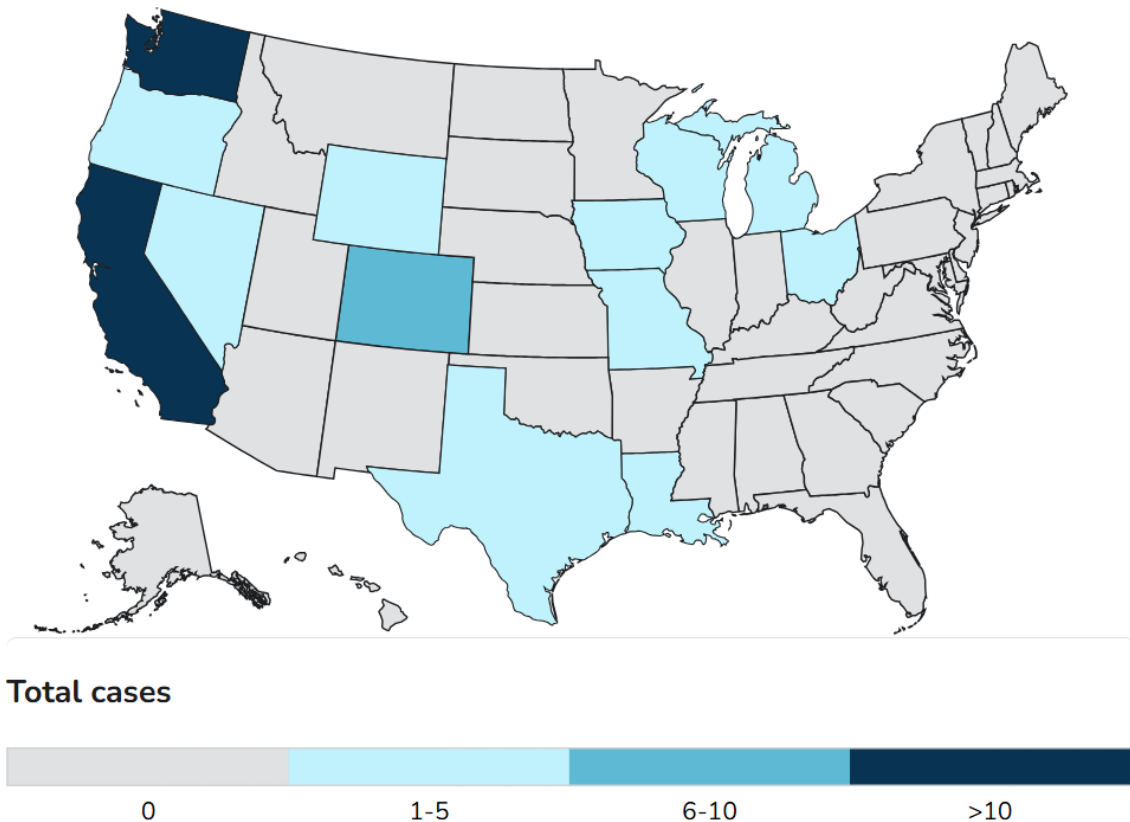


***Nature* volume 634, pages669–676 (2024)**

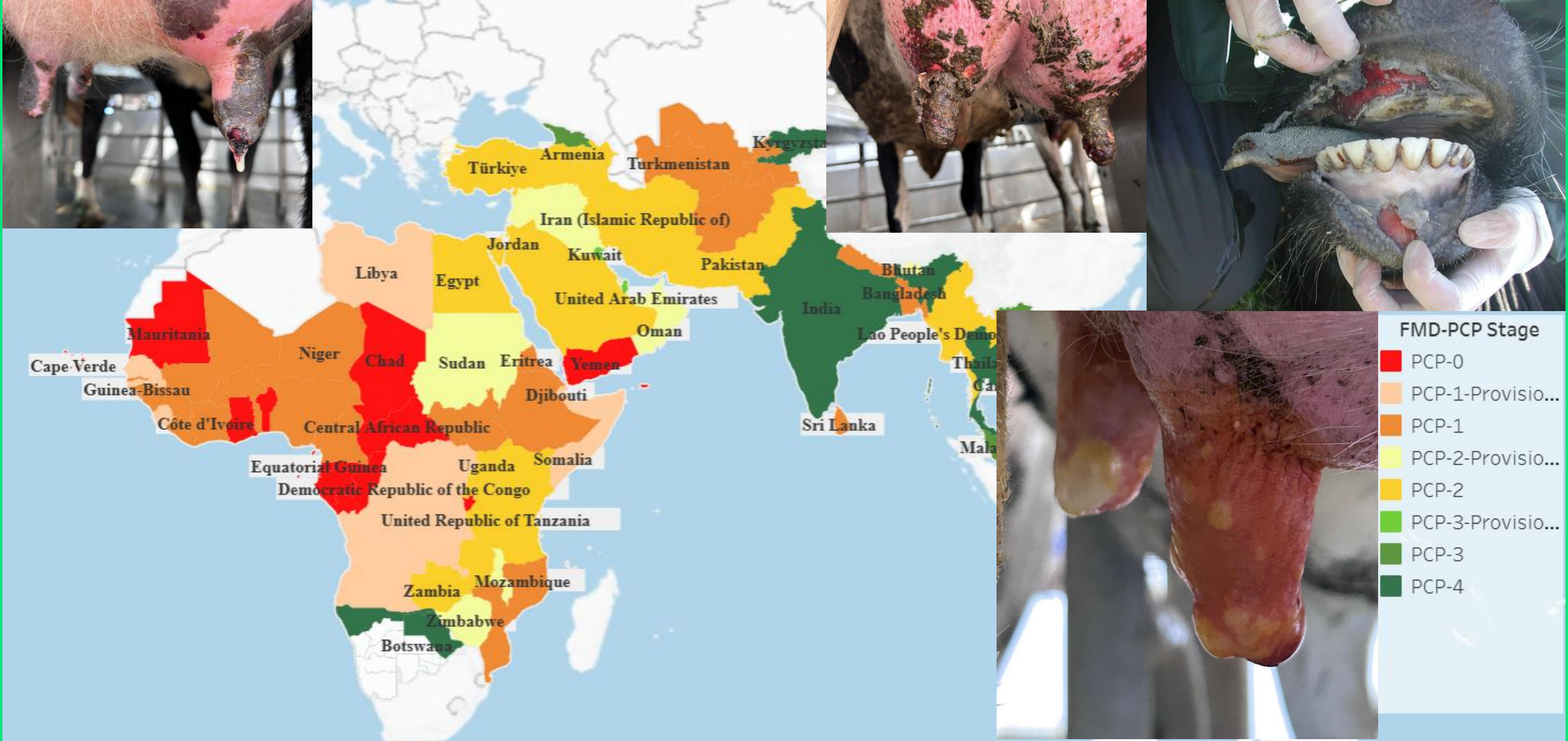
USA -- HPAI H5N1 in Cattle: 17 States -- 1,079 Confirmed Cases

National Total Cases: 70

Cases	Exposure Source
41	Dairy Herds (Cattle)*
24	Poultry Farms and Culling Operations*
2	Other Animal Exposure†
3	Exposure Source Unknown‡



<https://www.cdc.gov/bird-flu/situation-summary/index.html>



<https://tableau.apps.fao.org/views/PCP/PCPDASHBOARD?%3Aembed=y&%3AisGuestRedirectFromVizportal=y>

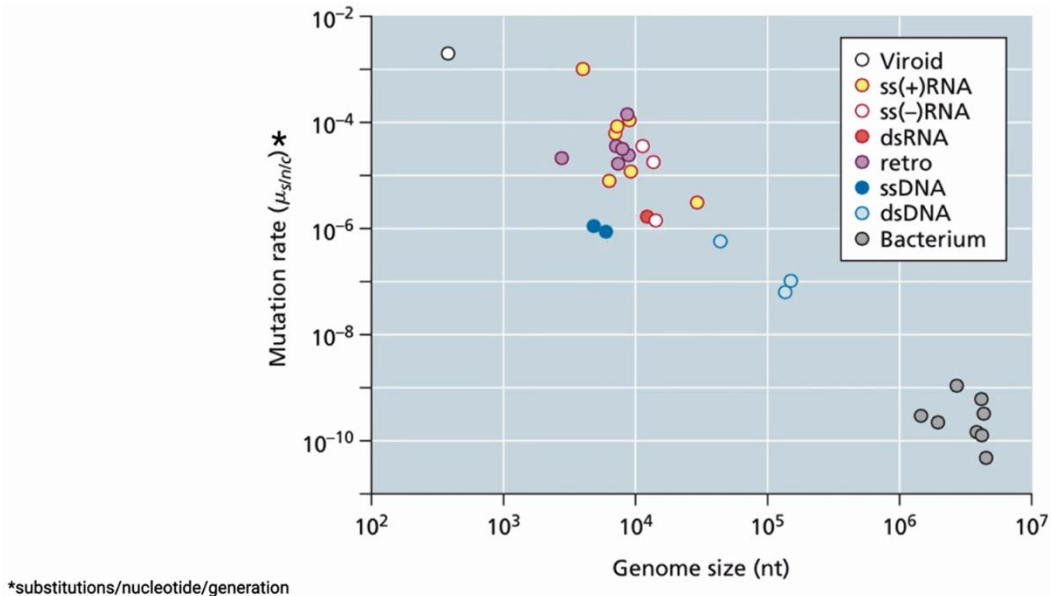
Gap_1: Vaccine Matching Test?

SEROTYPE /TOPOTYPE ABBREVIATION/Lineage^{SUB-LINEAGE}

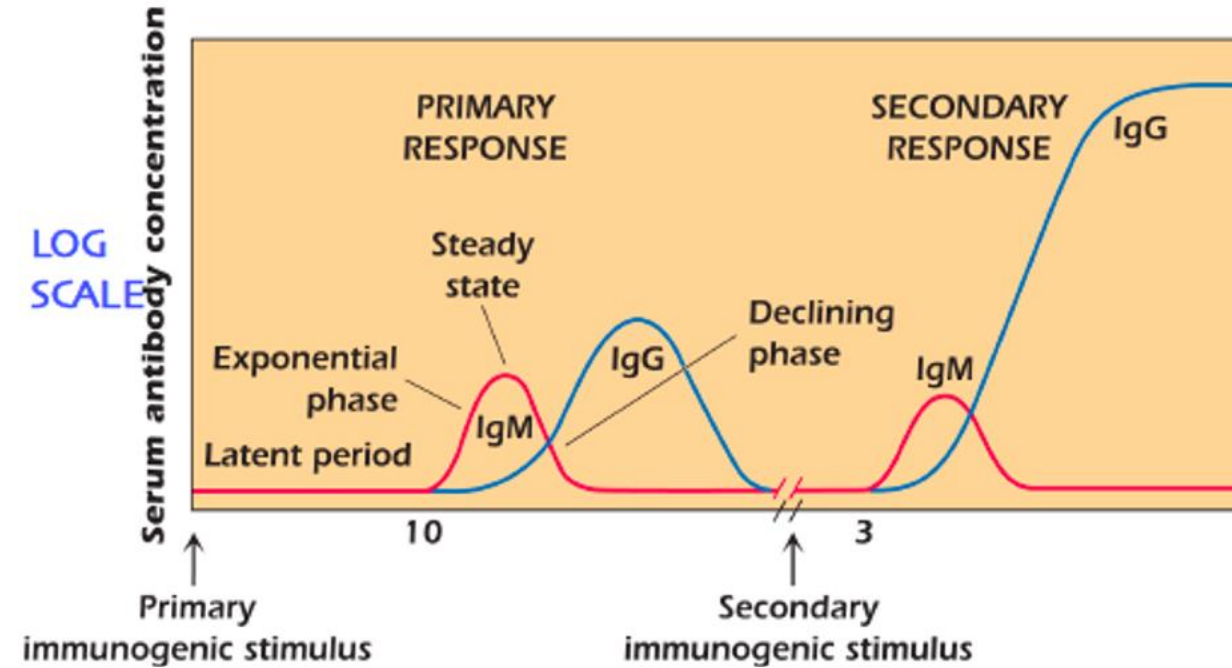
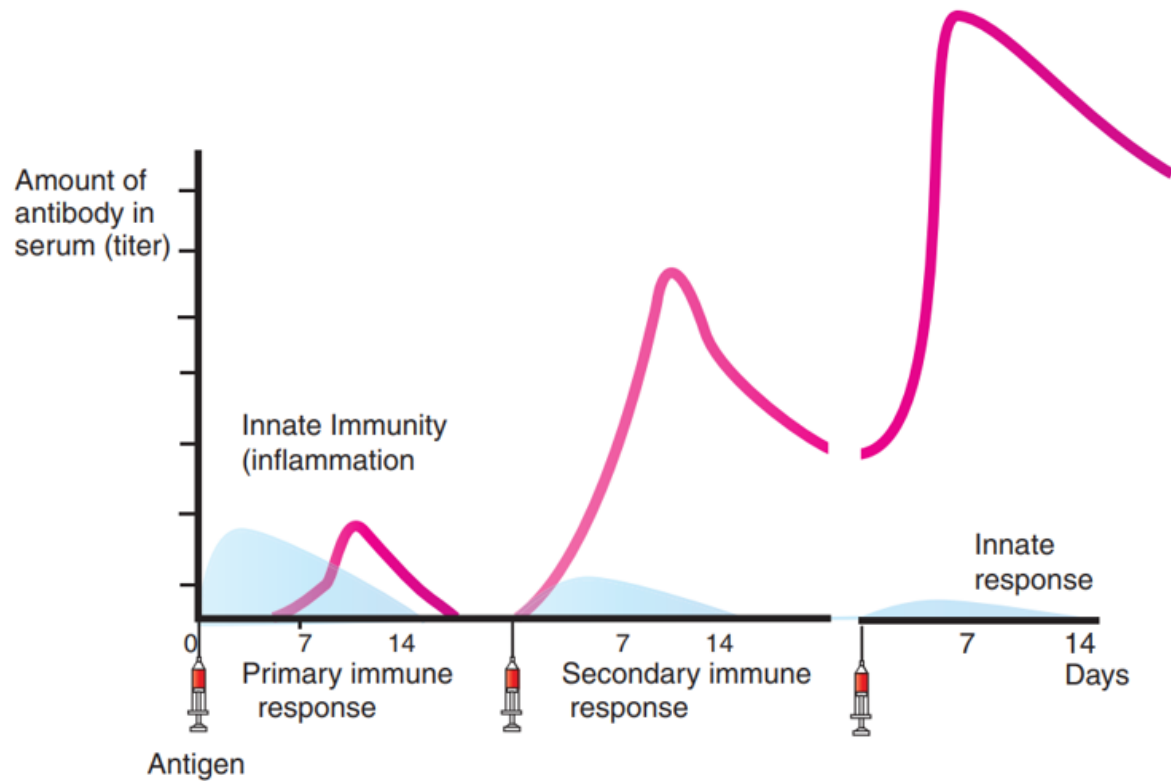
		O	A	C	SAT1	SAT2	SAT3	ASIA1
Topotype	52	11	4	4	13	14	5	1
Lineage	155	49	34	10	18	24	8	12

The Immuno-Dominant Strains!

WRL:
Vaccine Matching Test



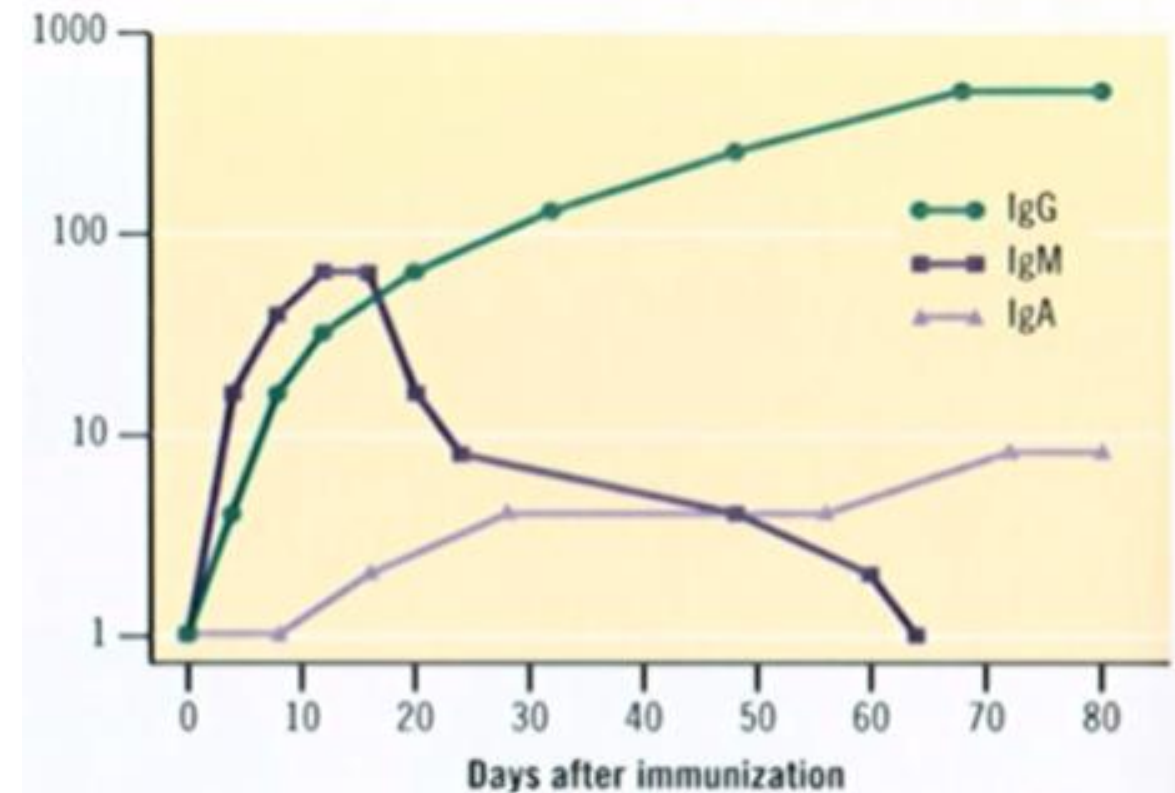
Gap_2: The Importance of the Booster Vaccination?



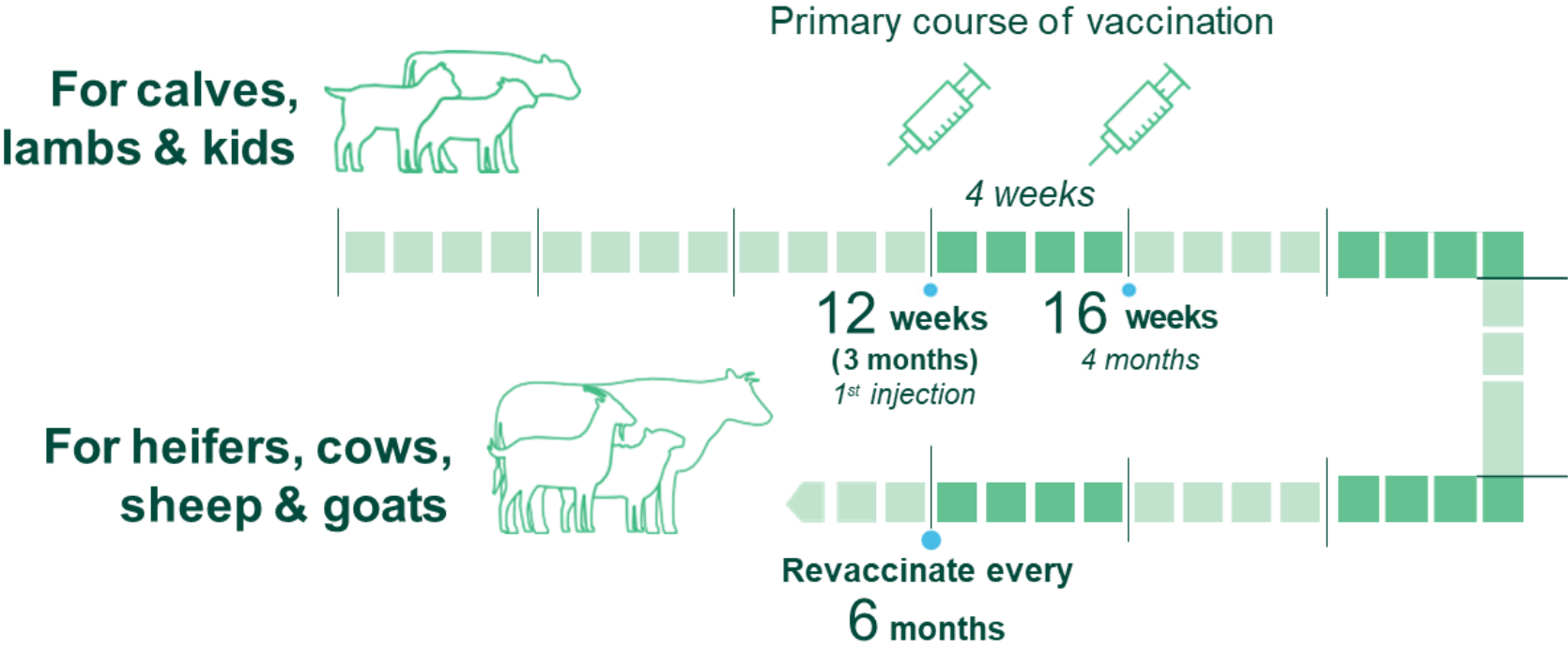
Gap_3: MDA Interference?

Immunoglobulin	Concentration (mg/dl)	
	Colostrum	Milk
 IgG (IgG1 and IgG2)	2,400–8,000	50–750
 IgM	300–1,300	10–20
 IgA	100–700	10–50

Adapted from Tizard, IR (2009). Introduction to Veterinary Immunology (8th Ed.). Ed. Elsevier. Madrid.

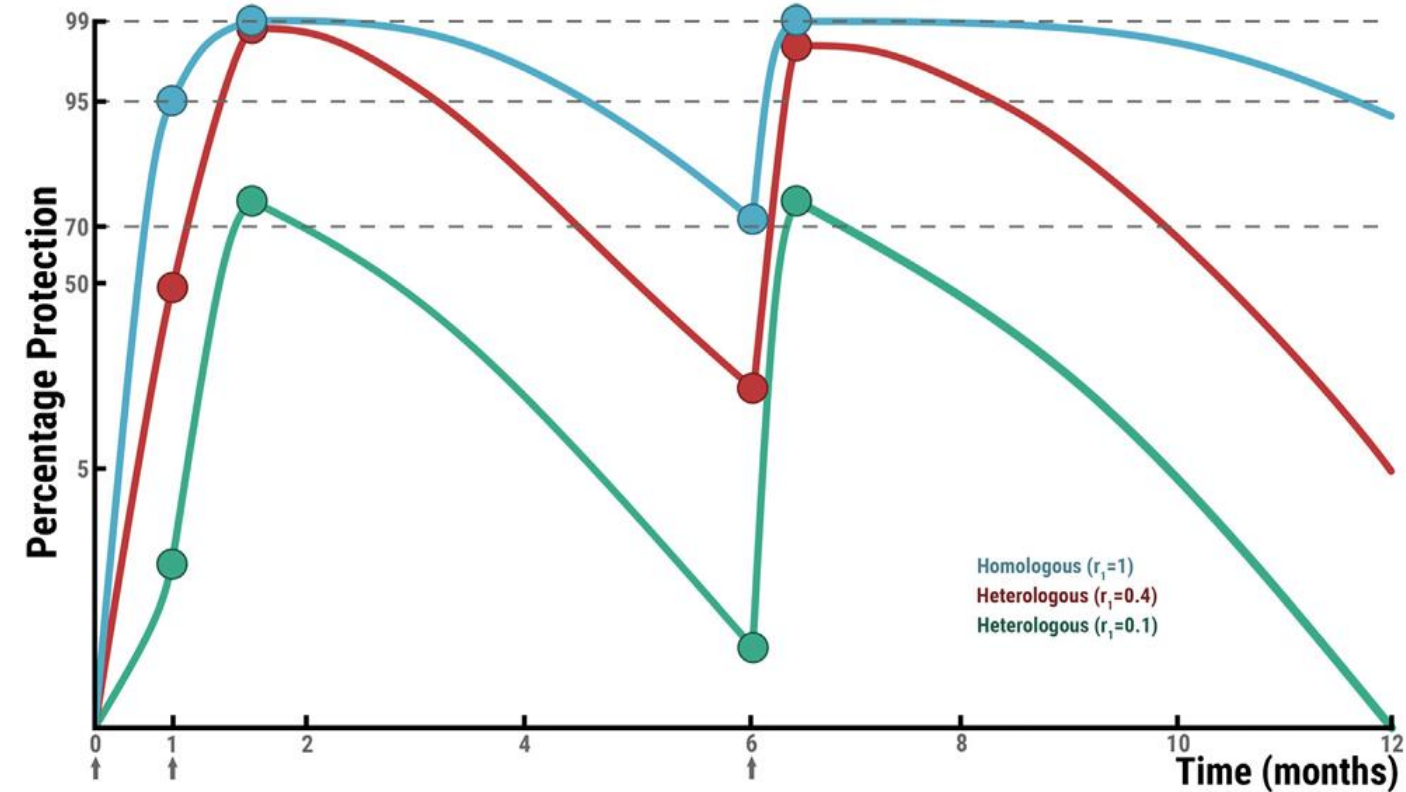
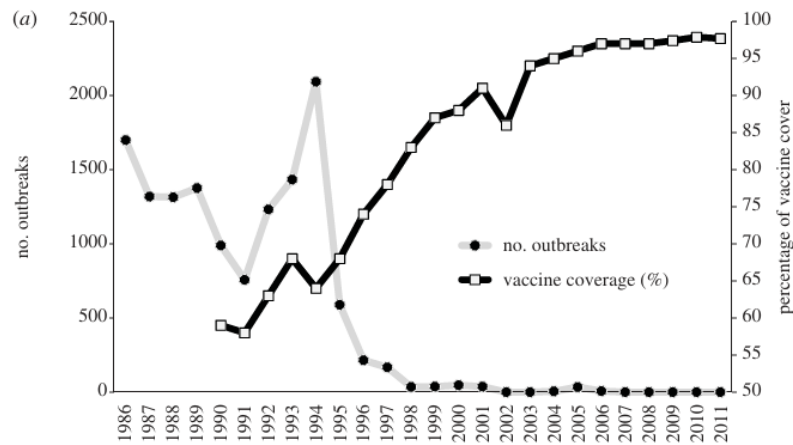
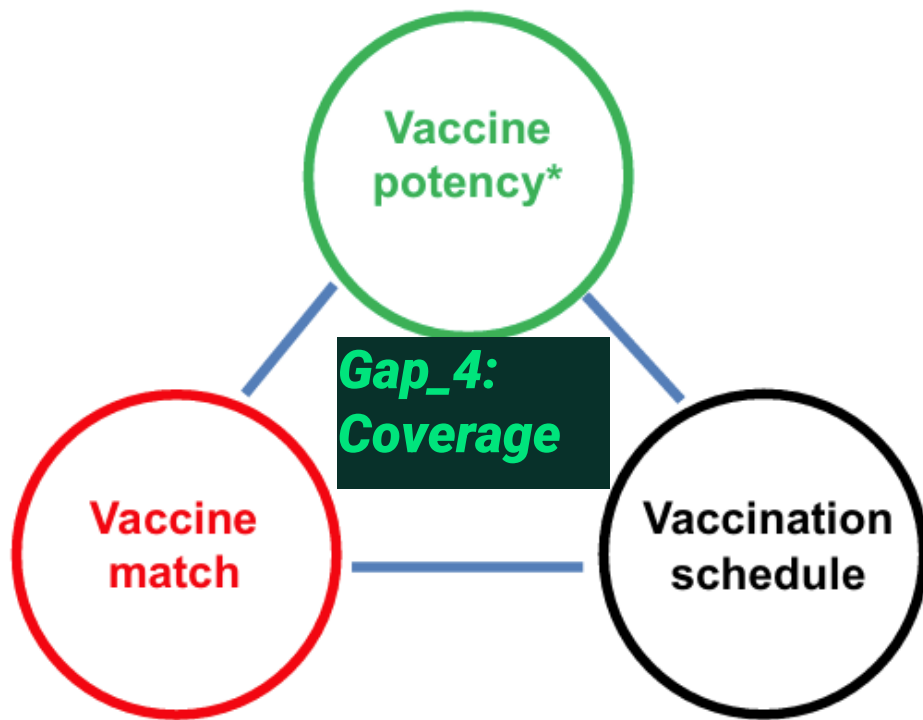


Standard Vaccination Protocol and Best Vaccination Practice



 Vaccinating too early and with only one shot can have an impact on the proper development of immunity.

Vaccination Coverage



Gap_5: Post-Vaccination Monitoring?

EVALUATION OF THE IMMUNE RESPONSE

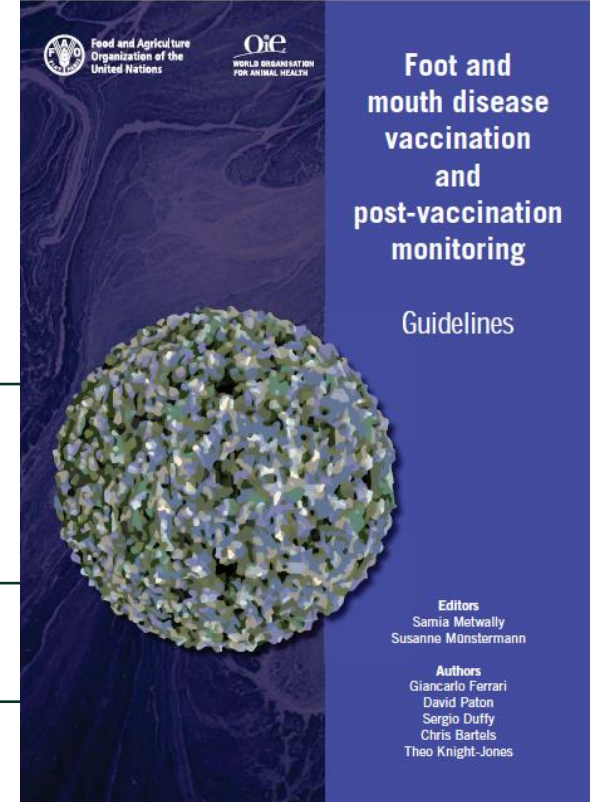
- OOI, DOI and MDA

VACCINE PROGRAMME, DELIVERY, SCHEDULE AND COVERAGE

- PVM to assess immunity at population level, individual level, and vaccination protocol

MONITORING THE IMPACT OF VACCINATION AND OTHER CONTROL MEASURES

- Strengthening Veterinary Services



4

TAKEAWAY

The One Health approach is not an option, but a necessity for sustainable disease prevention and global health security.

AMR is a silent pandemic threatening both human and animal health. Responsible AM use, awareness, and regulatory interference are critical to preserving treatment efficacy for future generations. Prevention through vaccination remain a corner stone to reduce AM use.

The emergence of HPAI in dairy cattle signals a shift in disease dynamics. Vigilance, rapid response, and cross-sector collaboration are essential to contain this evolving threat and protect food security.

FMD control requires harmonized regional strategies, good vaccination coverage with potent & tested vaccines, GVP and transparent data sharing. Bridging gaps in coordination with WRL, surveillance and PVMs are keys to achieving lasting control and eventual PCP progress.