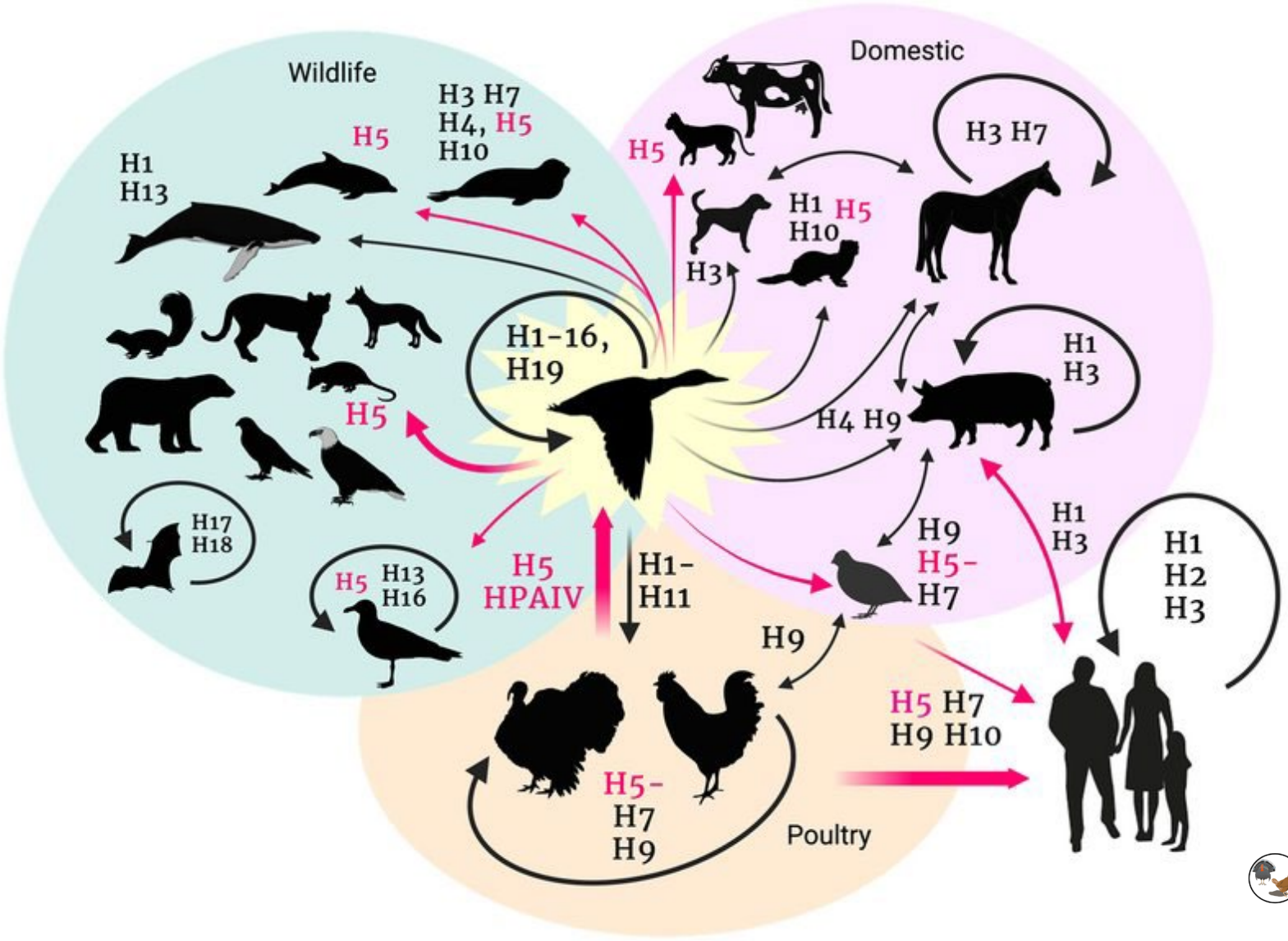
Erasmus MC
Universitair Medisch Centrum Rotterdam

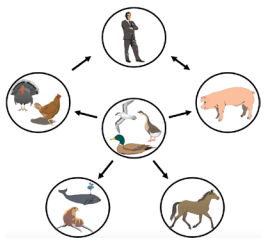
Viroscience lab
WHERE SKILLS MEET TO STUDY & PROTECT

HPAI surveillance in vaccinated poultry & public health gains

Ron A.M. Fouchier, PhD

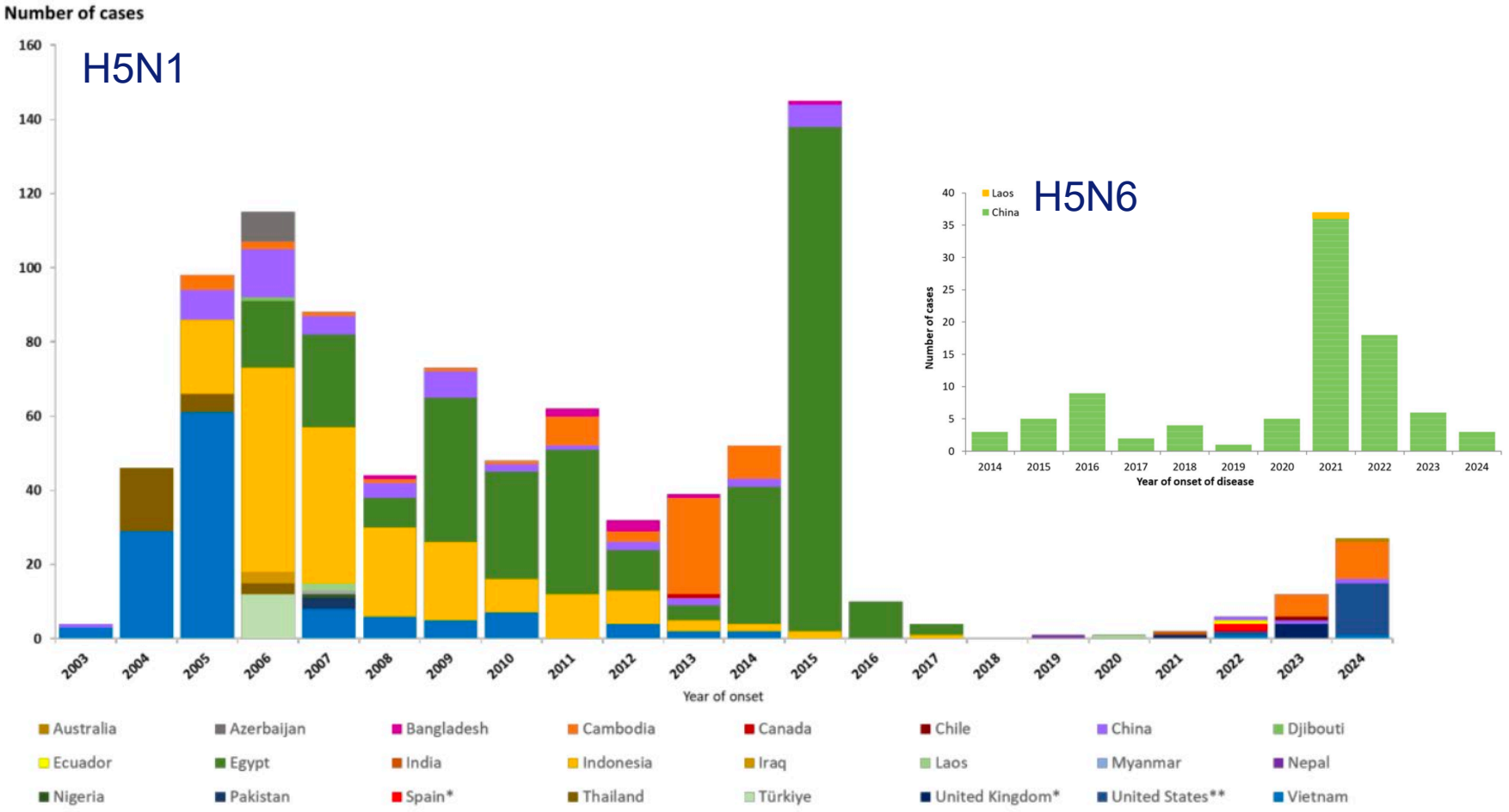
Host switching of (H5) influenza virus





Graziosi et al. Animals 14, 1372 2024

Human cases of A(H5) virus infection



EFSA Journal 2024;22(10):9057, 66 pp. https://doi.org/10.2903/j.efsa.2024.9057

Pros and cons of poultry vaccine use

- Vaccination of poultry may improve animal health and welfare and food security
- Prevention of human exposure to HPAI A(H5) may be an added indirect benefit
- But: poultry vaccines may not provide sterilizing immunity

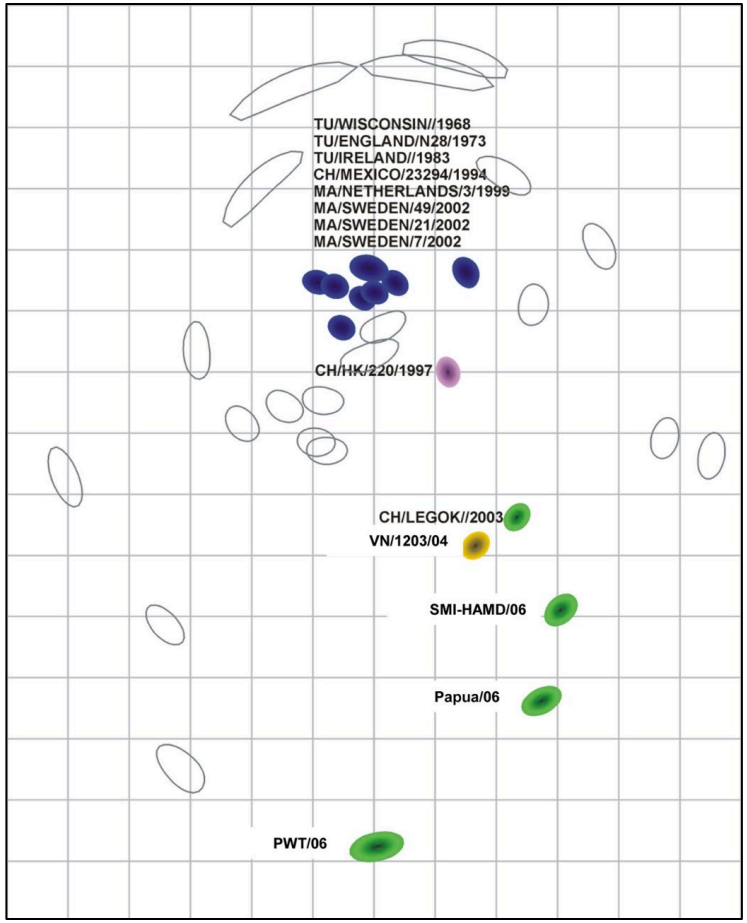
  chance of dormant infection, virus excretion, risk of zoonoses

  chance of onward spread to other (unvaccinated) animals
- And: vaccination can cause natural selection of antigenically drifted variants:

  possible reduced effectiveness of H5 vaccines in poultry

  possible increased need to update prepandemic H5 Candidate Vaccine Viruses

Antigenic drift & vaccines; escape



JVI Journals.ASM.org

Antibody Titer Has Positive Predictive Value for Vaccine Protection against Challenge with Natural Antigenic-Drift Variants of H5N1 High-Pathogenicity Avian Influenza Viruses from Indonesia

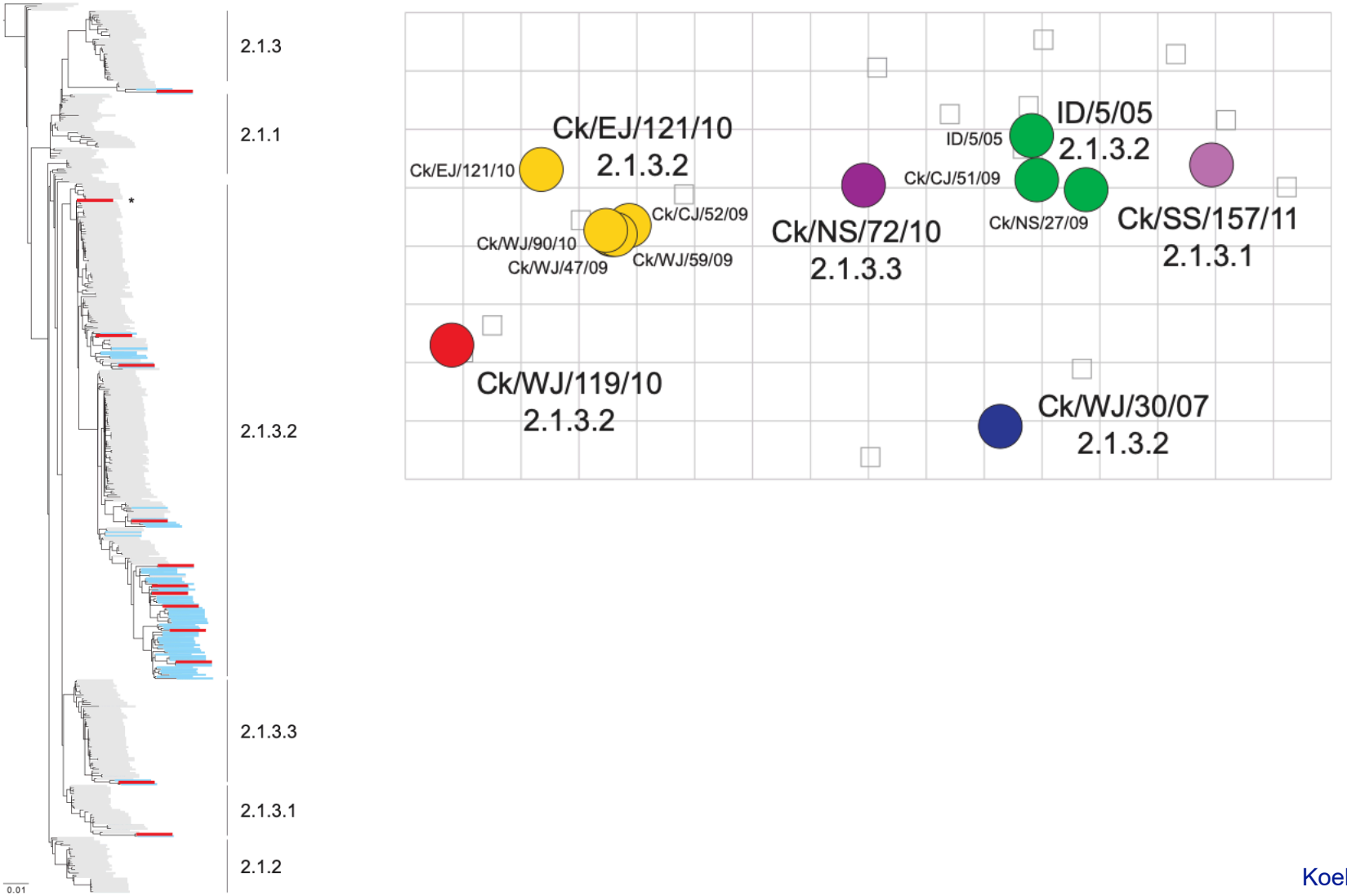
David E. Swayne,[a] David L. Suarez,[a] Erica Spackman,[a] Samadhan Jadhao,[a]* Gwenaelle Dauphin,[b] Mia Kim-Torchetti,[b]* James McGrane,[c] John Weaver,[c]* Peter Daniels,[d] Frank Wong,[d] Paul Selleck,[d] Agus Wiyono,[e] Risa Indriani,[e] Yuni Yupiana,[f]* Elly Sawitri Siregar,[g]* Teguh Prajitno,[h] Derek Smith,[i] Ron Fouchier[j]

TABLE 5 Detection of H5N1 HPAI virus shedding from oropharyngeal cavity at 2 DPC in chickens vaccinated with six different vaccine seed strains and challenged with one of three H5N1 HPAI viruses from Indonesia (Table view)

		SMI-HAMD/06		Papua/06		PWT/06	
Vaccine seed strain	Vaccine code	MDT[a]	Oral shedding at 2 DPC[b]	MDT	Oral Shedding at 2 DPC	MDT	Oral shedding at 2 DPC
Legok/03	K	2[c]	0/10^{A} (≤3.9^{A})		0/10^{A} (≤4.7^{A})	6.6^{AB}	1/10^{A} (5.68^{A})
VN/04	O		1/10^{A} (4.0^{A})	6.0[d]	0/10^{A} (≤4.7^{A})	5^{ABC}	2/10^{A} (4.5^{B})
rgGD/96	N		0/10^{A} (≤3.9^{A})	4.0[d]	0/10^{A} (≤4.7^{A})	3.1^{C}	ND[e]
Eng/73	B	3.4^{A}	1/10^{A} (4.0^{A})	5.8^{A}	3/10^{A} (5.1^{A})	4^{BC}	8/10^{BC} (6.13^{AC})
Mex/94	E		1/10^{A} (4.0^{A})		2/10^{A} (4.8^{A})	6.7^{AC}	0/10^{A} (<4.50^{B})
WI/68	F		0/10^{A} (≤3.9^{A})	5.0^{AB}	1/10^{A} (4.9^{A})	3.7^{C}	4/10^{AC} (5.40^{B})
Sham	U	2.0^{cA}	10/10^{B} (7.1^{B})	1.6^{cB}	10/10^{B} (7.1^{B})	1.7^{cD}	10/10^{B} (6.3^{C})

Swayne et al., JV 2015

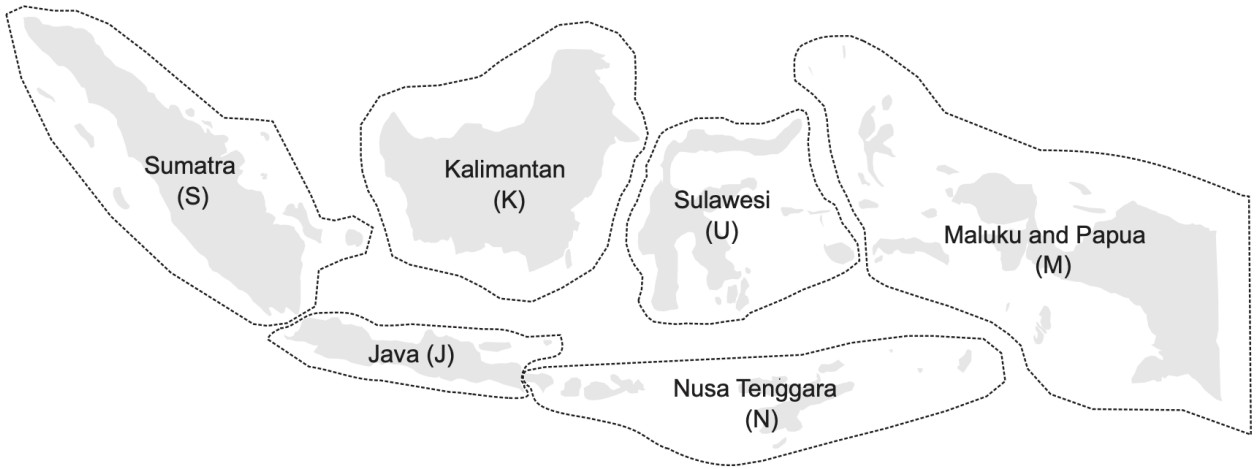
Vaccine-induced drift?



Koel et al., mBio 2014

Vaccine-induced or geo/temporal?

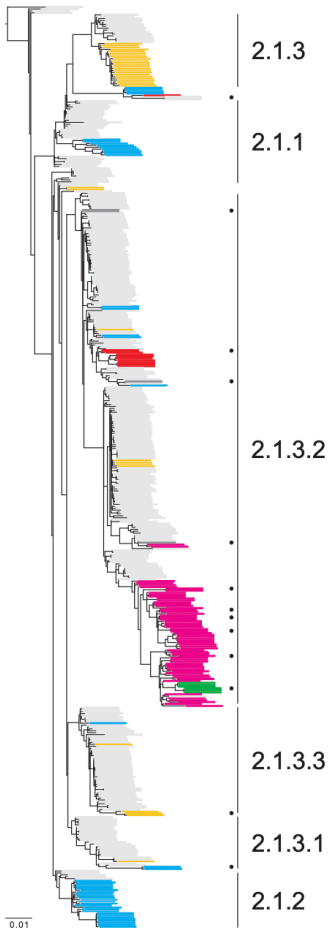
A



B

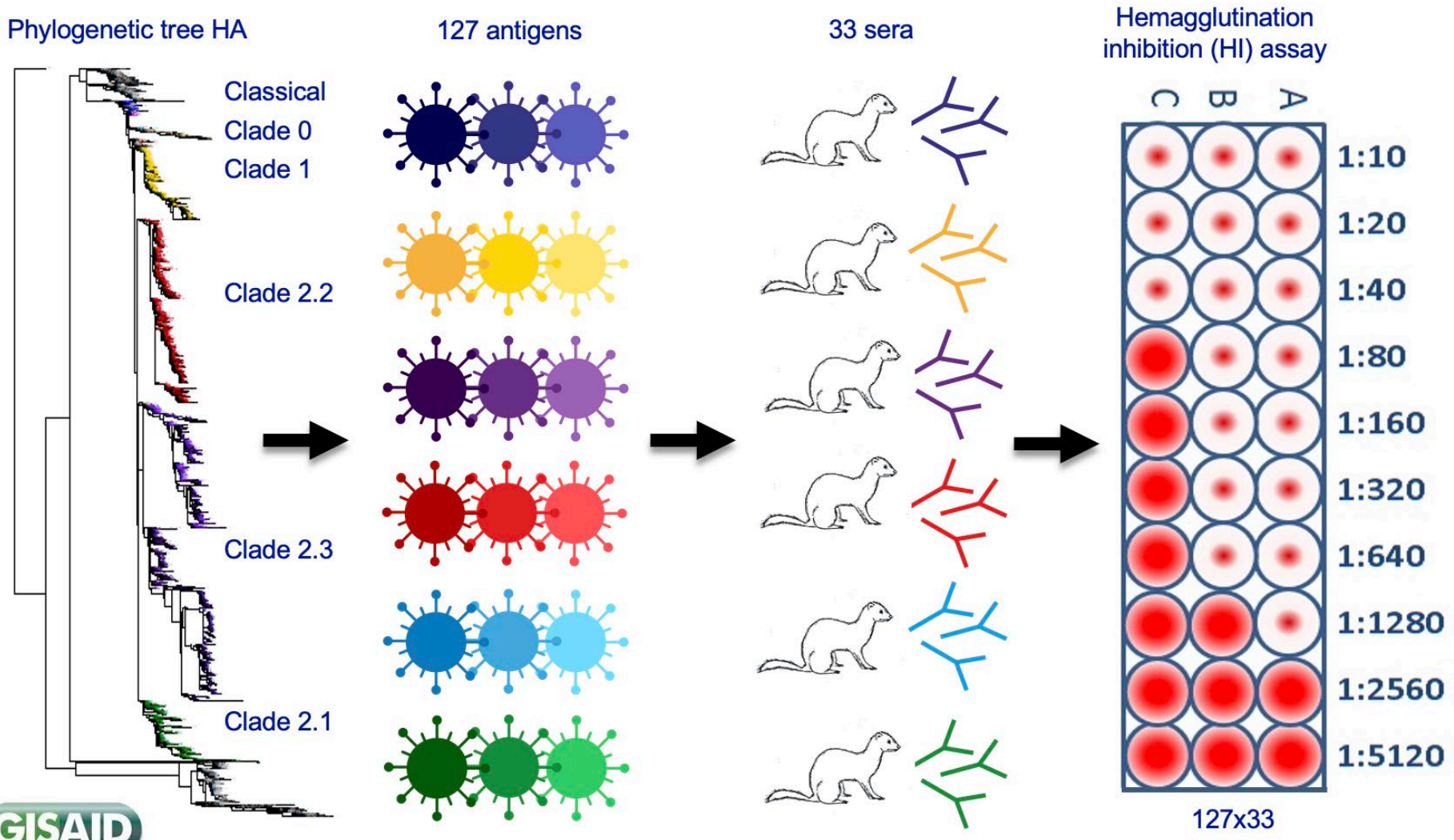
Antigenic Variant	Clade	2004	2005	2006	2007	2008	2009	2010	2011
		*	*	*	*	*	*	*	*
Ck/SS/157/11	2.1.3.1		S J N	S J	J N		K		U
Ck/WJ/119/10	2.1.3.2							J	
Ck/EJ/121/10	2.1.3.1					J	J	S J	S J U
Ck/NS/72/10	2.1.3.3	J		J K	S J N	U	S	U	
Ck/WJ/30/07	2.1.3.2			J	J	J	J		
ID/5/05	2.1.3.2		J				S J		

C



Koel et al., mBio 2014

Antigenic diversity of influenza A(H5)



Kok, et al, under review

Antigenic diversity of influenza A(H5)

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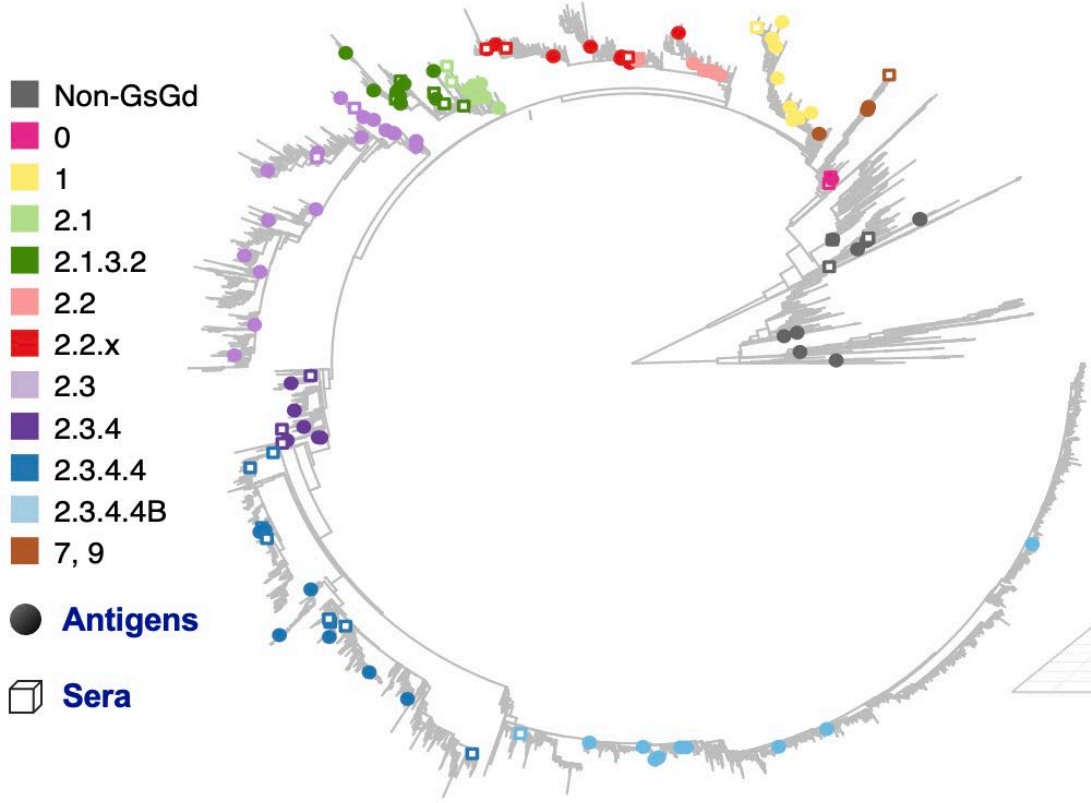

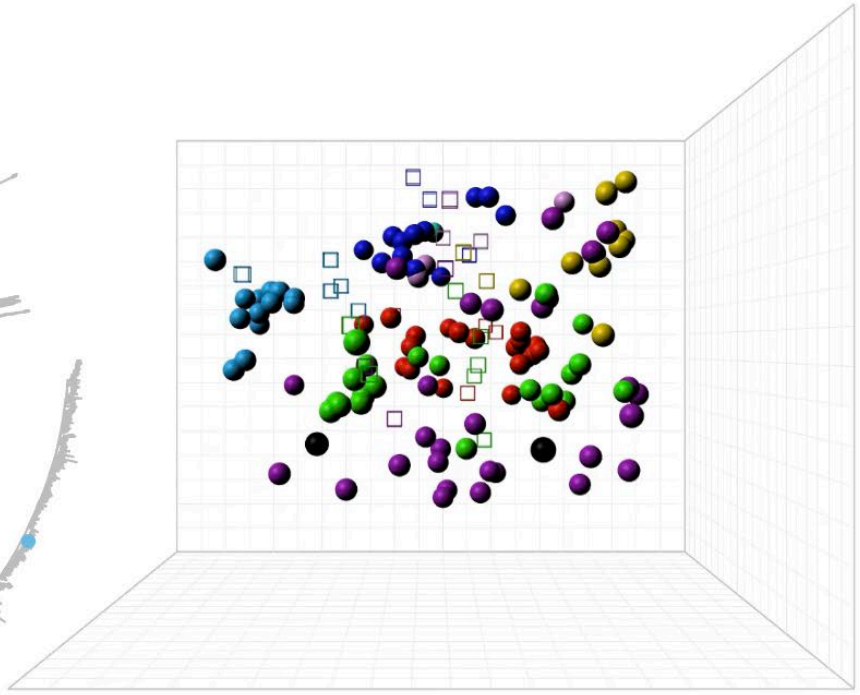

Mathilde Richard (PI) Adinda Kok (PhD student)

Kok, et al, under review

Antigenic diversity of influenza A(H5)

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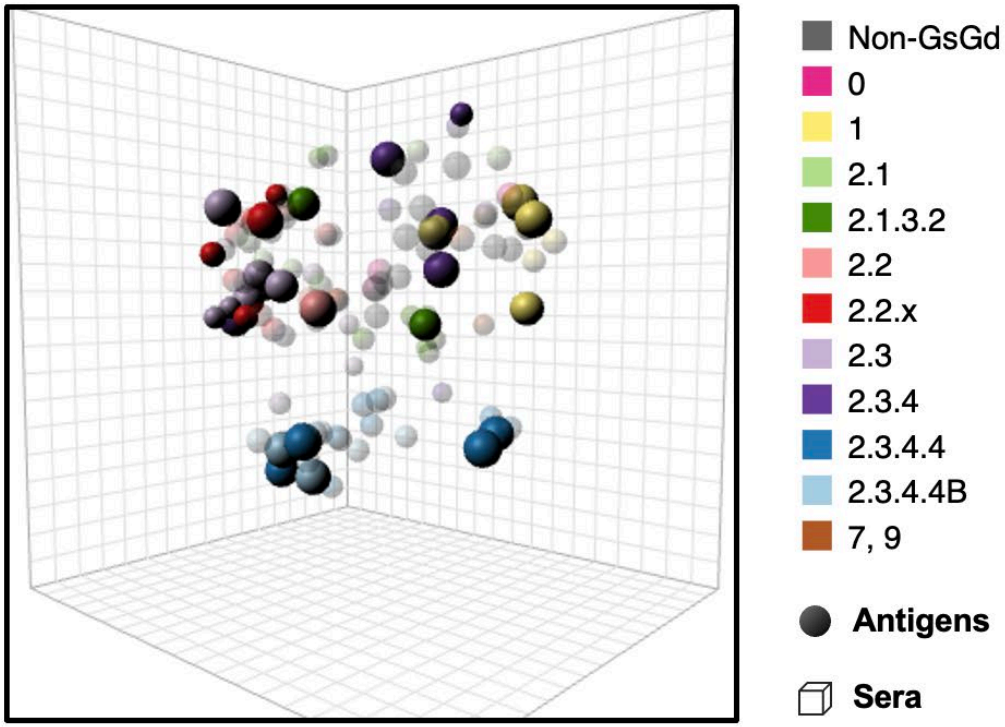
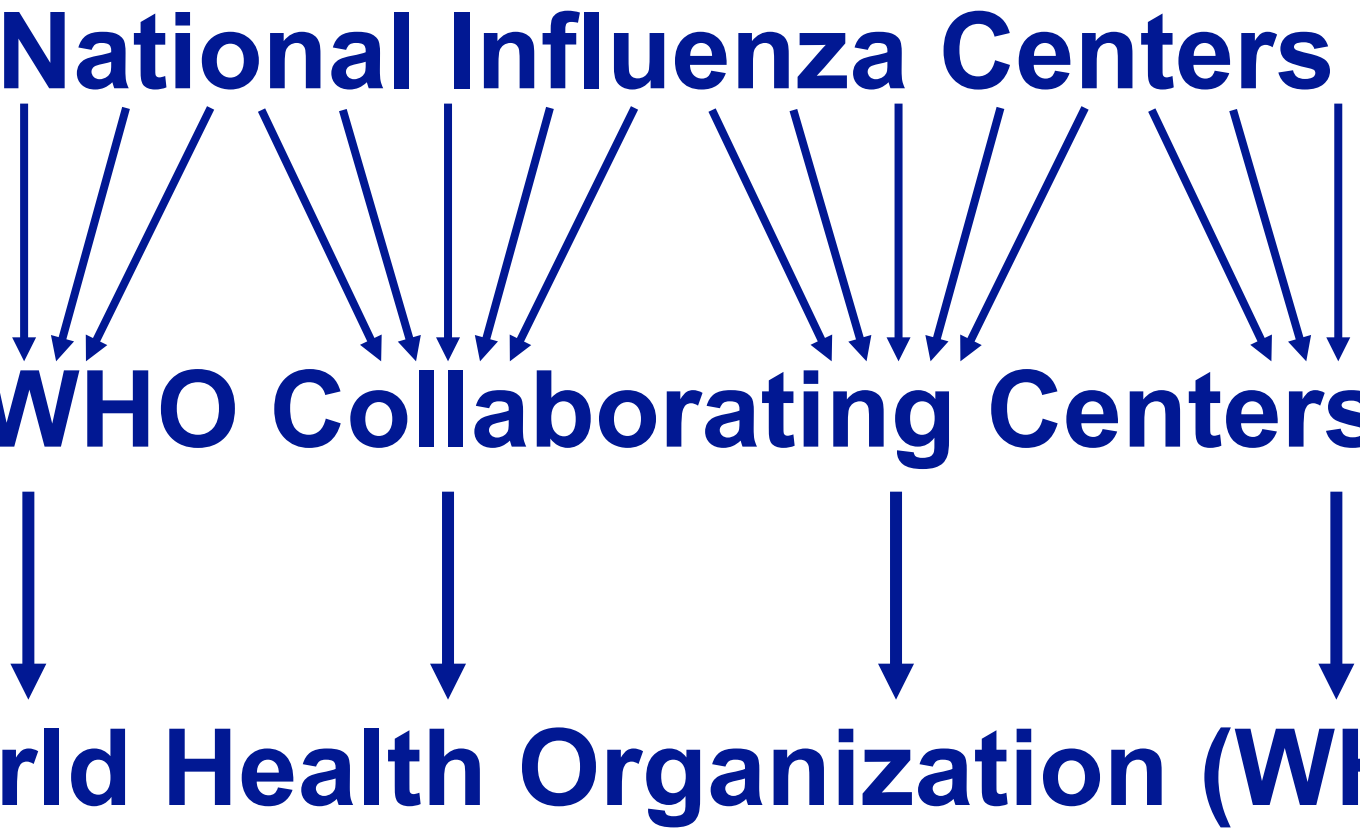
WHO candidates (N = 44)



Kok, et al, under review
https://cdn.who.int/media/docs/default-source/influenza/cvvs/

WHO GISRS

(Global influenza surveillance and response system)



Conclusions, discussion

- Vaccination of poultry may improve animal health and welfare and food security
- Prevention of human exposure to HPAI A(H5) may be an added indirect benefit
- But: poultry vaccines may not provide sterilizing immunity
  - chance of dormant infection, virus excretion, risk of zoonoses
  - chance of onward spread to other (unvaccinated) animals
- And: vaccination can cause natural selection of antigenically drifted variants:
  - possible reduced effectiveness of H5 vaccines in poultry
  - possible increased need to update prepandemic H5 Candidate Vaccine Viruses
- Post-vaccination monitoring:
  - Detection of dormant infections, monitor virus evolution and antigenic drift
  - Consider systematic random sampling on vaccinated farms
  - React to signs of dormant infection in vaccinated and other animals
  - Link post-vaccination surveillance to WHO GISRS system (update CVVs)