Instituto Nacional de Tecnología Agropecuaria
Centro de Investigación en Ciencias Veterinarias y Agronómicas
Instituto de Virología "Dr. Scholein Rivenson"

Swine Influenza in South and Central America

Ariel Pereda, DVM PhD
Institute of Virology - INTA

Swine Influenza
Technical Meeting
Rome, April 16th 2013

Last Technical Meeting (OIE, 2012)

Argentina Viruses isolated till 2011
huH3N1
H1N1pdm
δ H1N1 and H1N2 + pdm internal genes

Colombia (Universidad Nacional de Colombia)
Applied Techniques
Isolates: probably pdm H1N1, but need to sequence more isolates

Peru (SENASA)
Applied Techniques: AGID, commercial ELISA and rRT-PCR
2008-2009 They collected 1840 serum samples with 57 ELISA positives and only 6 from them were positive to AGID. No report of isolation or rRT-PCR results.

Training
Sanitary Services from Bolivia, Ecuador, Colombia and Peru have been trained in serological, virological and molecular techniques by a FAO grant (TCP/RLA/3207)

South and Central America
SIV Surveillance

Colombia

Samples were collected from the main pig producing areas of Colombia

2008 through 2010

Area	Participation	Number of farms
Antioquia	46,47%	33
Central	14,09%	10
West	39,44%	28
Total	100.00%	71

Serology

Estimated prevalence 50%

Reliability 95%

Maximum error 3%

Sampling size: 71

Colombian SIV field isolates

SIV ID	Aislamientos de campo del Virus de Influenza Porcina		
	Identificación	Región	Tipo
0102	A/swine/Colombia/0102/2009	Valle	pH1N1
0201	A/swine/Colombia/0201/2009	Antioquia	pH1N1
0301	A/swine/Colombia/0301/2009	Antioquia	pH1N1
0401	A/swine/Colombia/0401/**2008**	Antioquia	**cH1N1**
0502	A/swine/Colombia/0502/2009	Valle	pH1N1
0602	A/swine/Colombia/0602/2009	Valle	pH1N1
0701	A/swine/Colombia/0701/2009	Antioquia	pH1N1
0801	A/swine/Colombia/0801/**2008**	Antioquia	**cH1N1**
0901	A/swine/Colombia/0901/**2008**	Antioquia	**cH1N1**
1002	A/swine/Colombia/1002/2009	Valle	pH1N1
1101	A/swine/Colombia/1101/2009	Antioquia	pH1N1
1203	A/swine/Colombia/1203/2010	Central	pH1N1
1303	A/swine/Colombia/1303/2010	Central	pH1N1
1403	A/swine/Colombia/1403/2010	Central	pH1N1
1503	A/swine/Colombia/1503/2010	Central	pH1N1

Chile

- In 2009 a number of swine production sites experienced an abrupt increase animals coughing in the maternity and raising units.
- This correlated with an increase in respiratory disease and greater weight loss of the animals, ultimately affecting productivity during that year.
- A serological survey of 13 production sites revealed an overall seropositivity of 48% to H1N1 strains and 22% to H3N2 strains.
- H1N1 positive animals were detected in all the study sites, and 11 sites had H3N2 positive animals.
- Positive animals were found in basically all the production sites and units (e.g. maternity, reproduction, raising units, etc.) demonstrating widespread infection.

- H1N1 and H3N2 SIV have continued to circulate in the last 3 years, thus producers have began vaccinating sows (during the gestation and maternity period).

- Vaccination has lead to decreased coughing and clinical symptoms, an overall weight gain of the animals (less underweight swine), a substantial decrease of the cost of treatment of respiratory illnesses and reduced mortality.

- As a result Chilean producers are highly aware of the need to establish the tools to detect, isolate and characterize the viruses circulating in their swine.

- There are at least three SIV serotypes circulating in Chile:
    - Classical swH1N1
    - pdm H1N1
    - swH3N2

Guatemala

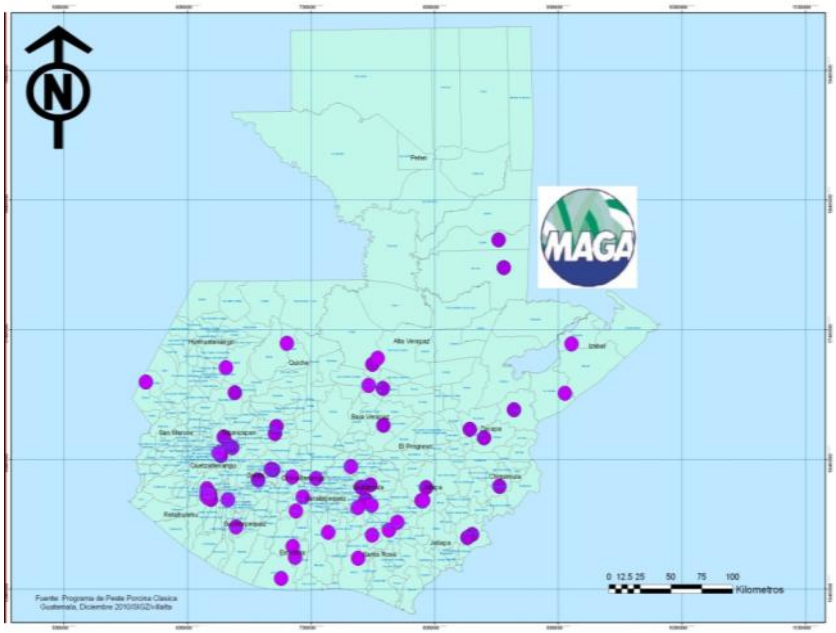
Nation-wide cross-sectional survey
multi-stage random sampling:
2010 – October (n=500) (MAGA, FAO)
2011 – June to August (n=499) (MAGA)

•Case definition: Farms or backyard pigs (pig productions units) where ≥ 10% of the exposed population have respiratory clinical signs

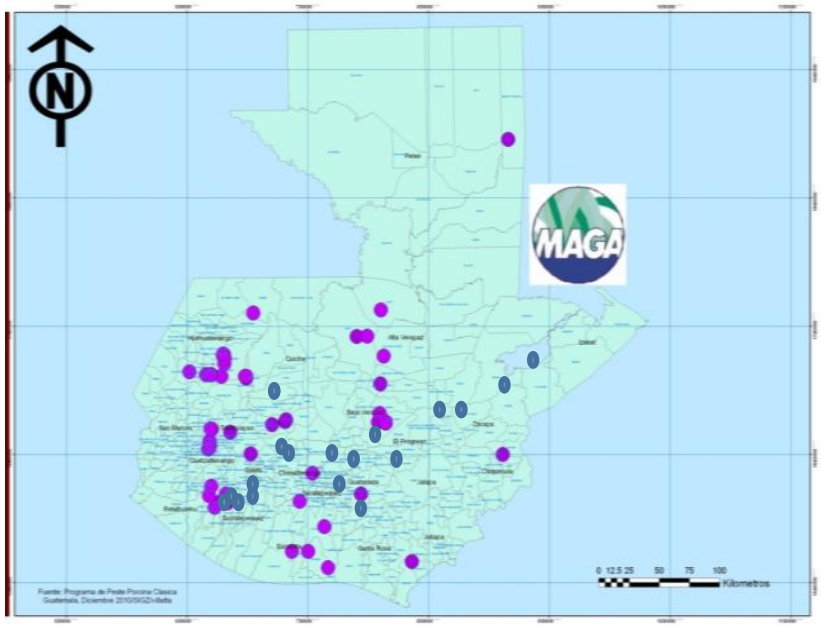
–Nasal swabs (Virus detection by rRT-PCR)

–Serum samples (Antibody detection by ELISA and HI)

Commercial farms



Backyard pigs



Spatial analysis. Global methods were used to detect the presence of purely spatial clusters of positive farms (Ripleys K function)

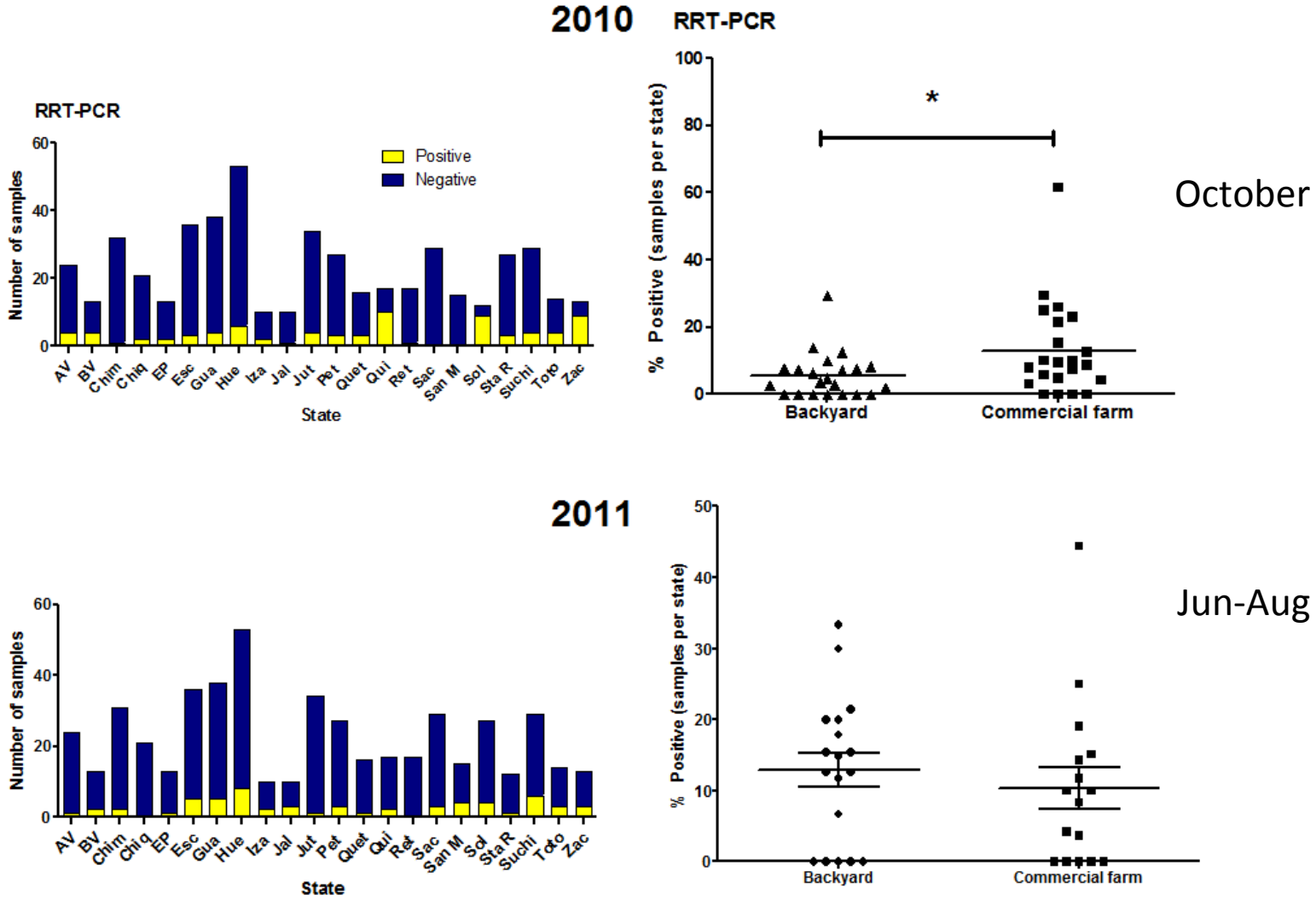
Estimated virus prevalence was comparable between years

RRT-PCR estimated Influenza A prevalence in sampled farms from Guatemala

	Prevalence		Total Average
RRT-PCR	**2010 (n=500)**	**2011 (n=499)**	
Influenza A positive	16%	12%	14%
Sick positive animals	17%	9%	13%
Healthy positive animals	10%	12%	11%
IDEXX ELISA	**2010 (n=460)**	**2011 (n=499)**	
Positive for influenza A antibodies	10%	1%	6%
Sick positive animals	9%	0%	4%
Healthy positive animals	36%	2%	19%

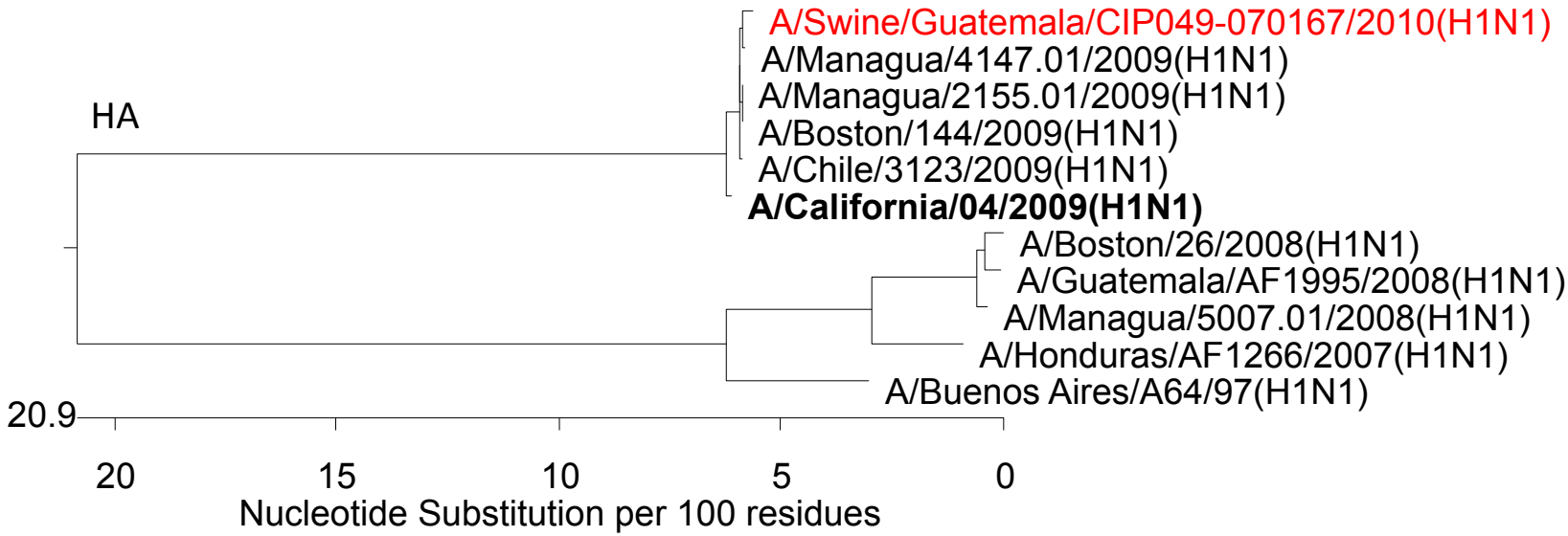
(A. González-Reiche, Unpublished)

Influenza A RRT-PCR prevalence in pigs varies between states and type of production unit



(A. González-Reiche, Unpublished)

The viruses…
fully pandemic H1N1 viruses were isolated from pigs

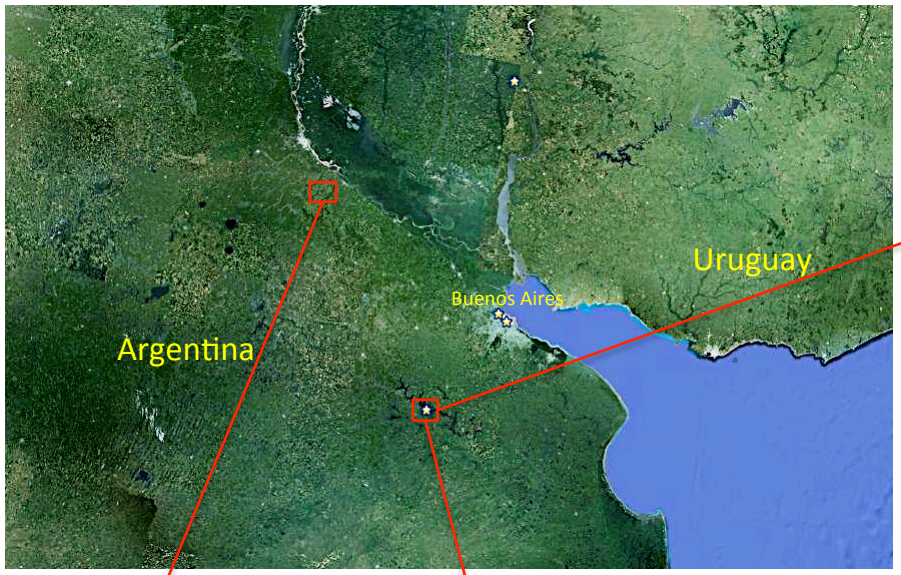


H3N2 isolates are related to seasonal human viruses

A/Swine/Guatemala/CIP049-040078/2010(H3N2)

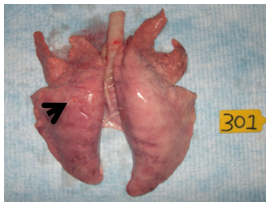
Segment	Most Similar Sequence in BLAST	%ID
PB2	A/Mexico City/WRAIR3580T/2010(H3N2)	99%
PB1	A/Mexico City/WRAIR3577T/2010(H3N2)	98%
PA	A/Thailand/CU-B657/2009(H3N2)	99%
HA	A/California/NHRC0004/2011(H3N2)	99%
NP	A/Mexico City/WRAIR4139N/2010(H3N2)	97%
NA	A/Mexico City/WRAIR4139N/2010(H3N2)	97%
M	A/Uganda/MUWRP-070/2009(H3N2)	100%
NS	A/Mexico/UASLP-013/2008(H3N2)	99%

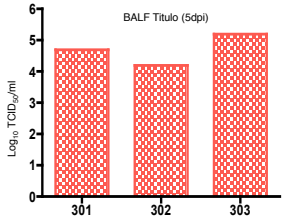
ARGENTINA

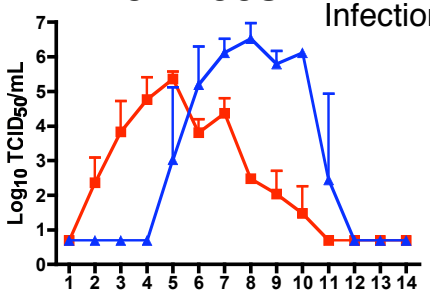


Evidence of a non-contemporary human H3N2 adapted to be transmitted among pigs

Farm A
Buenos Aires
6000 sows
Nov-2008







Infection and Transmission of A2/08 (H3N2)
Infected
Direct Contact

Journal of General Virology (2011), 92, 2871–2878 DOI 10.1099/vir.0.036590-0

Outbreak of swine influenza in Argentina reveals a non-contemporary human H3N2 virus highly transmissible among pigs

Javier A. Cappuccio,[1]† Lindomar Pena,[2]† Marina Dibárbora,[3] Agustina Rimondi,[3] Pablo Piñeyro,[1] Lucas Insarralde,[1] María A. Quiroga,[1] Mariana Machuca,[1] María I. Craig,[3] Valeria Olivera,[3] Ashok Chockalingam,[2] Carlos J. Perfumo,[1] Daniel R. Perez[2] and Ariel Pereda[3]

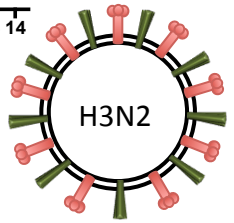
Farm B
Santa Fe
4000 sows
May-2010

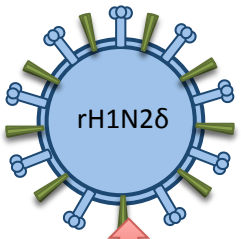
Farm C
Buenos Aires
9000 sows
Oct-2009

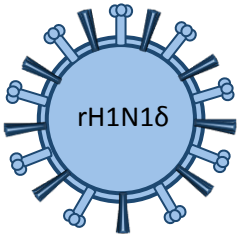
DISPATCHES

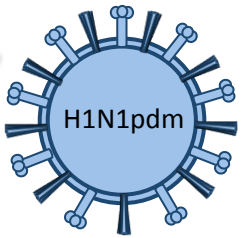
Pandemic (H1N1) 2009 Outbreak on Pig Farm, Argentina

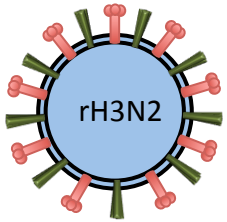
Ariel Pereda,[1] Javier Cappuccio,[1] María A. Quiroga, Elsa Baumeister, Lucas Insarralde, Mariela Ibar, Ramón Sanguinetti, María L. Cannilla, Débora Franzese, Oscar E. Escobar Cabrera, María I. Craig, Agustina Rimondi, Mariana Machuca, Rosa T. Debenedetti, Carlos Zenobi, Leonardo Barral, Rodrigo Balzano, Santiago Capalbo, Adriana Risso, and Carlos J. Perfumo











Influenza Other Respi Viruses. 2011 Nov;5(6):409-12. doi: 10.1111/j.1750-2659.2011.00246.x. Epub 2011 Apr 7.

Evidence of reassortment of pandemic H1N1 influenza virus in swine in Argentina: are we facing the expansion of potential epicenters of influenza emergence?

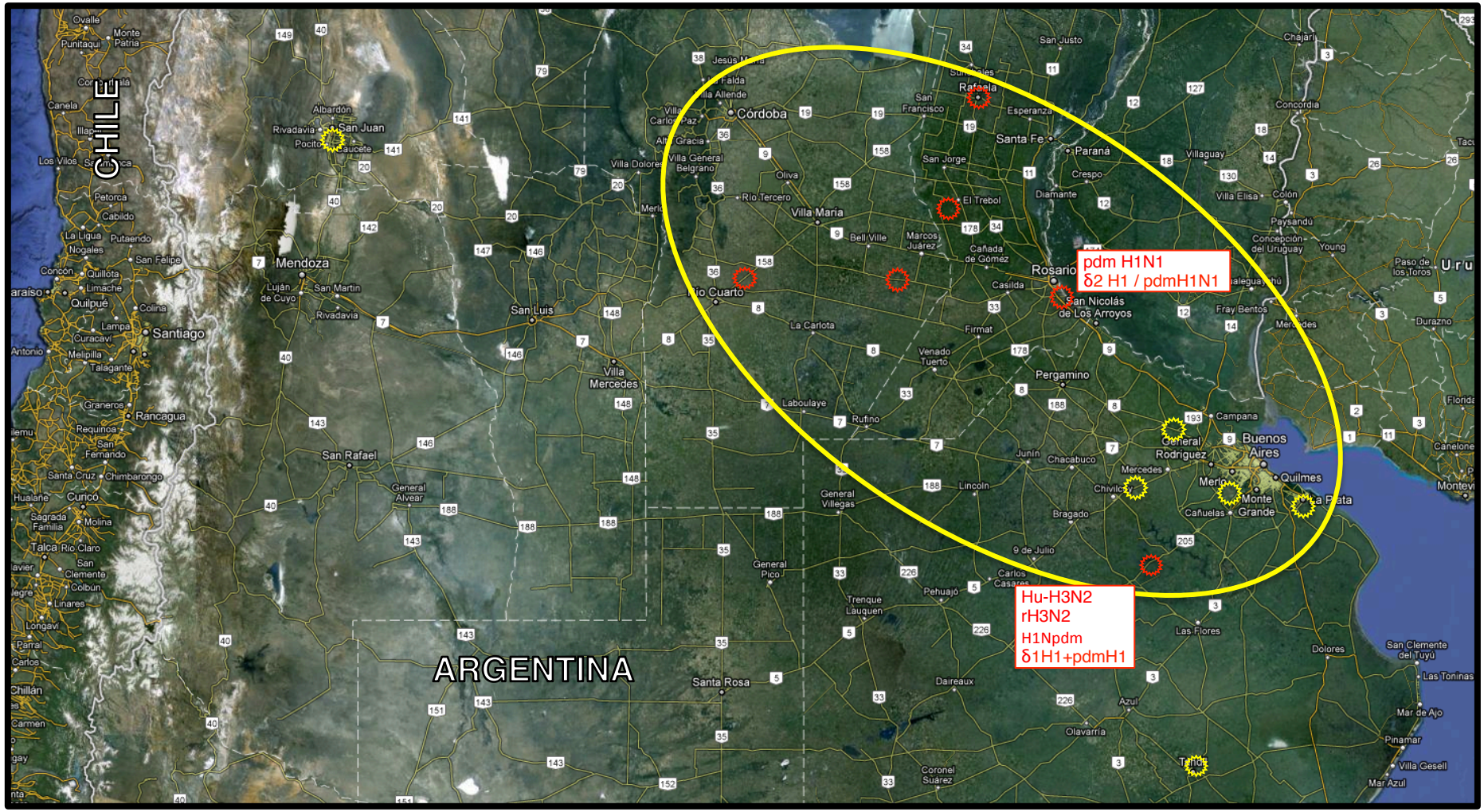
Pereda A, Rimondi A, Cappuccio J, Sanguinetti R, Angel M, Ye J, Sutton T, Dibárbora M, Olivera V, Craig MI, Quiroga M, Machuca M, Ferrero A, Perfumo C, Perez DR.

Laboratorio Aves y Porcinos, Instituto de Virología CICVyA-Instituto Nacional de Tecnología Agropecuaria, Buenos Aires, Argentina. apereda@cnia.inta.gov.ar

Farm D
Buenos Aires
9000 sows
Jan-2012

Recombinant H3N2 + pdm

GITEP study 2012
Sampling sites



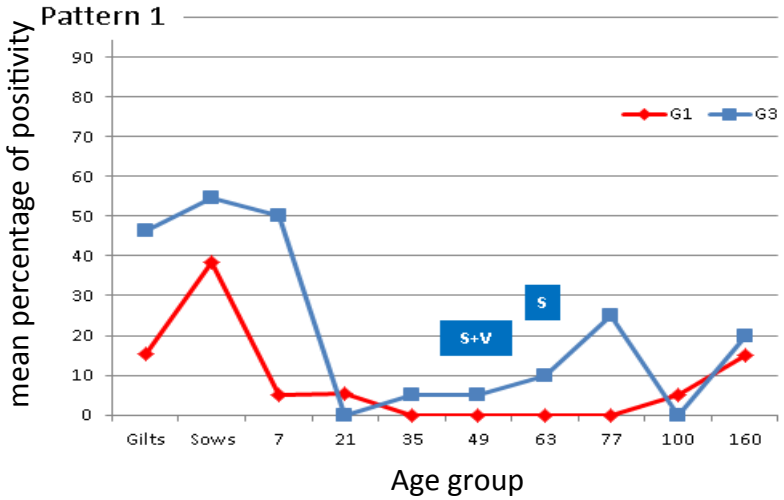
rRT-PCR/isolate = Positive - Serology = Positive

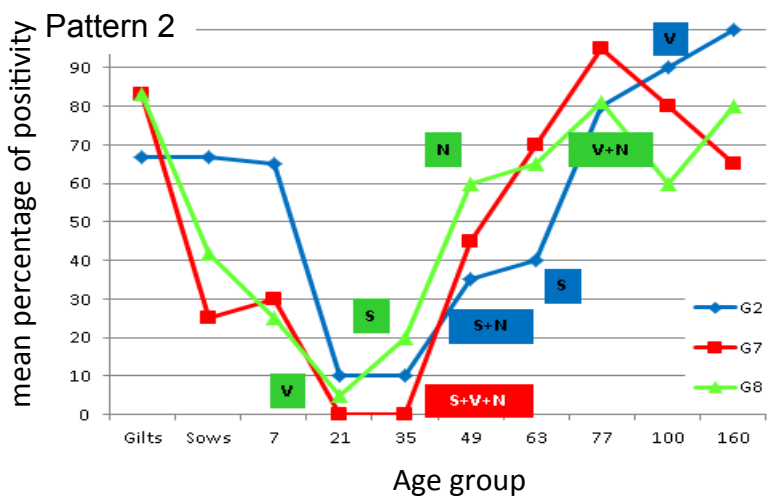
rRT-PCR/isolate = Negative - Serology = Positive

Analyzed samples

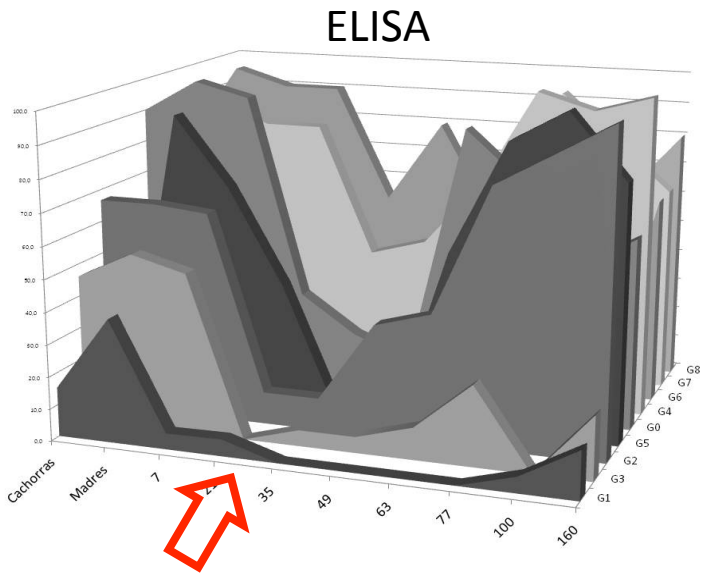
- 1199 nasal and/or bronchial swabs
- 59 lungs

10% of sows stock in Argentina

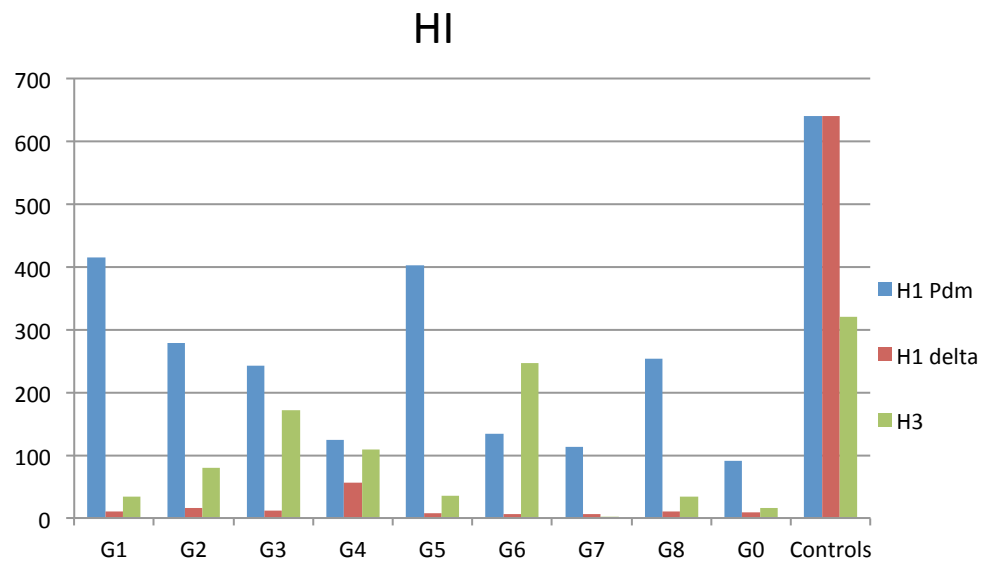




S: clinical signs. V: virus isolation. N: virus isolation from pneumonic lung lesions at necropsy



10% rH3N2
90% H1N1pdm



Isolated Viruses in Argentina

- **Non contemporaneous human origin H3N2**
  A/swine/Argentina/CIP051-A2/08 (H3N2)

- **pdm H1N1**
  A/swine/Argentina/SAGiles-31215/2009 (H1N1)

- Reassortant Viruses :

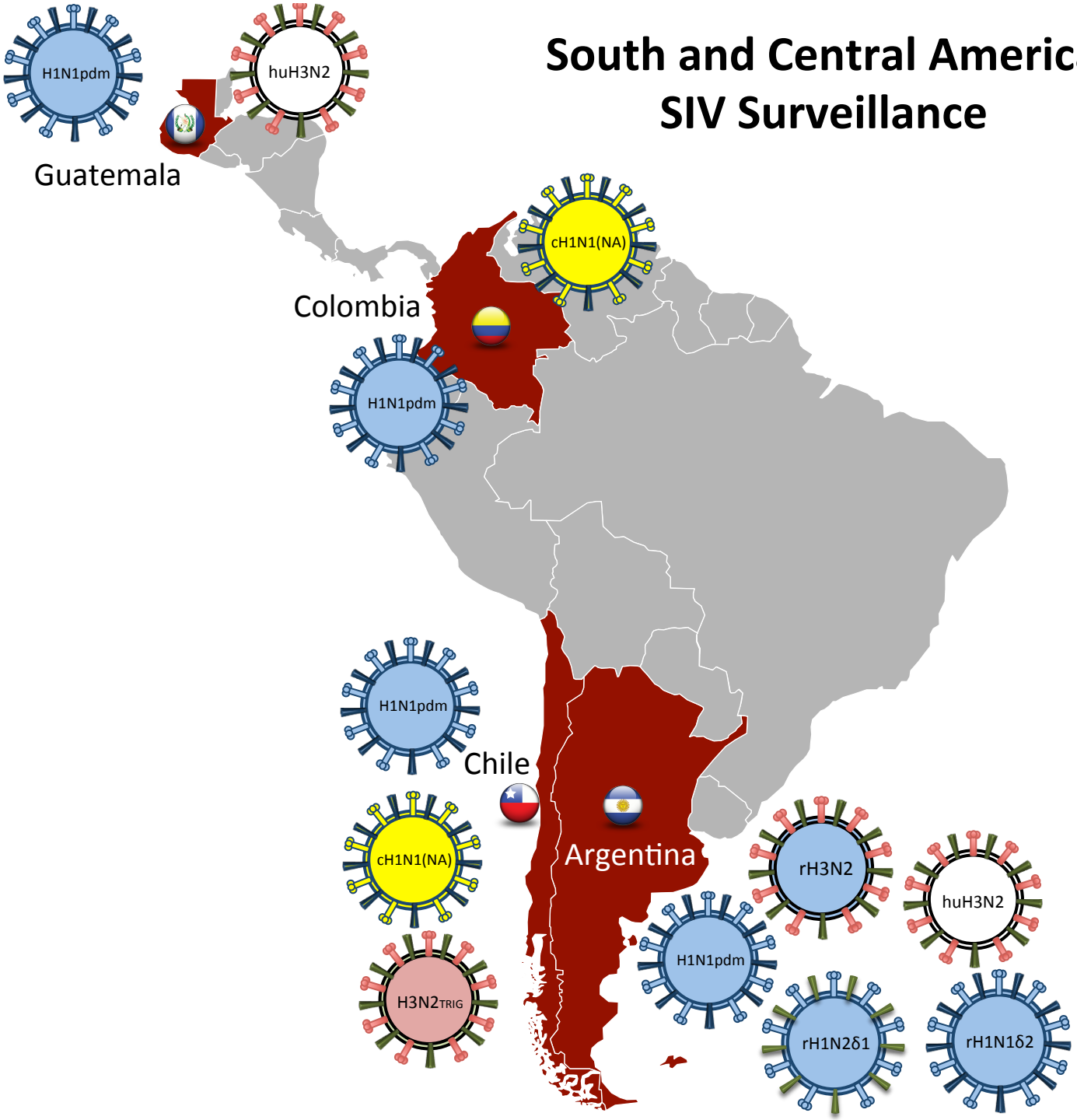
  • **Human Like δ H1 SIV (HA+NA) – pdm H1N1 (internal genes)**
  A/Swine/Argentina/CIP051-BsAs76/2009 (H1N1) **δ2**
  A/Swine/Argentina/CIP051-SantaFe/2010 (H1N2) **δ1**

  • **Pig adapted Hu H3N2 (HA+NA) – pdm H1N1 (internal genes)**

Summary and perspectives:

- **From collected data we know that:**
  - Influenza circulates in pigs in Central and South America: year to year variation suggests that levels of influenza transmission may vary along the year.
  - Mostly of the viruses isolated have a human origin and the principal subtype is the pandemic H1N1 virus.
  - These viruses started to reassort between them, at least in Argentina (and Brazil).
  - In some countries, the sera collected before the 2009 pandemic outbreak have very low HI reactivity against the pandemic virus, which explains the spread of this virus, but also demonstrate the lack of activity of this virus in the region before this pandemic virus appears in 2009.
- **But we still don't know:**
  - The seasonality of influenza transmission in pigs.
  - The ecological factors important for transmission.
  - Epidemiological relatedness between human cases and influenza viruses circulating in pigs.
  - Antigenic relatedness.
- **What we need for the region:**
  - More training in epidemiological/risk assessment and lab testing.
  - More awareness of the relevance of SIV by institutional presence (an agenda between FAO and/or OIE local vet officers with OFFLU).
  - More financial support to ensure the continuity of these efforts.
  - Local reference laboratory for South and Central America.

South and Central America SIV Surveillance



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