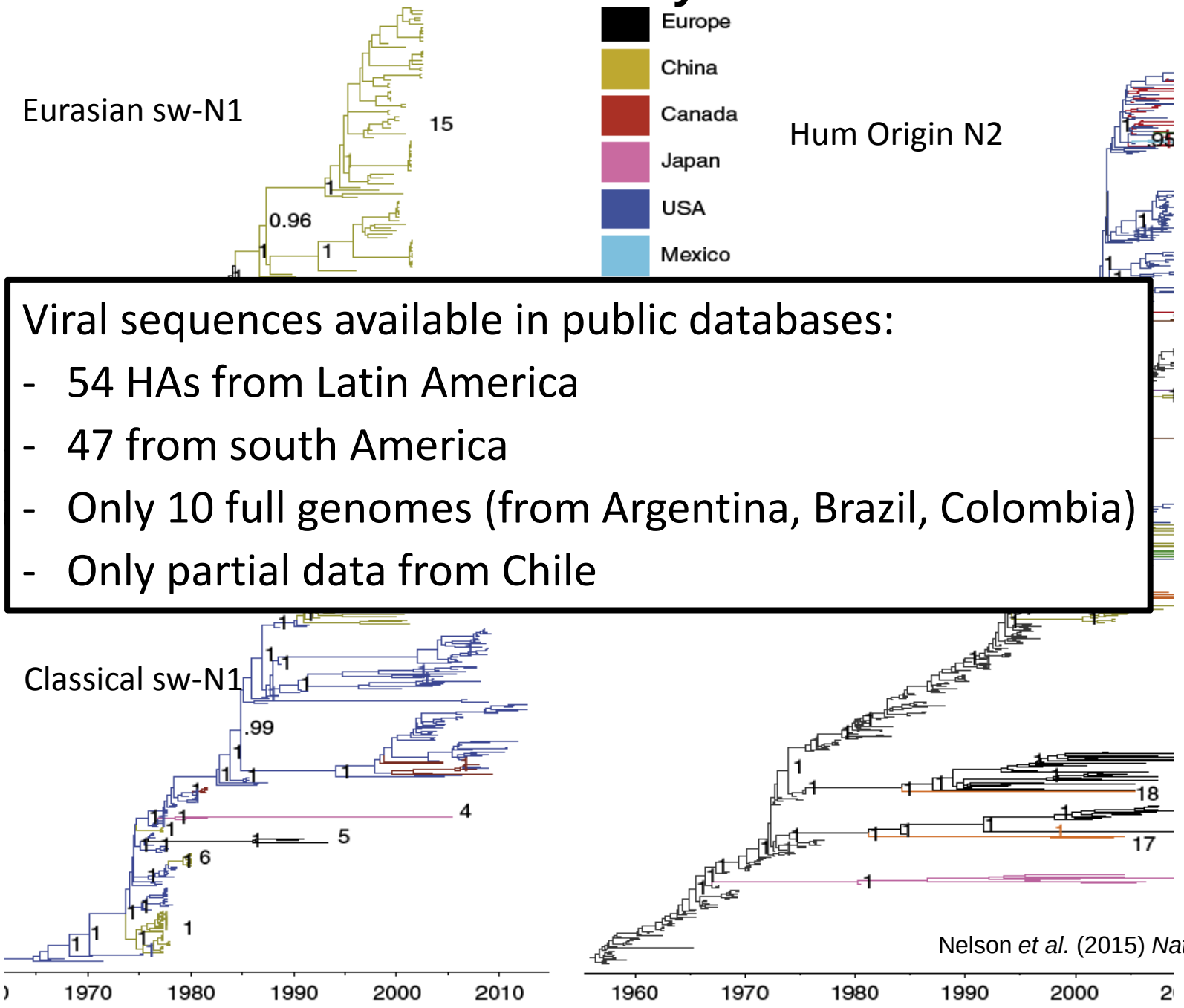
Instituto Nacional de Tecnología Agropecuaria
Centro de Investigación en Ciencias Veterinarias y Agronómicas
Instituto de Virología "Dr. Scholein Rivenson"

Swine Influenza in South and Central America

Ariel Pereda, DVM PhD
INTA

Swine Influenza
Technical Meeting
Paris, December3rd 2015

Lack of surveillance activity in Latin America



Viral sequences available in public databases:

- 54 HAs from Latin America
- 47 from south America
- Only 10 full genomes (from Argentina, Brazil, Colombia)
- Only partial data from Chile

Nelson *et al.* (2015) *Nat Comm*

South and Central America SIV Surveillance

Chile

Swine industry in Chile

Swine Export in 2013

490 Mill. USD

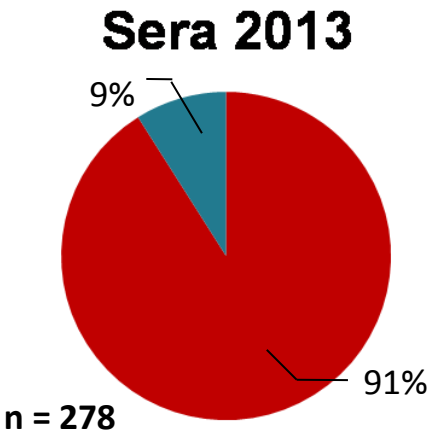
- Is the 5th largest swine meet exporter in the world (still growing).

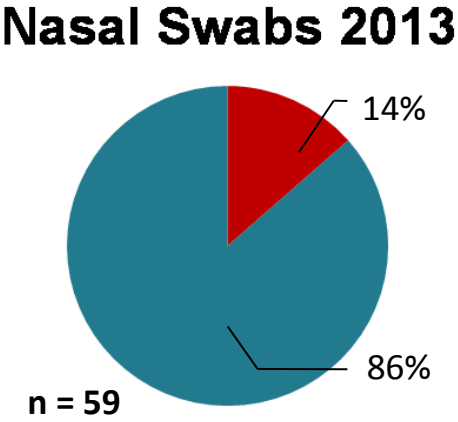
- Chile's geographical barriers and strict livestock control policies have prevented the introduction foreign pathogens.

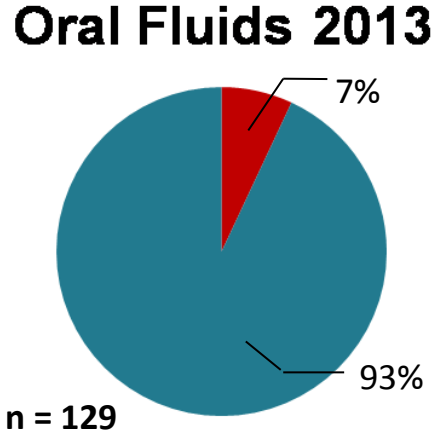
- IAV has been detected consistently in Chilean production farms since 2009.

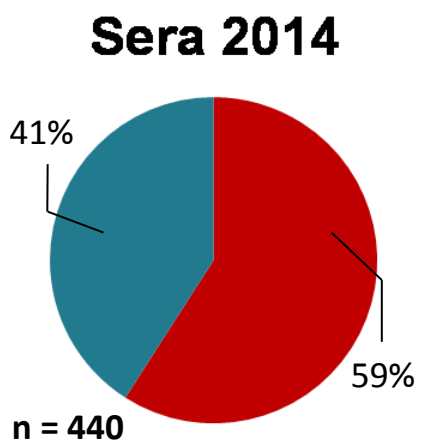
Swine Surveillance Sites

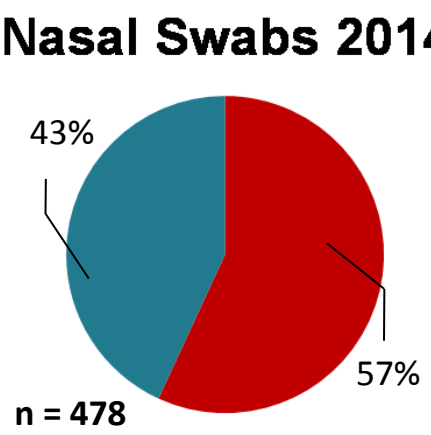
Positivity of analyzed swine samples per year.

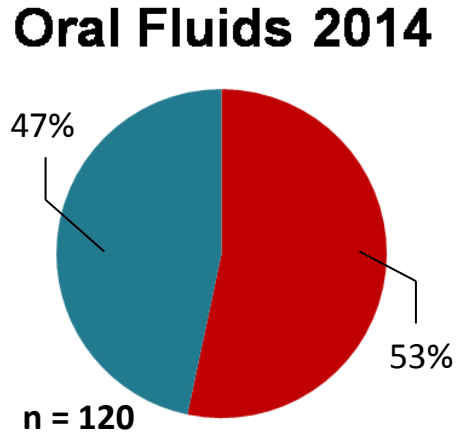








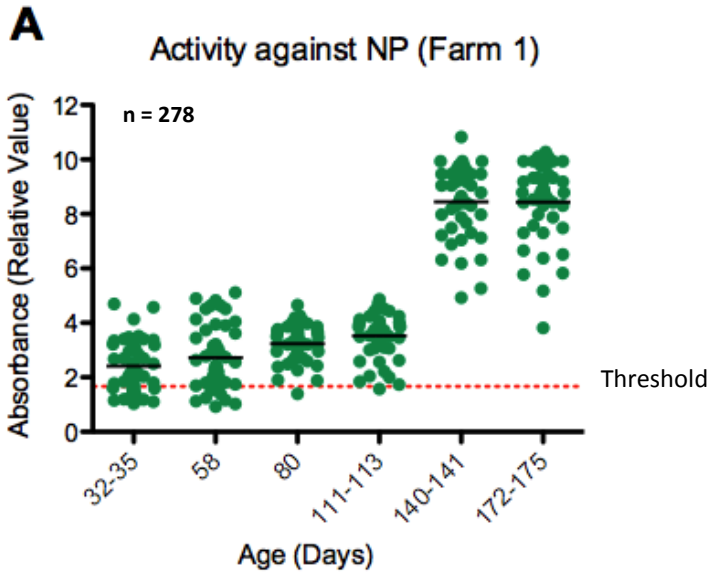


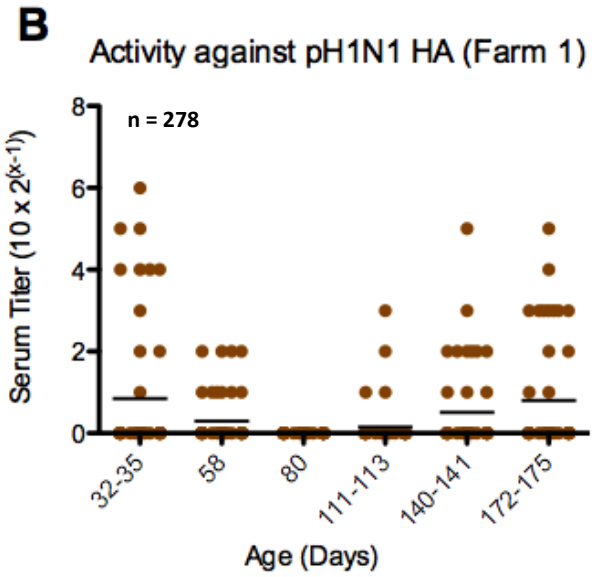


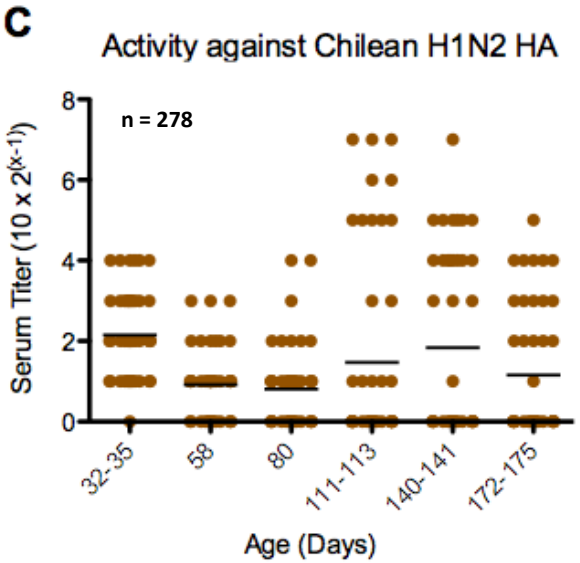
Positive

Negative

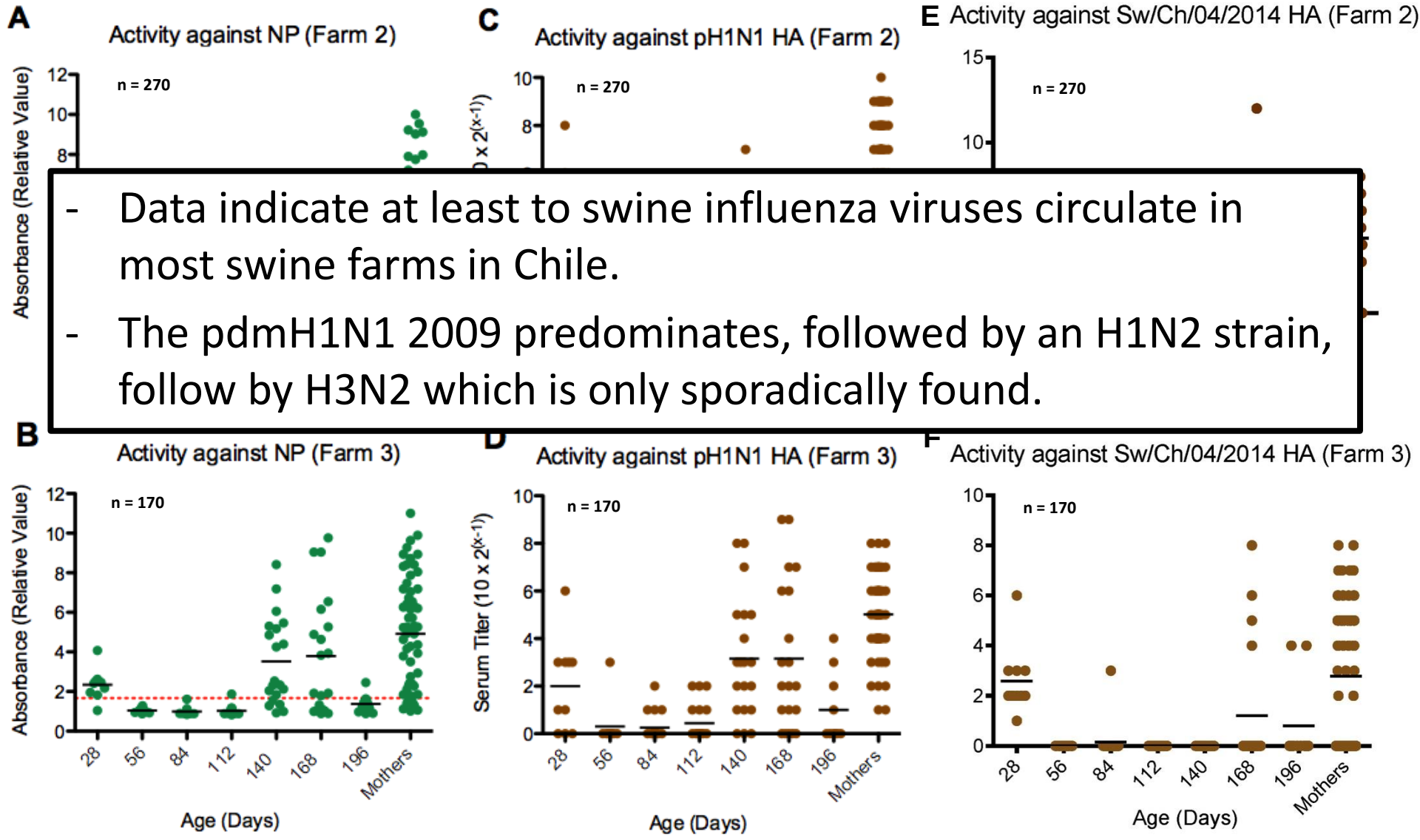
Longitudinal serological studies from an industrial farm in the Central Region of Chile.





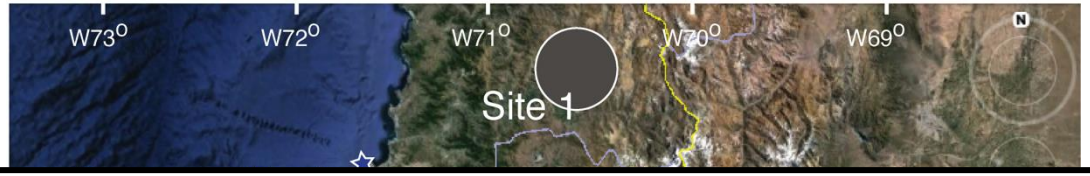


Cross-sectional serological studies in 2 industrial farms in different Chilean regions.



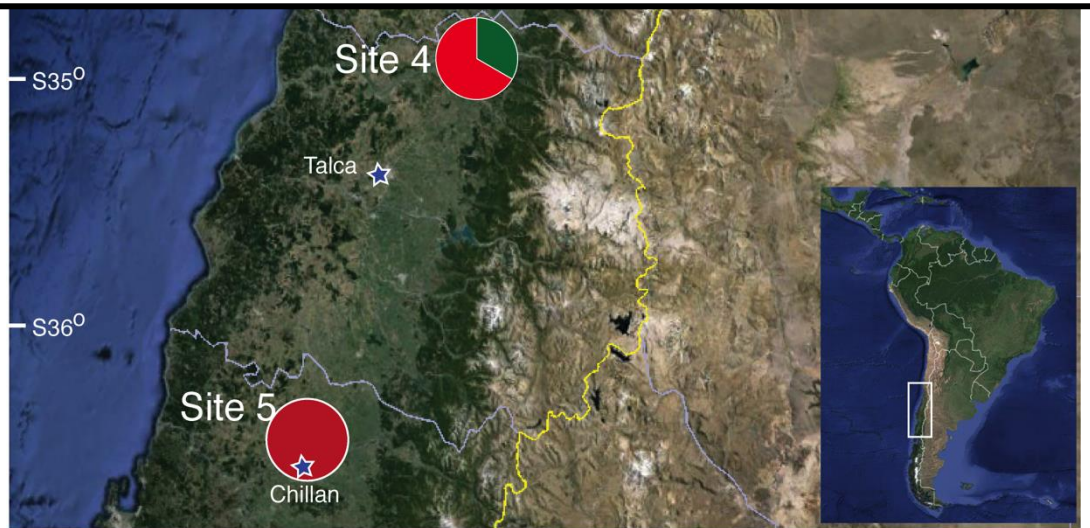
- Data indicate at least to swine influenza viruses circulate in most swine farms in Chile.
- The pdmH1N1 2009 predominates, followed by an H1N2 strain, follow by H3N2 which is only sporadically found.

Distribution and prevalence of subtyped IAV strains isolated from swine in Chile



We have only recently generated a total of:

- 67 H1
- 2 H3,
- 24 N1
- 27 N2



Conclusions

- SIV are endemic with multiple strains co-circulating in Chilean swine.
- Current analyses suggests multiple introduction of human IAV into swine populations since the late 80's – early 90's and after the 2009 H1N1 pandemic.
- Identified strain's include: SwH3N2, pH1N1-like, SwH1N2, and an H1N2 containing a classical swine Hemagglutinin (cSwH1) and N1 derived from the pH1N1 strain
- Additional phylogenetic analyses are ongoing to further characterize the time of introduction and the reassortment events that gave rise to the Chilean swine IAVs.

Guatemala

Animal influenza surveillance in Guatemala, 2006-2014

CENTRO DE ESTUDIOS EN SALUD

INSTITUTO DE INVESTIGACIONES
UNIVERSIDAD DEL VALLE DE GUATEMALA

The University of Georgia

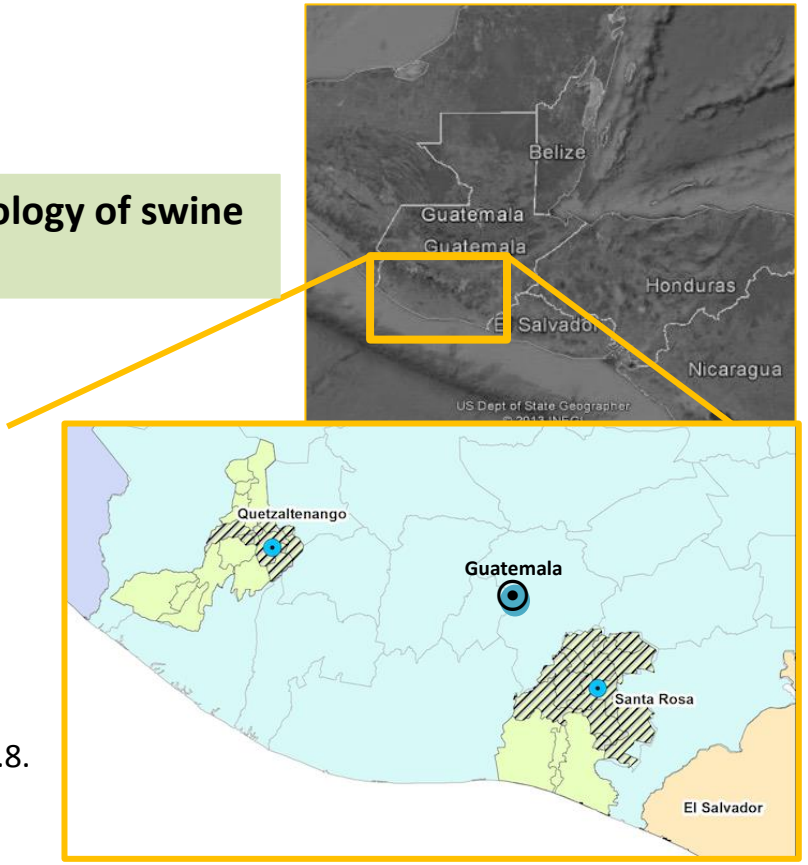
CRIP surveillance in pigs – Guatemala (UMD-UVG)

Animal-human interface

- Two nation-wide cross-sectional surveys. Years 2010, 2011
  Evidence of circulation of IAV of human origin in pigs.
  Gonzalez-Reiche, Ramirez, *et al.* In prep.

Human-animal contact may be important for the epidemiology of swine IAV in Guatemala

- Cross-sectional surveys in pigs from peridomestic smallholdings in proximity to health centers with human ILI surveillance (2 sites, 200 samples/site/yr). Years 2012, 2014
- Influenza A virus monthly prevalence (2012):
  - rRT-PCR: Santa Rosa 19% (95% CI: 14%, 23%), in Quetzaltenango 14% (95% CI: 12%, 16%)
  - ELISA: Santa Rosa 0%, in Quetzaltenango 9% (95% CI: 7%, 11%)
  - Swine farmed with domestic waterfowl may have higher risk of being infected with influenza A: Santa Rosa prevalence risk ratio (PRR): 5, 95% CI: 2.5, 9.7; Quetzaltenango PRR: 1.9, 95% CI: 0.9, 3.8. Müller *et al.* In prep.

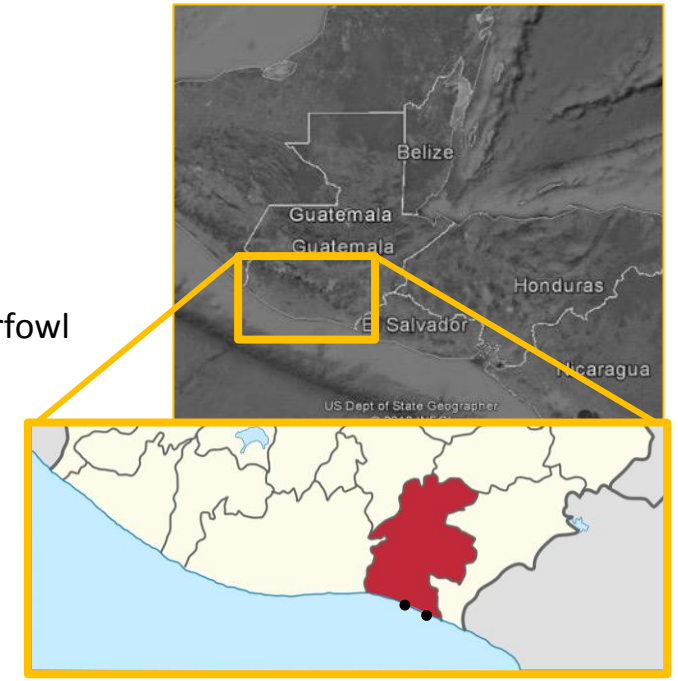


Rustic pig and poultry farming may influence influenza circulation in Guatemala

Surveillance in pigs – Guatemala (CDC-UVG-UGA)

Animal-human interface

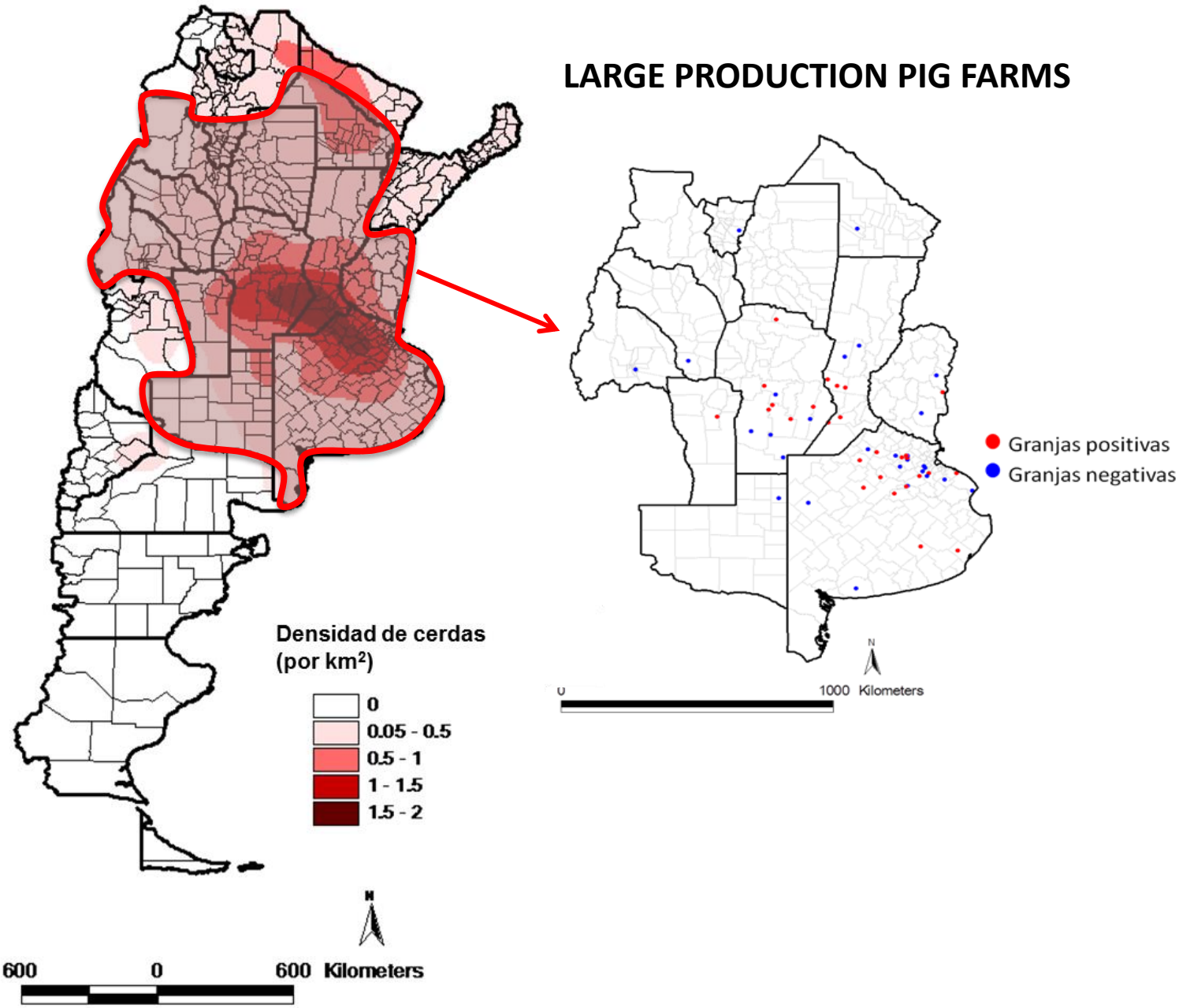
- Longitudinal study in backyard pigs (years 2013-2014)
- Two rural communities in proximity to wetlands with migrating waterfowl during winter
- Influenza A virus monthly prevalence (April-August 2013):
  - rRT-PCR: 0 - 6% (swine) and 0 - 2% (ducks)
  - ELISA: 1 - 6% (swine) and 0 - 4% (ducks)
- Antigenic response against pandemic H1N1 was detected in one pig suggesting IAV interspecies transmission.
- A cluster of influenza A seropositive households was observed may indicate suggest recent influenza virus transmission in this location.

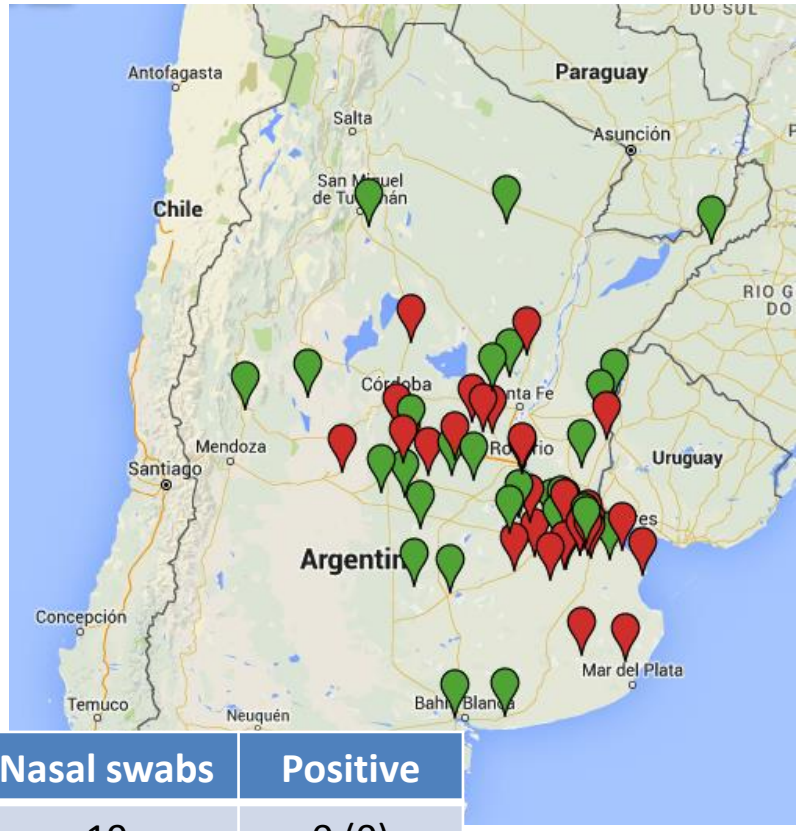


Müller, Ortiz, Cordon-Rosales *et al.* In prep.

Influenza A circulates in co-habiting backyard swine and ducks in wetlands in Guatemala

ARGENTINA

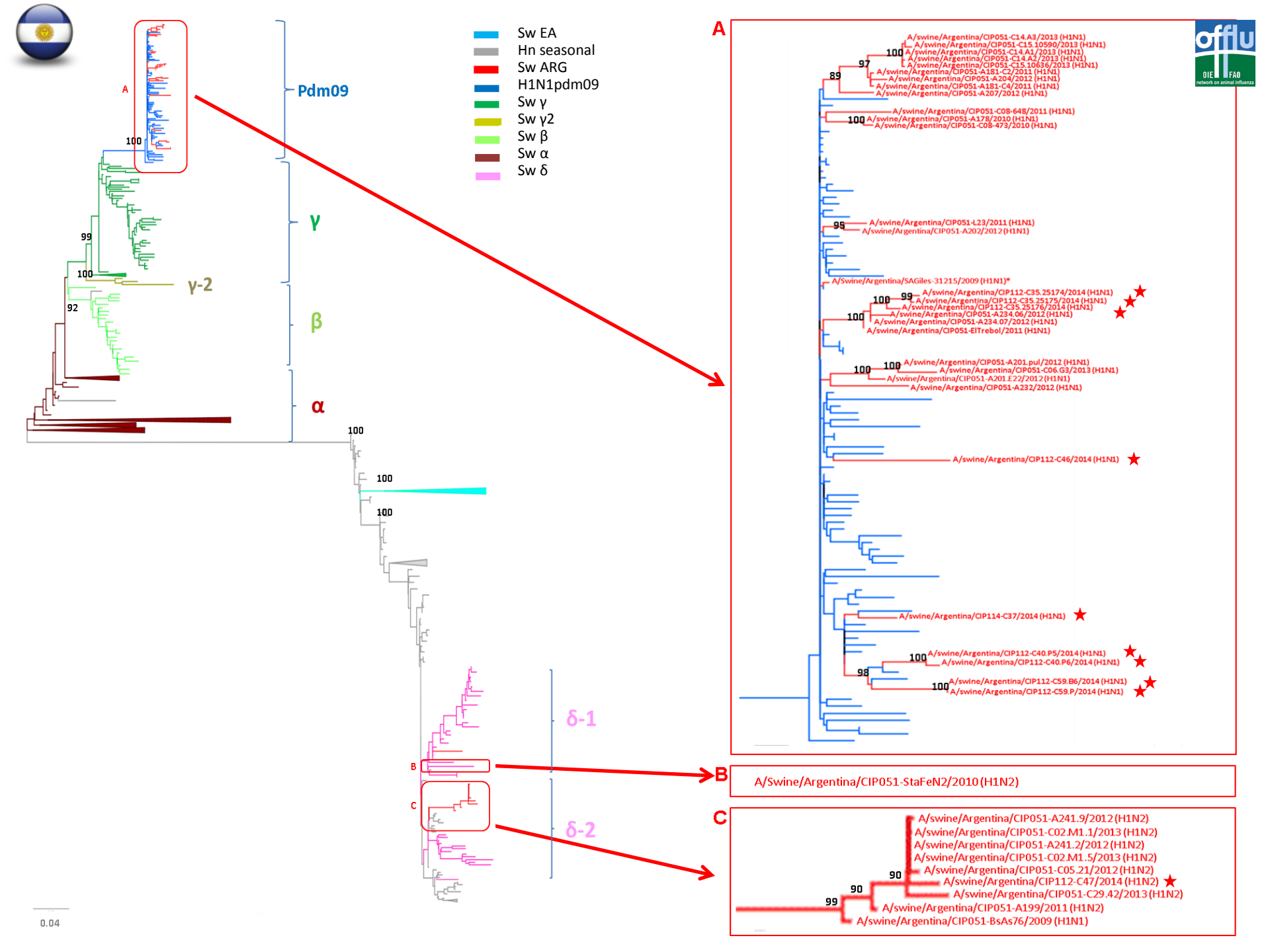

LARGE PRODUCTION PIG FARMS
Granjas positivas
Granjas negativas
0
1000 Kilometers
N
Densidad de cerdas
(por km²)
0
0.05 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2
600
0
600 Kilometers



CIP	Year	N samples	Lung	Positive	Nasal swabs	Positive
051	2010	27	8	1 (12.5)	19	0 (0)
	2011	499	38	12 (31.6)	461	37 (8)
	2012	2313	39	19 (48.7)	2274	58 (2.6)
	2013	166	61	28 (45.9)	105	68 (64.8)
	2014	55	55	4 (7.3)	0	0 (0)
112	2014	545	110	20 (18.2)	435	32 (7.4)
	2015	869	32	7 (21.9)	837	116 (13.9)
Total		4474	343	91 (26.6)	4131	311 (7.5)

Nasal swabs: pooled procesed

Granja	Edad de obtención de aislamientos (días)	Nombre del aislamiento	Subtipo	Nº acceso GenBank
1	35	A/swine/Argentina/CIP051-A232/2012	H1N1pdm09	KR863461 a KR863463
2	21	A/swine/Argentina/CIP051-C02.M1.1/2013	δ2 H1N2	KR863479 a KR863481
2	35	A/swine/Argentina/CIP051-C02.M1.5/2013	δ2 H1N2	KR863420 a KR863422
3	37	A/swine/Argentina/CIP051-C06.G3/2013	H1N1pdm09	KR863455 a KR863457
4	100	A/swine/Argentina/CIP051-C07-E1/2013	H3N2	KR863476 a KR863478
4	49	A/swine/Argentina/CIP051-C07-D2P1/2013	H3N2	KR863449 a KR863451
4	21	A/swine/Argentina/CIP051-C07-MP2.1/2013	H3N2	KR863464 a KR863466
6	42	A/swine/Argentina/CIP112-C40.P5/2014	H1N1pdm09	KR863437 a KR863439
6	42	A/swine/Argentina/CIP112-C40.P6/2014	H1N1pdm09	KT873326 a KT873328
7	56	A/swine/Argentina/CIP112-C47/2014	δ2 H1N2	KR863417 a KR863419
8	28	A/swine/Argentina/CIP112-C46/2014	H1N1pdm09	KR863414 a KR863416
10	49	A/swine/Argentina/CIP112-C59.B6/2014	H1N1pdm09	KR863458 a KR863460
10	49	A/swine/Argentina/CIP112-C59.P/2014	H1N1pdm09	KT873323 a KT873325


Sw EA
Hn seasonal
Sw ARG
H1N1pdm09
Sw γ
Sw γ2
Sw β
Sw α
Sw δ
Pdm09
γ
γ-2
β
α
δ-1
δ-2
A
B
C
A/swine/Argentina/CIP051-C14.A3/2013 (H1N1)
A/swine/Argentina/CIP051-C15.10590/2013 (H1N1)
A/swine/Argentina/CIP051-C14.A1/2013 (H1N1)
A/swine/Argentina/CIP051-C14.A2/2013 (H1N1)
A/swine/Argentina/CIP051-C15.10636/2013 (H1N1)
A/swine/Argentina/CIP051-A181-C2/2011 (H1N1)
A/swine/Argentina/CIP051-A204/2012 (H1N1)
A/swine/Argentina/CIP051-A181-C4/2011 (H1N1)
A/swine/Argentina/CIP051-A207/2012 (H1N1)
A/swine/Argentina/CIP051-C08-648/2011 (H1N1)
A/swine/Argentina/CIP051-A178/2010 (H1N1)
A/swine/Argentina/CIP051-C08-473/2010 (H1N1)
A/swine/Argentina/CIP051-L23/2011 (H1N1)
A/swine/Argentina/CIP051-A202/2012 (H1N1)
A/Swine/Argentina/SAGiles-31215/2009 (H1N1)*
A/swine/Argentina/CIP112-C35.25174/2014 (H1N1)
A/swine/Argentina/CIP112-C35.25175/2014 (H1N1)
A/swine/Argentina/CIP112-C35.25176/2014 (H1N1)
A/swine/Argentina/CIP051-A234.06/2012 (H1N1)
A/swine/Argentina/CIP051-A234.07/2012 (H1N1)
A/swine/Argentina/CIP051-ElTrebol/2011 (H1N1)
A/swine/Argentina/CIP051-A201.pul/2012 (H1N1)
A/swine/Argentina/CIP051-C06.G3/2013 (H1N1)
A/swine/Argentina/CIP051-A201.E22/2012 (H1N1)
A/swine/Argentina/CIP051-A232/2012 (H1N1)
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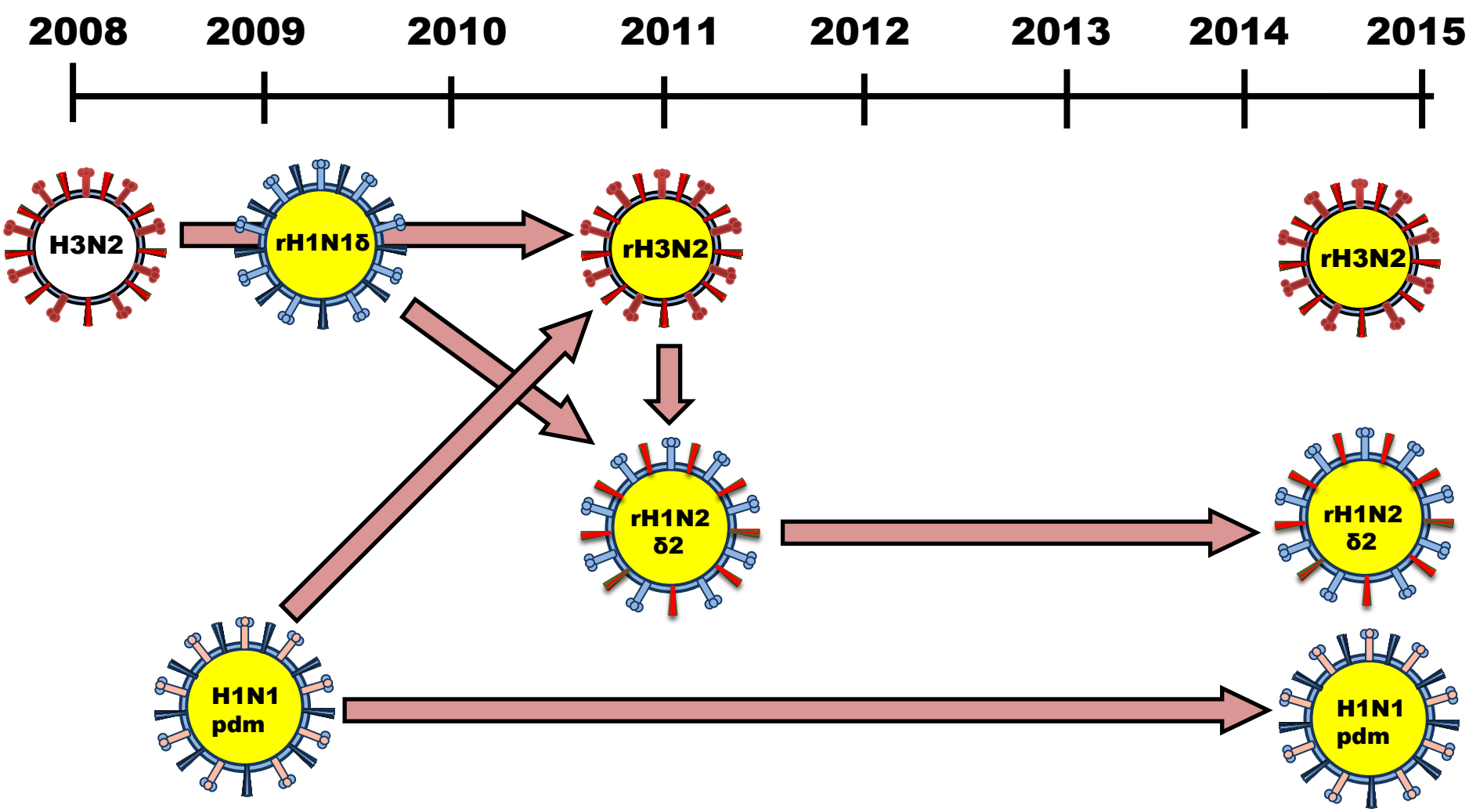
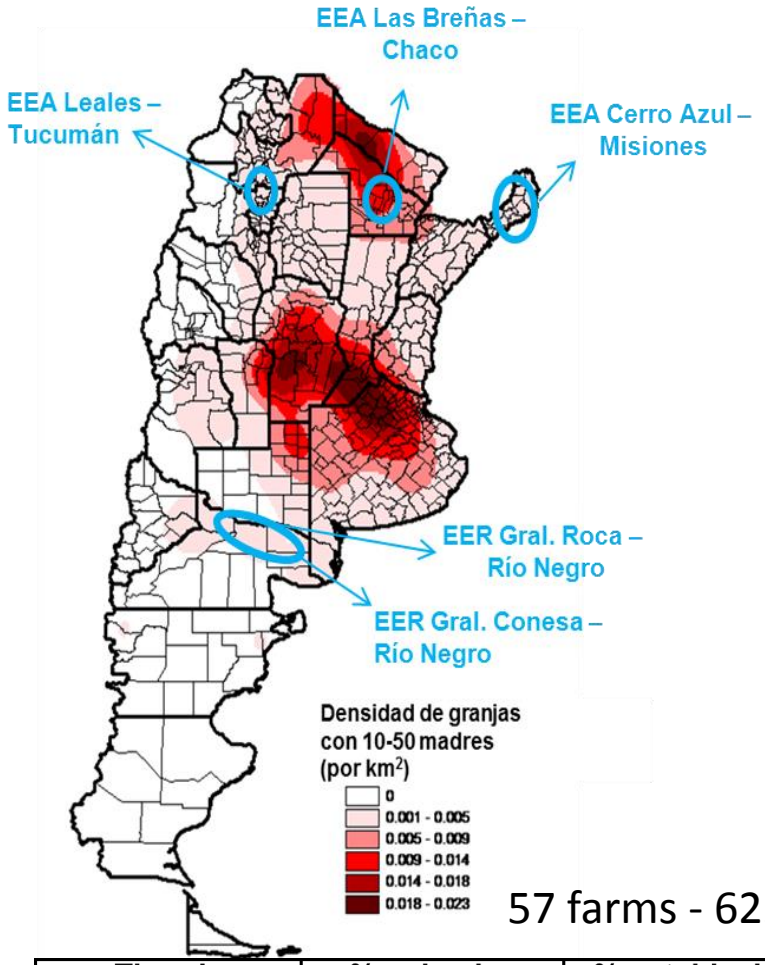
A/swine/Argentina/CIP114-C37/2014 (H1N1)
A/swine/Argentina/CIP112-C40.P5/2014 (H1N1)
A/swine/Argentina/CIP112-C40.P6/2014 (H1N1)
A/swine/Argentina/CIP112-C59.B6/2014 (H1N1)
A/swine/Argentina/CIP112-C59.P/2014 (H1N1)
A/Swine/Argentina/CIP051-StaFeN2/2010 (H1N2)
A/swine/Argentina/CIP051-A241.9/2012 (H1N2)
A/swine/Argentina/CIP051-C02.M1.1/2013 (H1N2)
A/swine/Argentina/CIP051-A241.2/2012 (H1N2)
A/swine/Argentina/CIP051-C02.M1.5/2013 (H1N2)
A/swine/Argentina/CIP051-C05.21/2012 (H1N2)
A/swine/Argentina/CIP112-C47/2014 (H1N2)
A/swine/Argentina/CIP051-C29.42/2013 (H1N2)
A/swine/Argentina/CIP051-A199/2011 (H1N2)
A/swine/Argentina/CIP051-BsAs76/2009 (H1N1)
0.04

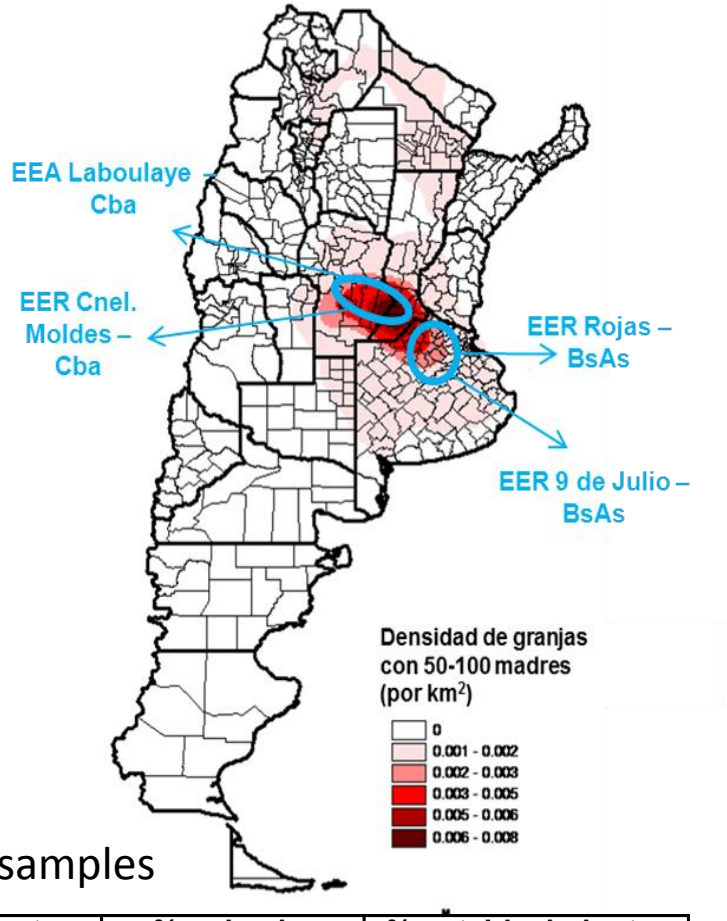
Continuous survey of SIV in pig farms



SMALL-SCALE / FAMILY OF PIG FARMING

90% pig productive units

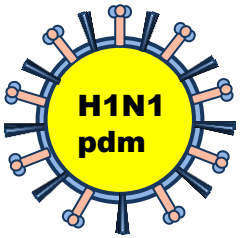




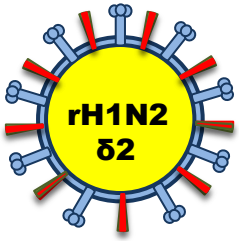
57 farms - 622 samples

Tipo de establecimiento	% animales (positivos/total) H1pdm09	% establecimientos (positivos/total) H1pdm09	% animales (positivos/total) H3	% establecimientos (positivos/total) H3
50 a 100 Madres	39,06 (150/384)	93,1 (27/29)	2,08 (8/384)	17,24 (5/29)
10 a 50 Madres	32,35 (77/238)	60,71 (17/28)	0,42 (1/238)	3,57 (1/28)

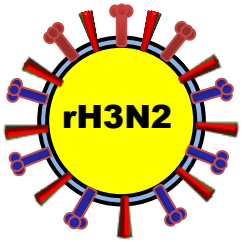
Conclusions 2014 - 2015



Predominant Subtype in Argentina

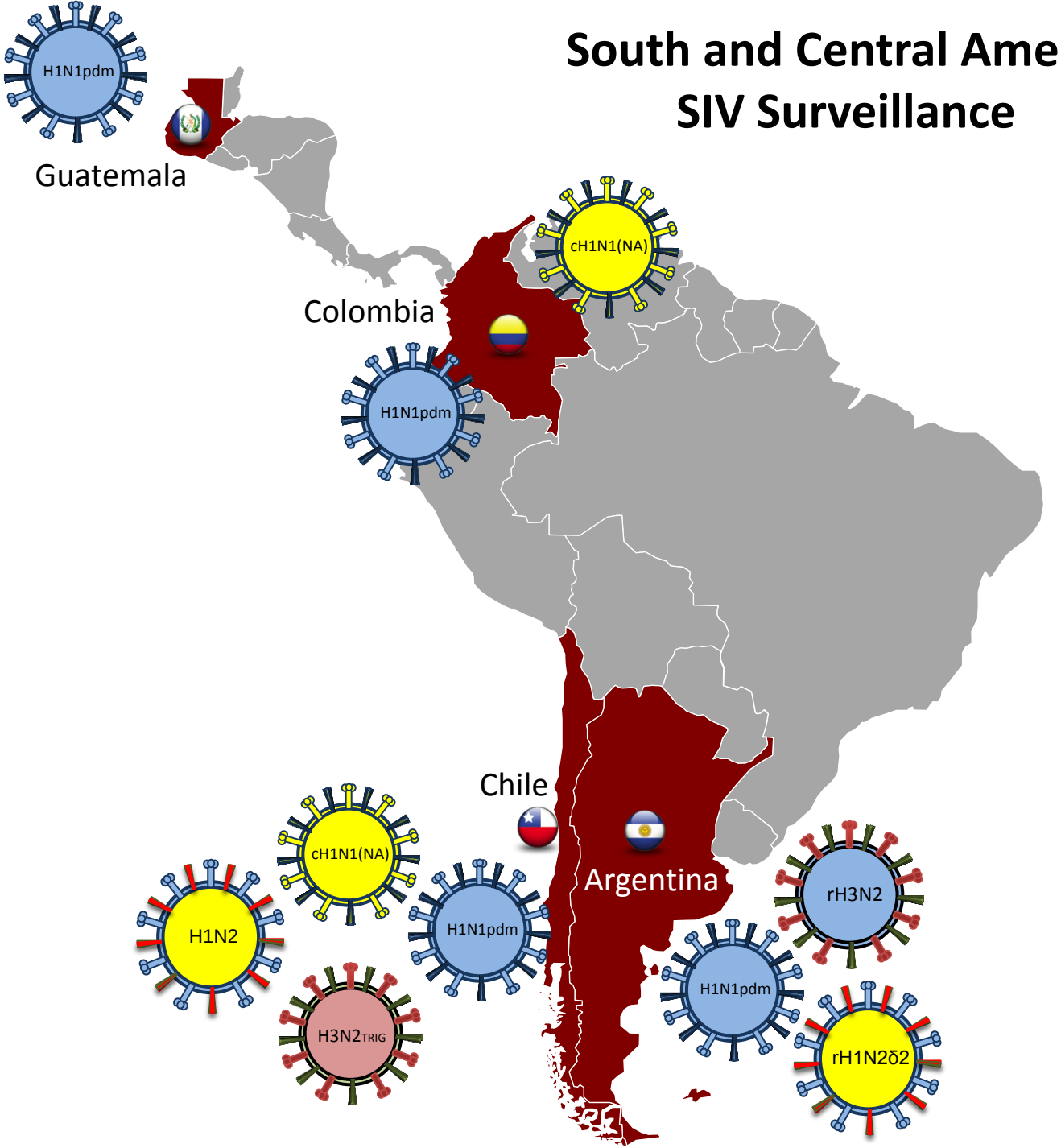


Continuous circulation in non related pig farms

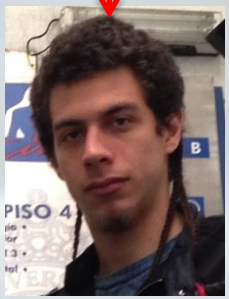


Serological evidence of circulation

South and Central America SIV Surveillance



Medina Lab



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Guatemala
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