





AFSSA
AGENCE FRANÇAISE
DE SÉCURITÉ SANITAIRE
DES ALIMENTS

ESNIP Minisymposium
4-5 June 2008, Gent, Belgium



Genetic and antigenic characterization of swine influenza viruses in France: identification of novel H1N1 reassortants


Gaëlle Kuntz-Simon



RÉGION
BRETAGNE


AFSSA-LERAPP
Swine Virology Immunology Unit
Ploufragan, France






Pig production in France


ESNIP Minisymposium, Gent, Belgium, 4-5 June 2008



- Typically farrow-to-finish units, family farms
- Average ~ 200 sows (increasing size)
- Usually one site (except some of the largest)
- Different compartments but high level of confinement
- **Brittany** = leading pig producing region (60%)
(7200 farms - 14,2 M pigs in 2006)




© SORP MULTIMEDIA D'APRÈS GEOATLAS



Historical record of SIV in France (before 2000)


ESNIP Minisymposium, Gent, Belgium, 4-5 June 2008



Dates	Virus type	Virus strains	Ab (HA) related to	References
~1973-early 1980s ?	Human-like swine H3N2	-	A/PC/73, A/VIC/75, A/Texas/77	Tillon, 1980 Aymard, 1980
From 1999		A/Sw/Finistere/127/99	A/Sydney/97	Marozin, 2002
? 1978	? Classical swine H1N1	-	A/NJ/76 (but not A/Sw/Iowa/31)	Tillon, 1980
1978-mid 1980s ?	Human-like swine H1N1	-	A/USSR/77	Aymard, 1980
From 1979	Avian-like swine H1N1	A/Sw/Finistere/2899/82	A/duck/Bavaria/77	Gourreau, 1980 Madedc, 1983
		A/Sw/IleVilaine/1455/99		Marozin, 2002
From 1984	Reassortant human-like swine H3N2 (hu-like sw H3N2 x av-like sw H1N1)	A/Sw/Cotes d'Armor/3633/84 A/Sw/Finistere/510/94	A/PC/73	Madedc, 1984 Gregory, 2001

ESNIP Meetingposium, Gent, Belgium, 4-6 June 2008

Historical record of SIV in France (before 2000)




Dates	Virus type	Virus strains	Ab related to	References
1987-1988	Reassortant swine H1N2 (hu-like sw H3N2 x av-like sw H1N1)	A/Sw/France/5027/87	A/Sw/Finistere/82	Gourreau, 1994
From 1994	Reassortant human-like swine H1N2 (reassortant hu-like sw H3N2 x hu-like sw H1N1)	A/Sw/Cotes d'Armor/797/97 A/Sw/Cotes d'Armor/800/00	A/Sw/Scotland/94 A/USSR/77	Marozin, 2002

AFSSA
AGENCE FRANÇAISE
DE SÉCURITÉ ALIMENTAIRE
ET DES CHAÎNES ALIMENTAIRES

ESNIP Meetingposium, Gent, Belgium, 4-6 June 2008

Serological surveillance in France, 2001-2007




- ESNIP 1 (2001-2003): **Brittany**, 55 herds, 315 sera (Madec, 2004, van reeth, 2004)
- Fort Dodge (2006): **Other regions than Brittany**, 58 herds, 348 sera (Guillaume, 2007)
- Fort Dodge (2006): **Brittany**, 62 herds, 492 sera (Labarque, 2008)
- AFSSA (2006-2007): **Brittany + Pays Loire + Basse-Normandie**, 125 herds, 1875 sera (Kuntz-Simon, unpublished)

	Subtype	Fatteners	Herds
H1N1 = dominant subtype	H1N1		
	1. A/Sw/Bel/1/98	29 %	44 %
	2. A/Sw/Bel/1/98	24 %	41 %
	3. A/Sw/Bel/1/98	54 %	81 %
H3N2 = no serological evidence for circulation (cross-reactive Ab) except in Nord-Pas-de-Calais	H3N2		
	1. A/Sw/Flanders/1/98	0 %	0 %
	2. A/Sw/Flanders/1/98	4 %	7 %
	3. A/Sw/Flanders/1/98	6 %	13 %
H1N2 = circulation in Brittany and Basse-Normandie but not elsewhere	H1N2		
	1. A/Sw/Scotland/410440/94	26 %	42 %
	2. A/Sw/Gent/7625/99	2 %	2 %
	3. A/Sw/Gent/7625/99	38 %	56 %
	4. A/Sw/Scotland/410440/94	34 %	54 %

ESNIP Meetingposium, Gent, Belgium, 4-6 June 2008

Sampling in affected herds and laboratory investigations

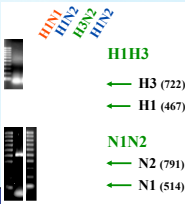


> Acute respiratory disease: fever, loss of appetite, cough,...

Commemoratives: vaccination, co-infections, age, movements...

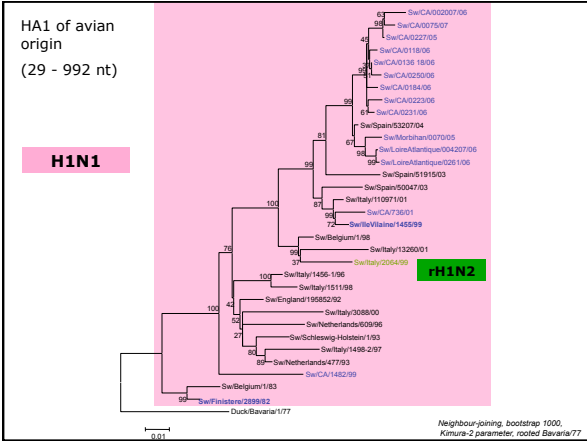
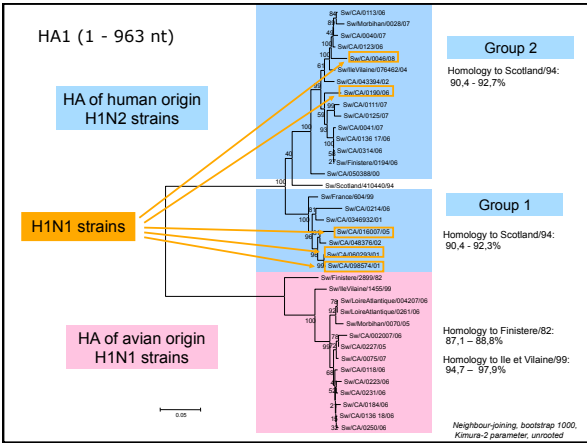
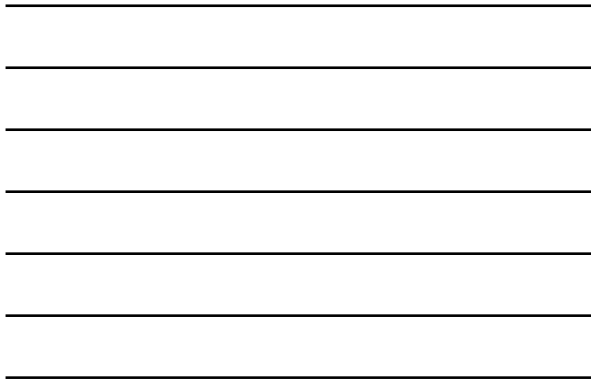
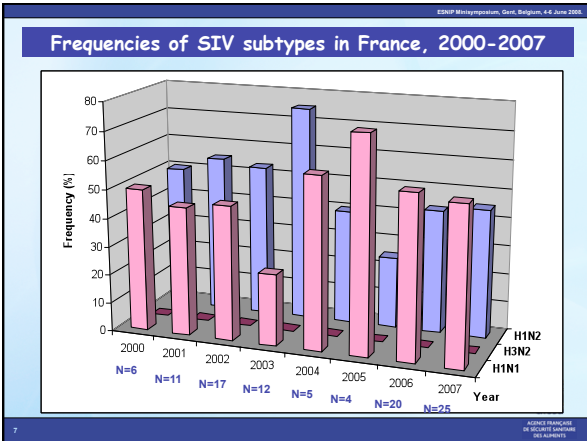
Nasal swabs in 10 individuals with hyperthermia

- > virus isolation: MDCK cells or embryonated eggs (+ isolates from LDA22)
- > HA test
- > sub-typing: double RT-PCR multiplex (Kuntz-Simon, 2005 ; Chiapponi, 2003)
- > HA and NA sequencing
- > partial sequencing of internal genes
- > phylogenetic analyses
- > antigenic characterization (HI test, NI test)



Blood samples in the same 10 animals

- + 2nd blood samples three weeks later
- > seroconversion ascertainment: HI test




ESNIP Meeting report, Ghent, Belgium, 4-6 June 2008

Discussion (2)

Farm « CAV » (Côtes d'Armor):
farrow-to-finish, no vaccination, outbreaks at 7 weeks of age

2000:	avian-like H1N1
2001 (spring):	reassortant H1N1 (G1)
2001 (autumn):	reassortant H1N1 (G1)
2002 :	reassortant human-like H1N2 (G1)
2005 (July):	reassortant H1N1 (G1)
2007 (March):	reassortant human-like H1N2 (G2)

3 strains rH1N1 genetically and antigenically closely related
evidence for the adaptation in pigs ?


 AGENCE FRANÇAISE
 DE SÉCURITÉ ALIMENTAIRE
 ET DES ALIMENTS

16


ESNIP Meeting report, Ghent, Belgium, 4-6 June 2008

Discussion (3)

Farm « BAL » (Côtes d'Armor):
farrow-to-finish, 900 sows, vaccination of sows since 2004, most of outbreaks at 7 weeks of age

2002 (October):	reassortant human-like H1N2
2003 (September):	reassortant human-like H1N2
2006 (March):	reassortant human-like H1N? (Ha of human origin)
2006 (August):	reassortant H1N1* (G2)
2006 (September):	avian-like H1N1
2008 (February):	reassortant H1N1 (G2)
2008 (March):	<i>reassortant H1N2 with HA of avian origin ? characterization in progress</i>

*** Consequence(s) of the mutation/deletion in antigenic site, close to the RBS ? (detection, affinity to the receptor ?)**


 AGENCE FRANÇAISE
 DE SÉCURITÉ ALIMENTAIRE
 ET DES ALIMENTS

17

ESNIP Meeting report, Ghent, Belgium, 4-6 June 2008

Acknowledgements

AFSSA-LERAPP, Ploufragan

VIP Unit
Nathalie Franck
Stéphane Quéguiner
Stéphane Gorin

EBEP Unit
Éric Eveno
Nicolas Rose
François Madec

SPPAE
Roland Cariolet


LDA22, Ploufragan


**Jean-Philippe Buffereau
Marie-Agnès Baudouard**


H. Guillmoto, R. Roche and
all the veterinarians

The farmers...

CNR Lyon
Martine Valette


 European Coordination Action ESNIP2
 SSPE-CT-2005-0227749


 PRIR 2183 FLUPORC


 AGENCE FRANÇAISE
 DE SÉCURITÉ ALIMENTAIRE
 ET DES ALIMENTS

18
