

Tipos de virus influenza			
	Tipo A	Tipo B	Tipo C
Reservorios animales	Sí	No	No
Gravedad	+++	++	+
Pandemias humanas	sí	no	no
Epidemias humanas	sí	sí	no (esporádico)
Canvios antigenicos	shift, drift	drift	drift

### Nomenclatura

gruppo → A/equine/Saskatoon/1/90(H3N8)  
 especie → Subtipo HA y N  
 lugar → año  
 N° del aislado

- A/equino/Praga/1/56(H7N7)
- A/aviar/Hong Kong/1/98(H5N1)
- A/cerdo/Lincoln/1/86(H1N1)

Hemagglutinin subtypes		Neuraminidase subtypes	
H1		N1	
H2		N2	
H3		N3	
H4		N4	
H5		N5	
H6		N6	
H7		N7	
H8		N8	
H9		N9	
H10			
H11			
H12			
H13			
H14			
H15			

### Subtypes of Influenza A Virus

- Many subtypes (H and N)
- 3 subtypes have caused human epidemics
  - H1N1
  - H2N2
  - H3N2
- Subtypes that usually infect birds but have caused infections in humans:
  - H5, H7 and H9

(Karl G Nicholson, et al Lancet 2003; 362: 1733-45)

World Health Organization

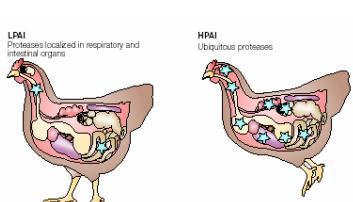
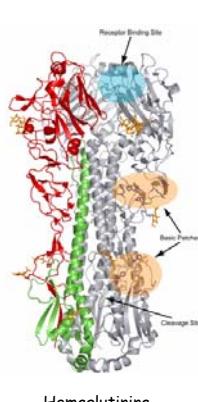
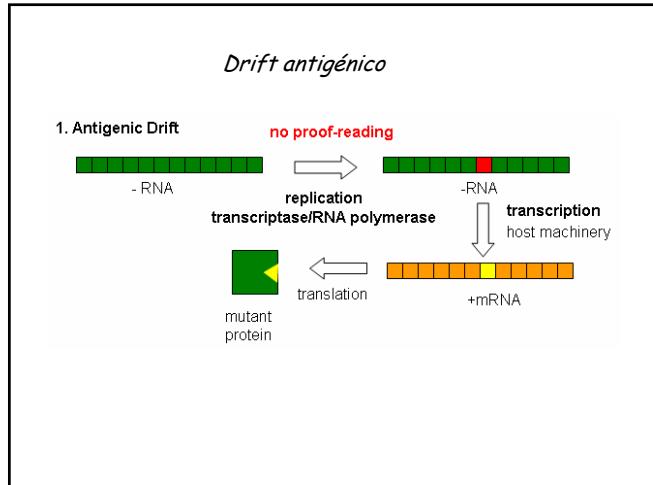


Figure 4 | Hemagglutinin (HA) as a major determinant of the pathogenicity of avian influenza viruses in poultry. Post-translational proteolytic cleavage of the HA precursor molecule (HA0) into HA1 and HA2 subunits by host proteases generates a trypsinogen domain at the N-terminus of the HA (HA1 subunit), which mediates fusion between the viral envelope and the endosomal membrane. The HA1 subunit activation of the HA molecule is essential for viral infectivity. The HA of low-pathogenicity avian influenza (LPAI) viruses do not contain a series of basic amino acid (PCT) at the protease cleavage site and are cleaved by proteases that are localized in respiratory and intestinal organs, resulting in local infections. By contrast, the HA of high-pathogenicity avian influenza (HPAI) viruses possess multiple basic amino acids at the cleavage site (IEFRRIKRR), which are cleaved by ubiquitous proteases in a wide range of organs, resulting in lethal systemic infection.

Fuente: Horimoto y Kawaoka, 2005. *Nature Rev Microbiol*, 3: 591-600




---



---



---



---



---



---



---



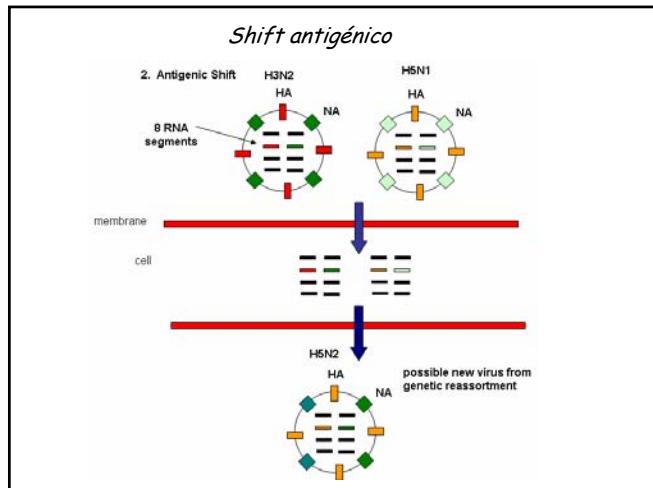
---



---



---




---



---



---



---



---



---



---



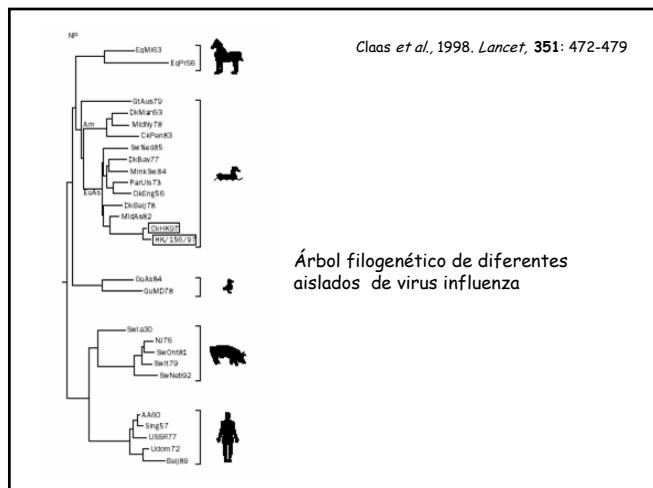
---



---



---




---



---



---



---



---



---



---



---



---



---

### Gripe en cerdos

1918	Primeras descripciones (gripe española)
1930	Primer aislamiento de cerdos (H1N1 → cepas clásicas)
1976	H1N1 llega a Europa
1979-80	H1N1 de origen aviar circulan en Europa
1984	Se detectan H3N2 de origen humano
1994	Se detectan virus H1N2

H1N1	Clásicas	→ Todo el Mundo
	Aviares	→ Europa (1976) y Ásia

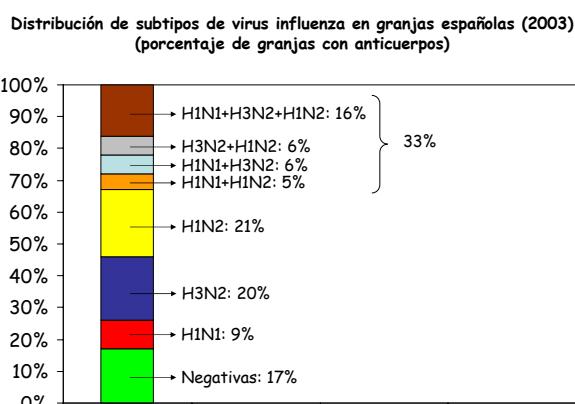
  

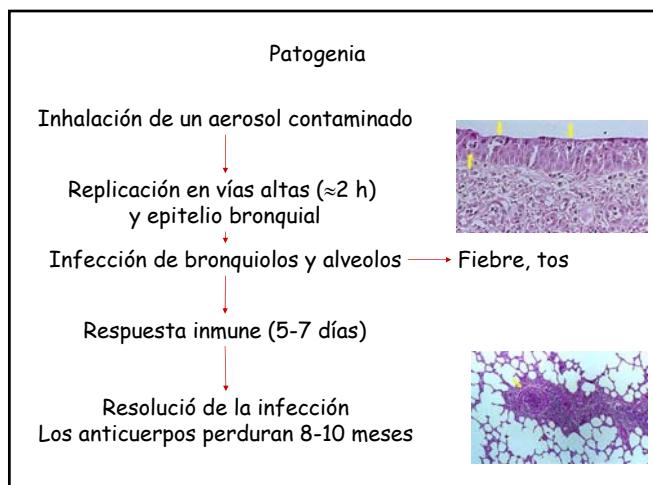
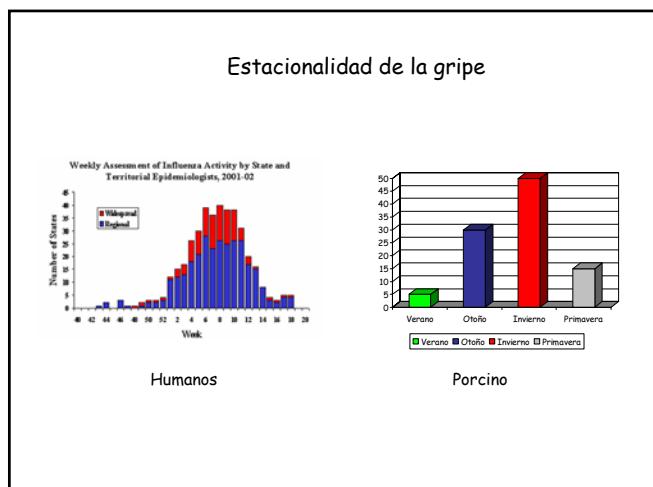
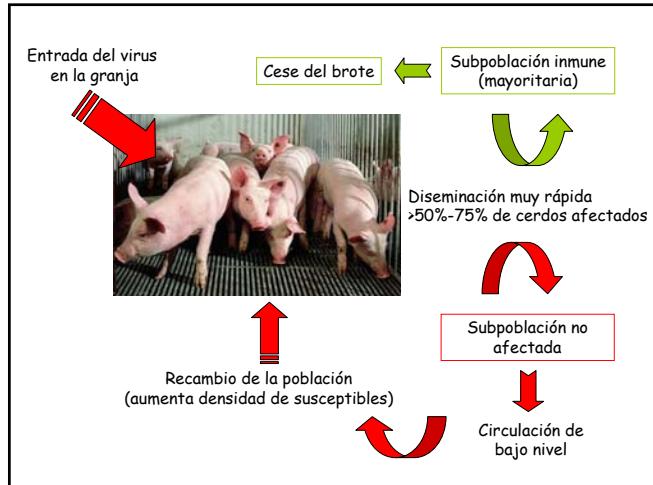
H3N2	Humanas	→ Todo el Mundo
	Aviares	→ Ásia

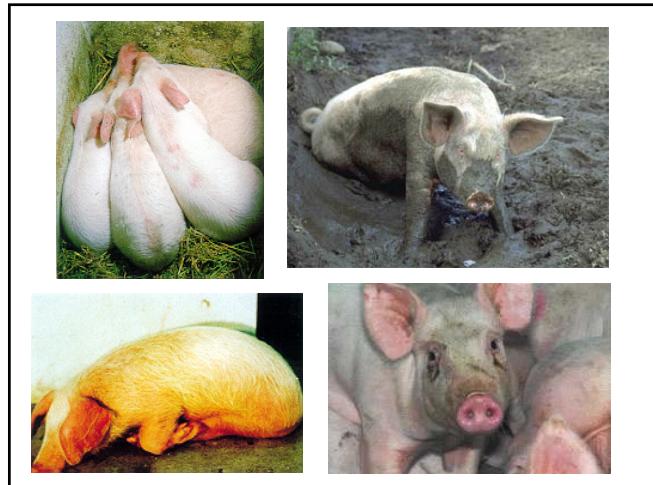
  

H1N2	Humanas	→ Europa y Ásia (1990s)
	Clásica/humana	→ Ásia

Otros tipos poco frecuentes: H4N6, H3N3, H9N2








---

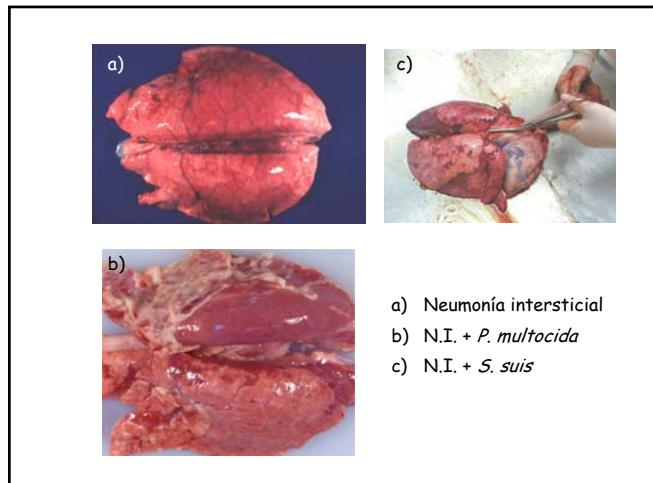
---

---

---

---

---




---

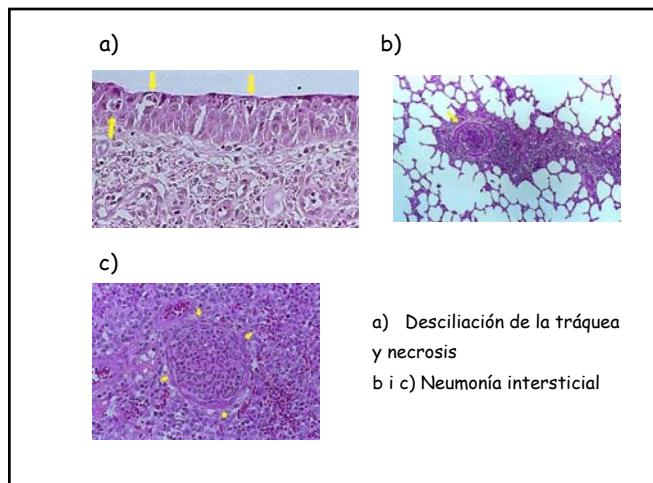
---

---

---

---

---




---

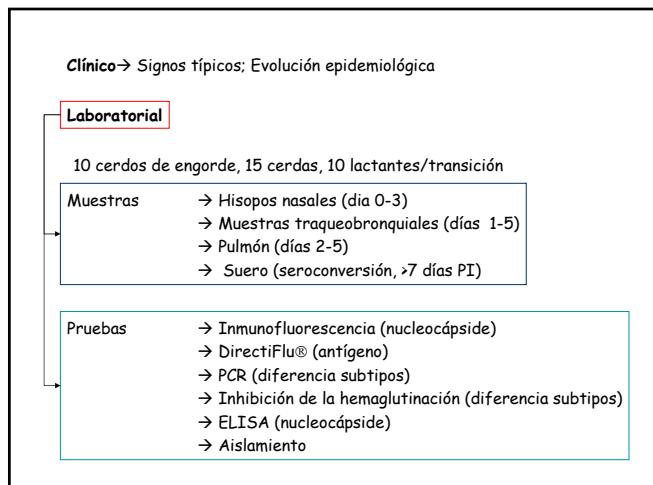
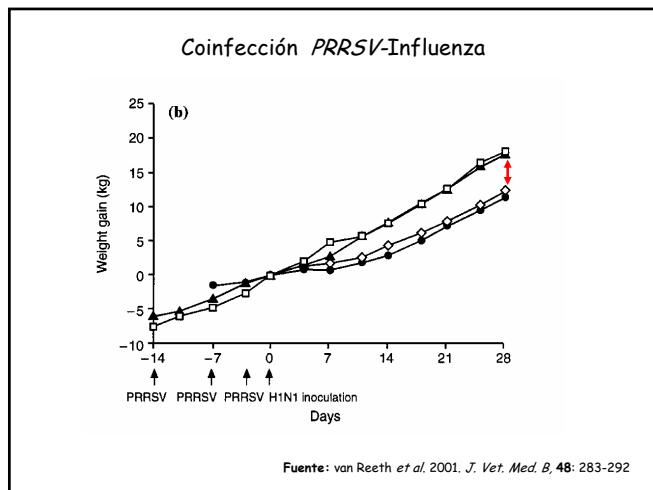
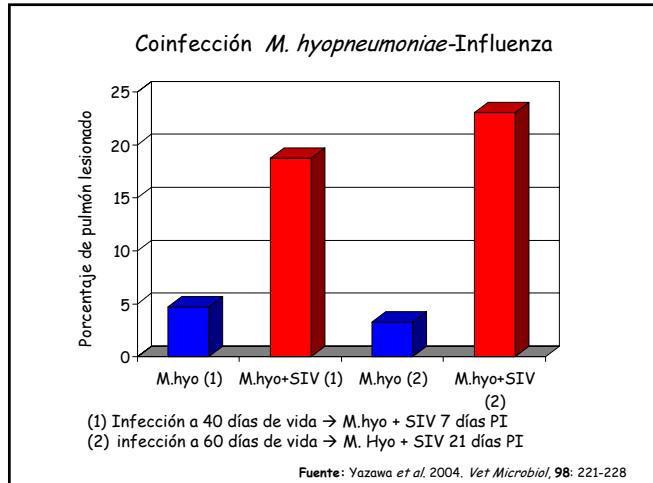
---

---

---

---

---



## Prevención y control

El principal efecto de la vacunación es la atenuación del cuadro clínico (prevención abortos)

Situaciones en las que resulta aconsejable vacunar

- Circulación continua de virus
- Infecciones concurrentes muy frecuentes
- Granjas sobre pobladas
- Sistemas de manejo continuo
- Entradas sin control o de origen dudoso

Vacunación de las cerdas → 2 dosis separadas tres semanas/2 veces por año  
La protección es específica de subtipo y variante

## Riesgo de transmisión de los cerdos a las personas

	Título medio geométrico		
	H1N1 porcino	H1N2 porcino	H3N2 porcino
Granjeros	10.3 <sup>a</sup>	12.5 <sup>a</sup>	22
Industrias cárnica	6.2	6.8	54
Veterinarios	8.9 <sup>a</sup>	11.3 <sup>a</sup>	28.3
Controles	5.1	5.6	37.9

	Odds Ratio		
	H1N1 porcino	H1N2 porcino	H3N2 porcino
Granjeros	35.3	13.8	0.4
Industrias cárnica	6.5	2.7	n.s
Veterinarios	17.8	9.5	n.s

Fuente: Myers et al. 2006. *Clin Infect Dis*, 42: 14-20

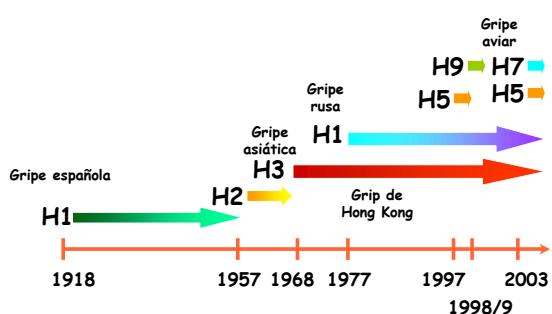
## Gripe humana

### Pandemias atribuidas a la gripe

Year(s)	Origin	Virus type
1729–1730	Russia	
1732–1733	Russia	
1781–1782	Russia/China?	
1830–1831	Russia/China	
1833	Russia	
1889–1890	Russia (Asia)	H2
1899–1900	?	H3*
1918–1919	USA/France?	H1N1
1957	China	H2N2
1968	China	H3N2
1977	China	H1N1

Fuente: Hampson W. 1997. Surveillance for pandemic influenza. *J Infect Dis*, 176 (Suppl 1): S8-S13

### Emergencia de virus Influenza A en personas



### Pandemias de gripe en el siglo XX



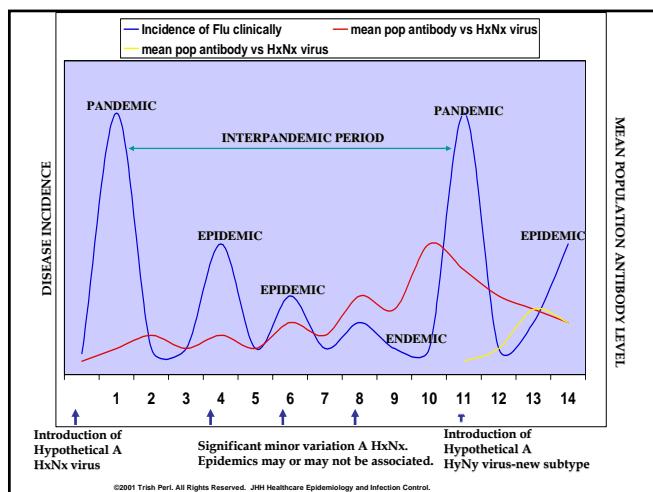
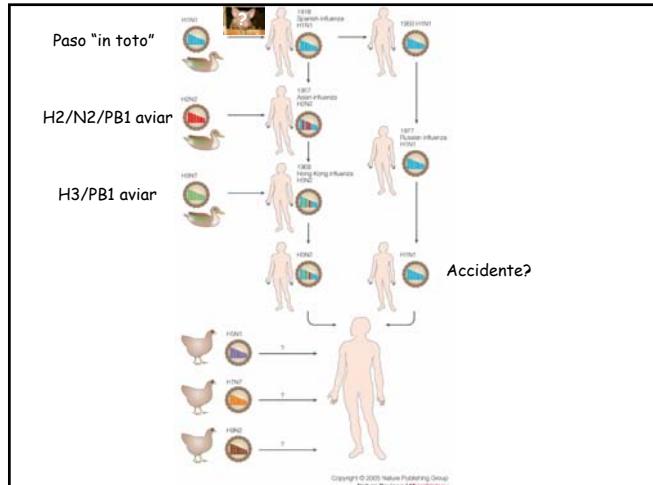
Credit: US National Museum of Health and Medicine

**1918: Gripe española**  
20-40 millones de muertos A(H1N1)

**1957: Gripe asiática**  
1-4 millones de muertos A(H2N2)

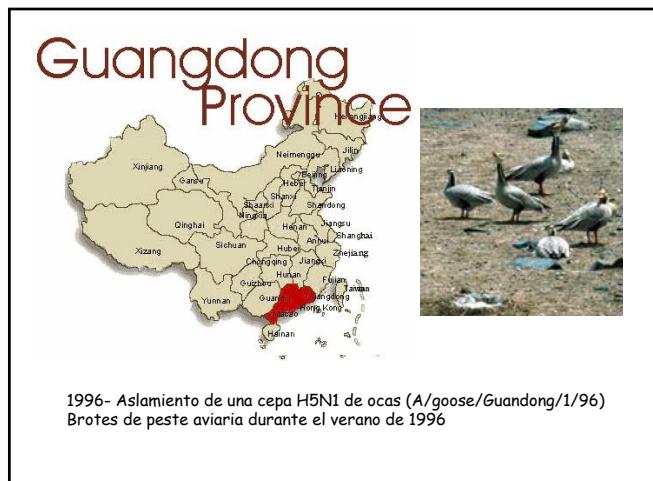
**1968: Gripe de Hong Kong**  
1-4 millones de muertos A(H3N2)

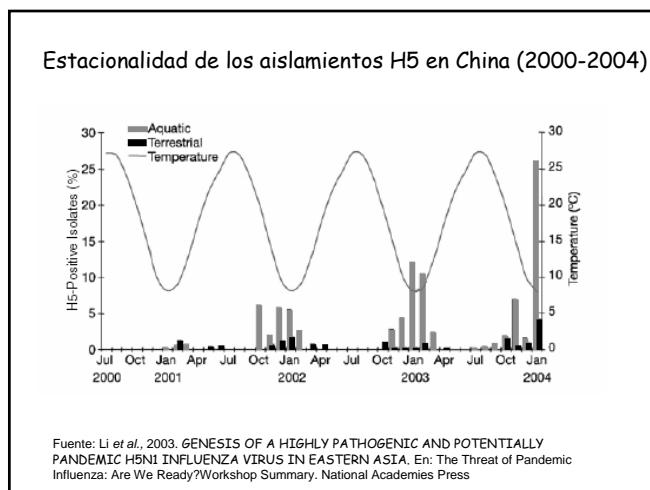
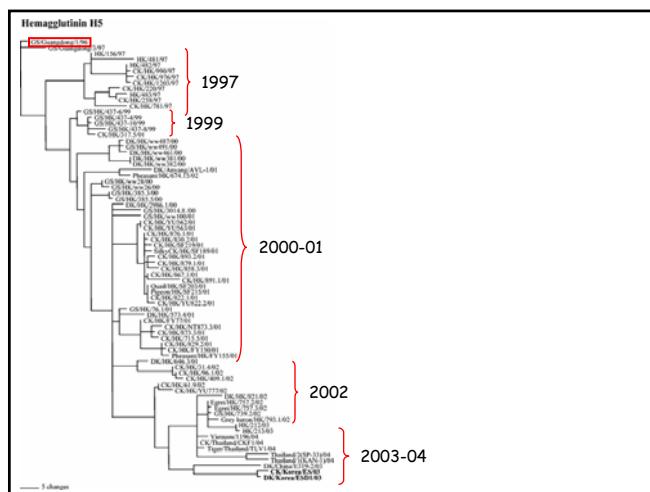
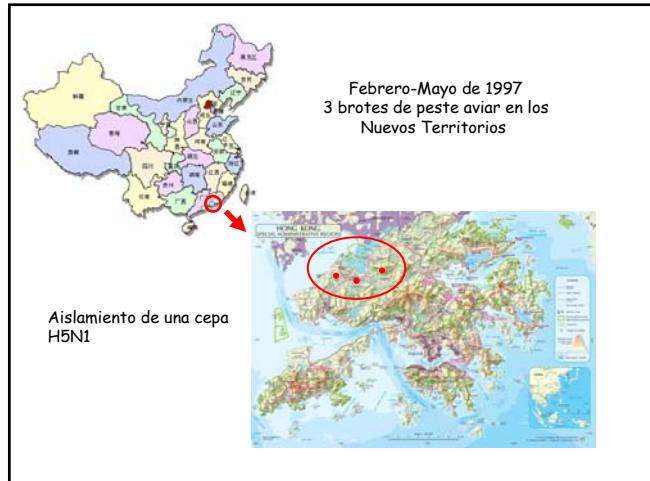
A partir de: Communicable Disease Surveillance and Response, WHO

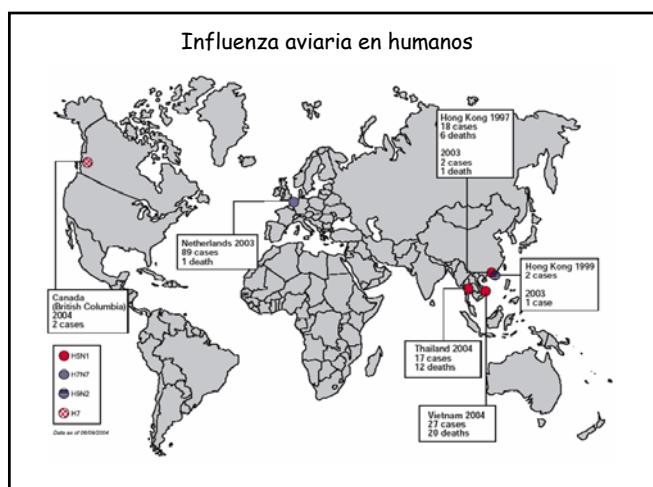
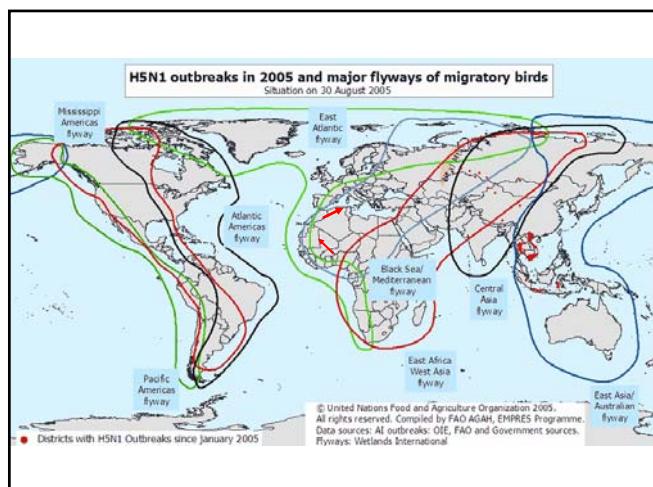
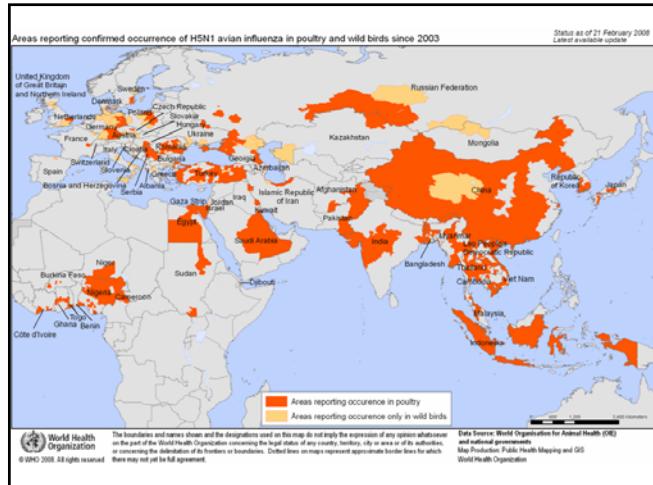


Recent Outbreaks of Avian Influenza in Poultry				
Year	Subtype	High pathogenicity?	Location	Birds killed
1983	H5N2	yes	Pennsylvania	17 million
1995	H5N2	yes	Mexico	?
1997	H5N1	yes	Hong Kong	1.6 million
1999-2000	H7N1	no	Italy	13 million
2002	H7N2	no	Virginia	4.7 million
2003	H7N7	yes	Netherlands	>30 million
2004	H5N1	yes	Asia	>100 million
2004	H7N2	no	Delaware	?
2004	H5N2	yes	Texas	?
2004	H7N3	yes	BC/Canada	?

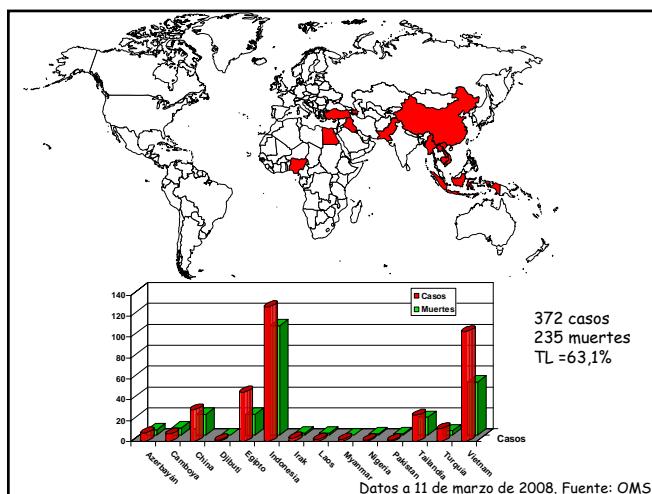
## Origen y evolución del virus H5N1





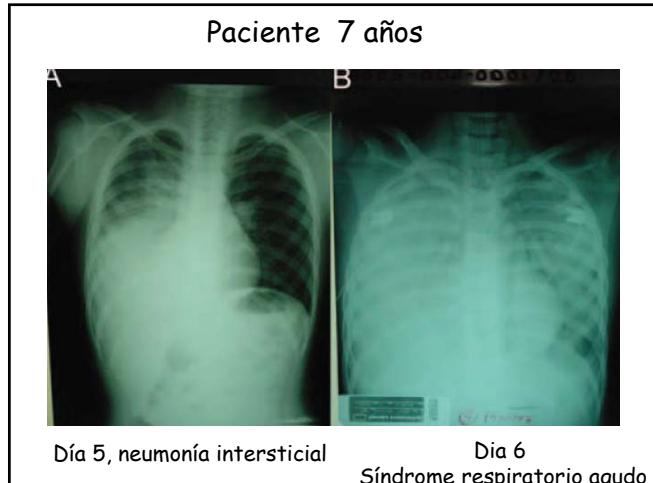


Influenza aviaria en humanos					
Año	Lugar	Cepa	Nº casos	Nº muertes	Letalidad
1997	Hong Kong	H5N1	18	6	0,33
1999	Hong Kong	H9N2	2	0	0,00
2003	Hong Kong	H5N1	2	1	0,50
2003	Holanda	H7N7	89	1	0,01
2003	Hong Kong	H9N2	1	0	0,00
2004	Vietnam	H5N1	22	15	0,68
2004	Tailandia	H5N1	11	7	0,64
<b>Total</b>			<b>140</b>	<b>30</b>	<b>0,21</b>



Clinical presentation — no./total no. (%)					
Fever (temperature >38°C)	17/18 (94)	17/17 (100)	10/10 (100)	10/10 (100)	4/4 (100)
Headache	4/18 (22)	NS	NS	1/10 (10)	4/4 (100)
Myalgia	2/18 (11)	9/17 (53)	0	2/10 (20)	NS
Diarrhea	3/18 (17)	7/17 (41)	7/10 (70)	NS	2/4 (50)
Abdominal pain	3/18 (17)	4/17 (24)	NS	NS	2/4 (50)
Vomiting	6/18 (33)	4/17 (24)	NS	1/10 (10)	0
Cough§	12/18 (67)	16/17 (94)	10/10 (100)	10/10 (100)	4/4 (100)
Sputum	NS	13/17 (76)	5/10 (50)	3/10 (30)	NS
Sore throat	4/12 (33)	12/17 (71)	0	0	1/4 (25)
Rhinorrhea	7/12 (58)	9/17 (53)	0	0	NS
Shortness of breath§	1/18 (6)	13/17 (76)	10/10 (100)	10/10 (100)	NS
Pulmonary infiltrates	11/18 (61)	17/17 (100)	10/10 (100)	10/10 (100)	4/4 (100)
Lymphopenia¶	11/18 (61)	7/12 (58)	NS	8/10 (80)	1/2 (50)
Thrombocytopenia	NS	4/12 (33)	NS	8/10 (80)	1/2 (50)
Increased aminotransferase levels	11/18 (61)	8/12 (67)	5/6 (83)	7/10 (70)	NS

Fuente: Writing Committee of the World Health Organization (WHO) Consultation on Human Influenza A/H5  
NEJM, 353: 1374-1385



---

---

---

---

---

---

### Actuación ante una posible pandemia

---

---

---

---

---

---

1. El surgimiento de pandemias de gripe es inevitable
2. Una pandemia se produce cuando:
  - Un nuevo subtipo se introduce en una población virgen
  - Es virulento
  - Y se transmite eficientemente entre personas
3. Hoy por hoy, resulta imposible predecir cuando ocurrirá

---

---

---

---

---

---

---

---



La OMS ha puesto en marcha una red mundial de alerta y respuesta frente a epidemias

Fases de una pandemia según la OMS					
Interpandémica		Alerta Pandémica			Pandémica
Fase 1	Fase 2	Fase 3	Fase 4	Fase 5	Fase 6
Ningún nuevo virus en humanos	Ningún nuevo virus en humanos	Nuevo virus para los humanos	Pequeños focos, localizados	Focos grandes, localizados	Diseminación sostenida y masiva en la población humana
Virus animal de bajo riesgo para humanos	Virus animal de alto riesgo para humanos	Poca o ninguna diseminación entre personas	Diseminación limitada entre personas	Diseminación limitada entre personas	

↑  
Actualmente

---



---



---



---



---



---



---