



## Incursion of H5N1 'Asian lineage' virus into Europe: source of introduction?

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## Surveillance systems in EU

- Passive systems :disease
- Apparent increase in H5/H7
- Knowledge of LPAI (NAI) H5/H7
  
- Formal programmes since 2003 for active surveillance in poultry
  
- Also wild birds

## AI survey in wild birds

- Diversity of species
  - waterfowl, shorebirds & other free-living birds
- Virus detection using faecal material
  - test sample pools from same host species
- Results received from high proportion of MS's
- eg 7482 samples examined in 2004 with:
- 214 (2.9%) influenza A viruses
  - 15 x H5
  - 7 x H7

## Avian influenza viruses isolated in Europe 2003/4

### H5 & H7 subtypes

#### LPAI in wild ducks

H5N2/3 in Germany

H5N2 in Denmark

H7N1 in Germany

H7N3/7 in Germany

H7N4/7 in Italy

H5/H7 in Sweden

#### HPAI in other birds

H5N1 in smuggled Eagles in Belgium

## Avian influenza viruses isolated in Europe in 2003/4

### Other subtypes

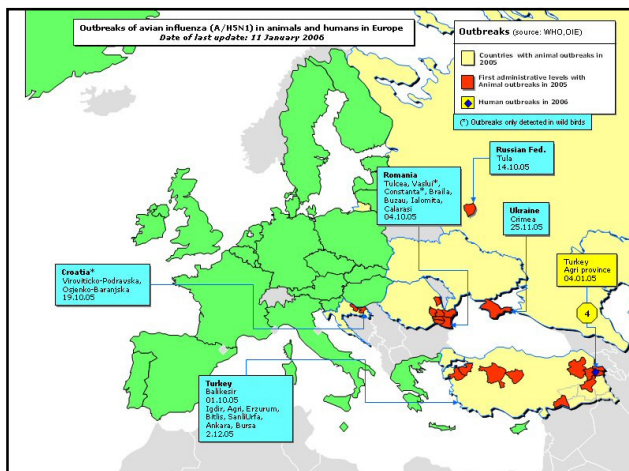
In wild birds:

**Ducks and geese** H1N1, H2N3, H3N2, H3N8, H4N6, H6N1, H6N2, H6N5, H6N6, H6N8, H9N9, H10N4, H10N5, H10N6, H10N7, H11N9

**Other birds** H9N9, H10N4, H13N6, H16N3

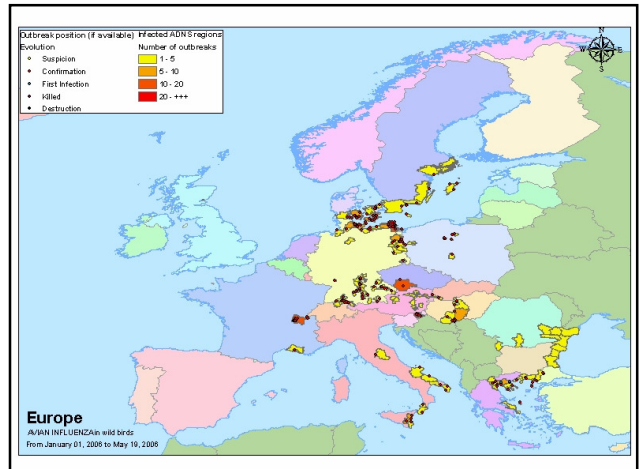
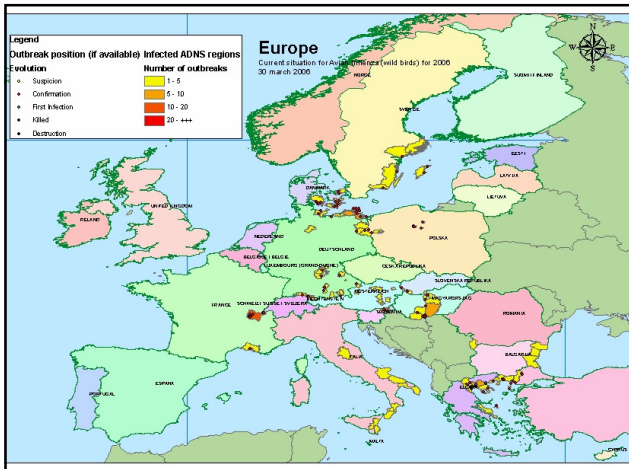
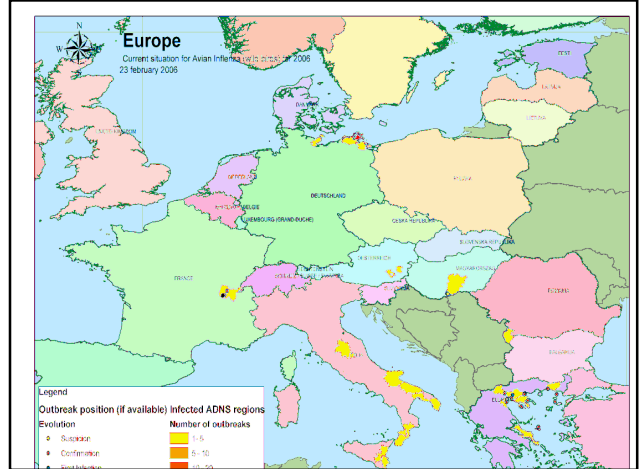
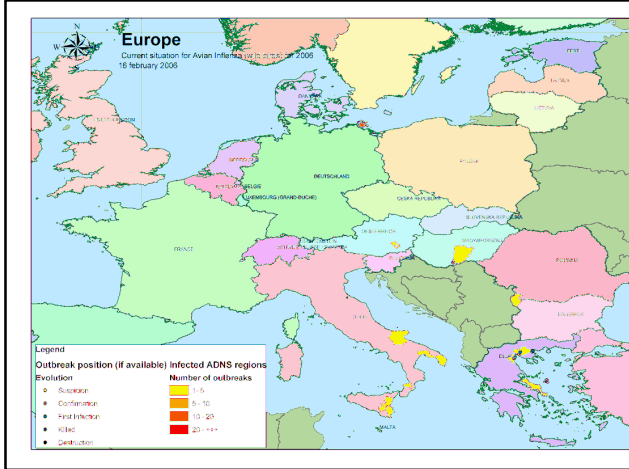
## Enhancement of surveillance in wild birds

- Following westward spread :
- To investigate possible role of wild birds
- Potential for early warning
- Ongoing surveillance in dead wild birds
- September 2005, Brussels meeting
  - Broad guidelines for surveillance in healthy birds
  - 15 target species based on perceived risk



## Wild bird surveillance

- Active
  - In excess of 45,000 wild birds tested
  - October 05 to January 06
  - A number of LP H5 (principally N2/N3 but also N1 in Italy) viruses detected in eight EU member states
  - **NO H5N1 HPAI**
  - Programme extension to dead wild birds



### Detection in Europe

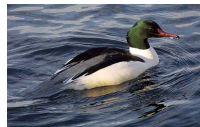
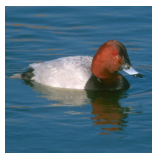
Country (estimated 1 <sup>st</sup> report)	Wild birds	Poultry
Turkey (Oct 2005)	+	+
Romania (Oct 2005)	+	+
Croatia (Oct 2005)	+	-
Ukraine (Dec 2005)	?	+
Azerbaijan (Jan 2006)	+	+
Bulgaria (Jan 2006)	+	-
Greece (Jan 2006)	+	-
Italy, Austria, Slovenia, Bosnia-H, Hungary, Poland, Slovakia, Switzerland, Sweden, Denmark, Albania, Serbia-Montenegro, Slovenia, UK (to April 2006)	+	-/+
France, Germany	+	+



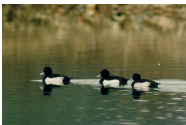
Mute swans seem to have been good sentinels: role for spread of H5N1 in Europe?

European countries HPAI H5N1 reported in swans January – May 2006

Croatia, Germany, Italy, Austria, Bosnia, Greece, Bulgaria, Slovenia, Hungary, Russia, Poland, Serbia, Sweden, France, UK and Azerbaijan, Kazakhstan & Iran



France [pochard], Switzerland [goosander], Denmark [buzzard, tufted ducks, scaup], Sweden [tufted ducks, scaup]



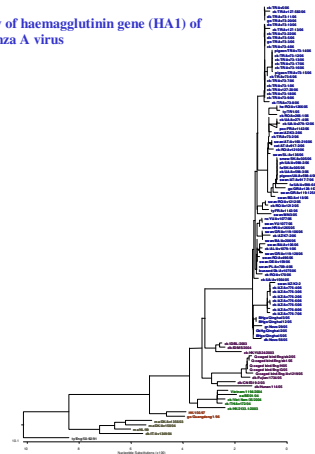
### Analyses of H5 viruses

- Based on submission of viruses or clinical materials from 25 countries
  - October 2005 to date
- Study of molecular epidemiology using the haemagglutinin gene
- Analysis ongoing but data preliminary

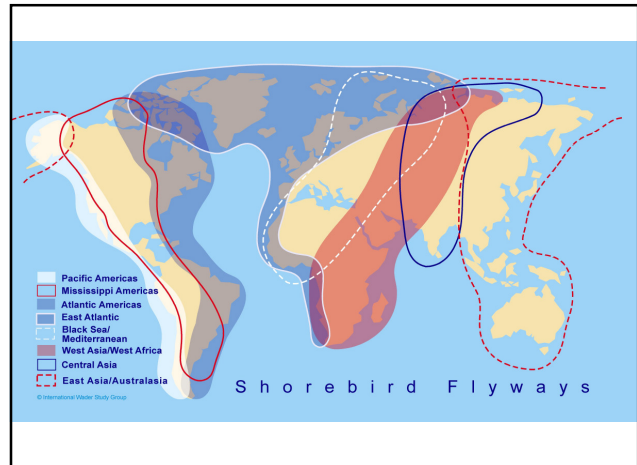
## Pathogenicity

- HA cleavage site motif predominantly
  - **PQGERRRKKRGLF**
  - **PQGERIRKKRGLF**
  - **PQGERKRRKKRGLF**
  - **PQGEKRRKKRGLF**
- IVPI 3.0
  - Embryo lethal agent <20 hours
  - Preliminary data in-vivo
- Broad host range including spread to mammals
  - Cats, Humans, Stone Marten, Mink, Dog, Fox?

## Phylogeny of haemagglutinin gene (HA1) of H5 influenza A virus

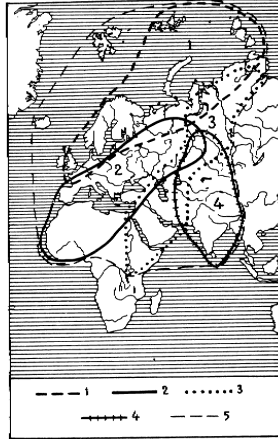


## Phylogeny of haemagglutinin gene (HA1) of H5 influenza A virus detected in Europe 2005-6



Isakov's (1967) main geographical populations of Anatidae in western Eurasia. Flyway coding:

- Northern White Sea/North Sea population;
- European Siberia/Black Sea-Mediterranean population;
- West Siberian/Caspian/Nile population; and
- Siberian-Kazakhstan/Pakistan-India population.



## Observations

- H5N1 detected in over 700 dead wild birds
- High similarity with viruses from Eastern Asia
- Carriage by wild birds but also poultry movement?
- Primary introduction via wild birds?
- Influence of weather and seasonality
- Infection locally of wild birds from outdoor poultry?
- Some species of wild bird highly susceptible and visible!
- Spread to poultry generally as a result of limited biosecurity

## Key questions

- What are the key wild bird reservoirs?
- Host specie range/susceptibility?
- Dynamics of infection in wild birds?
  - Low prevalence in healthy birds
- Are H5N1 HPAI viruses endemic in wild bird populations?

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