# Emerging Diseases

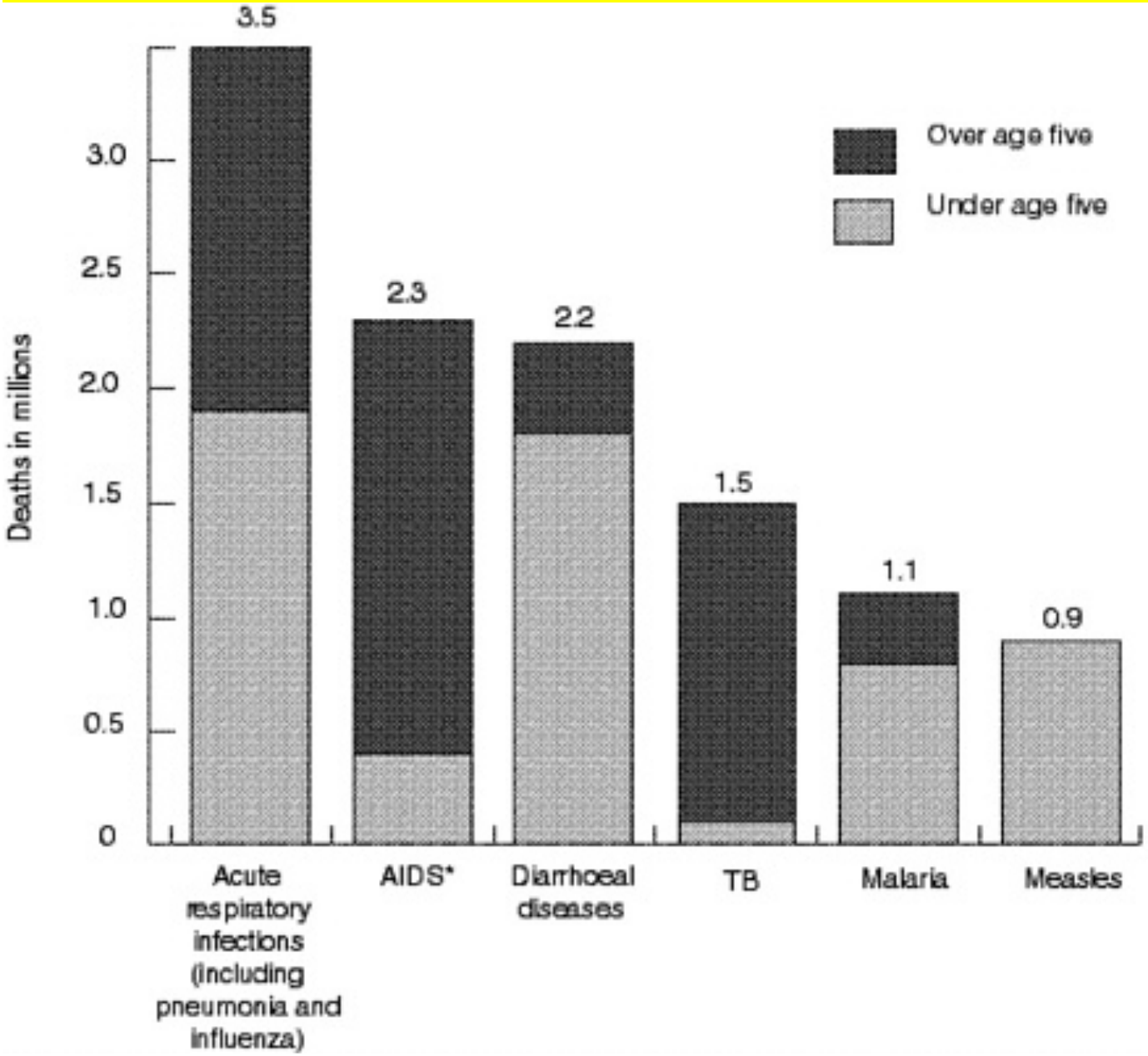
Sören Thybo,. Epidemiklinikken, RH

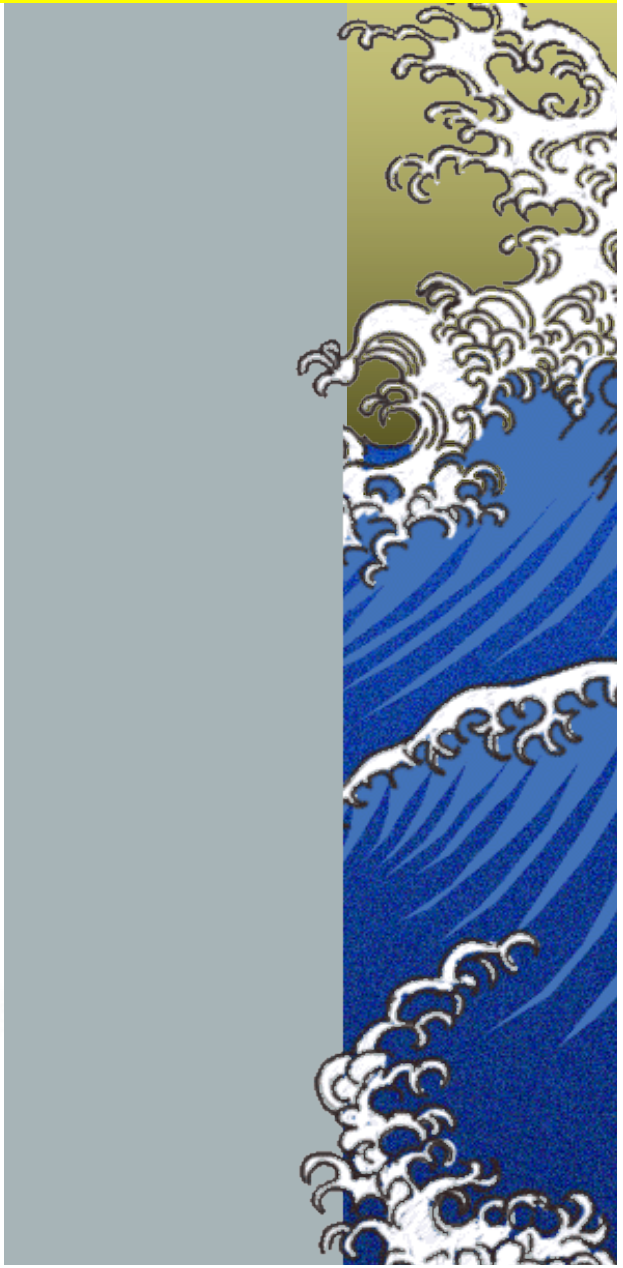
**Mass treatment**
**Spanish Flu**
**2018-9**

# Emerging Dissese Part 1
# Previous Epidemics

Sören Thybo

# *Non-emerging diseases:How Trivial !*



# *Emerging diseases*

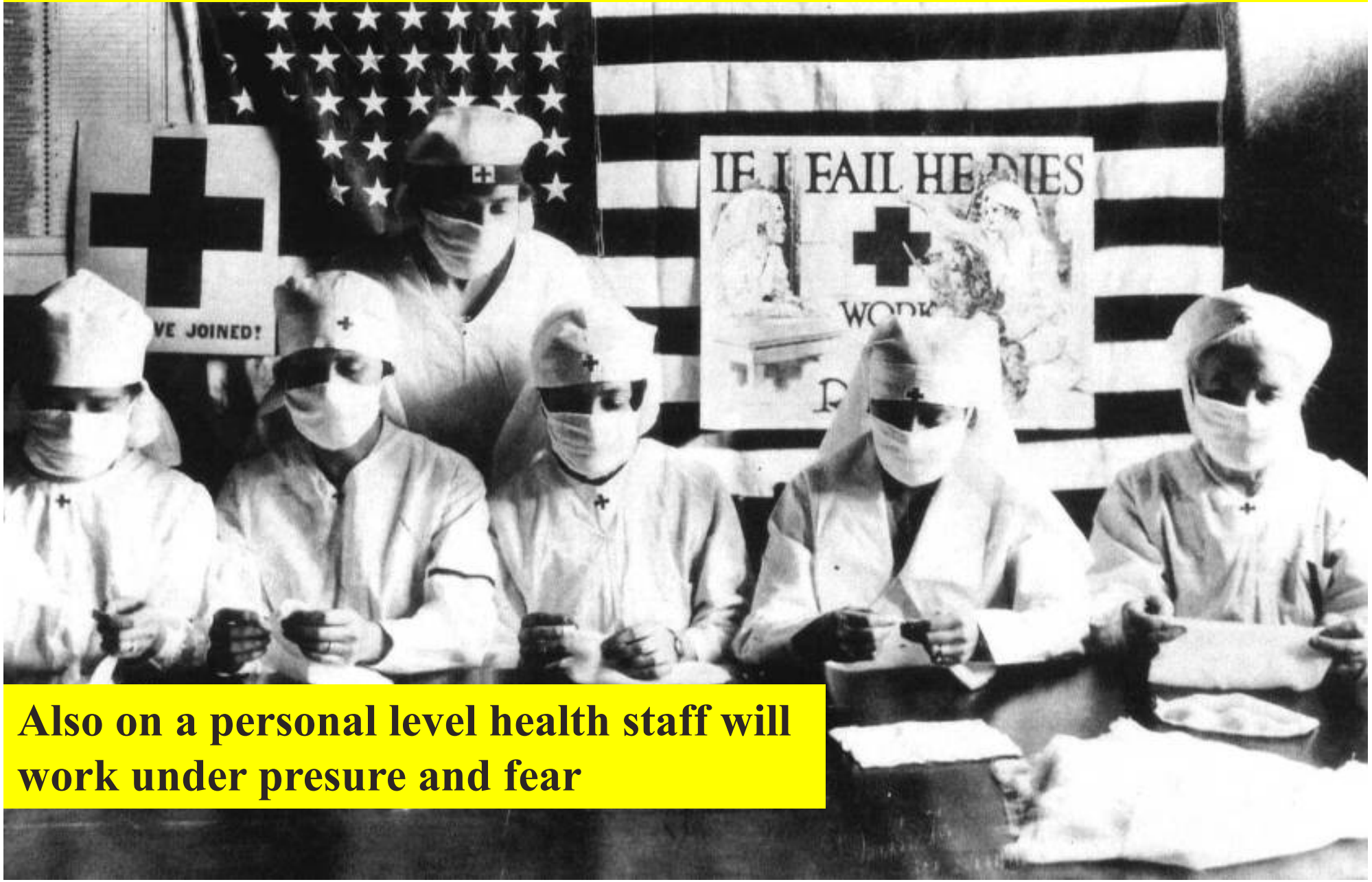
***Dramatic public health measures Often not rational , at times even but very irrational dictated by fear and felt political needs***

# *Emerging infectious diseases*

CENTER FOR
BIOSIKRING OG
BIOBEREDSKAB

**På SSI siden 2009**
**The Danish stand-by Task force- so far never engaged in significant action**

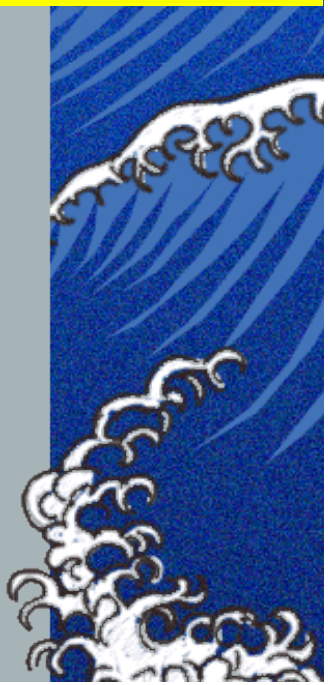
# *Dramatic emerging diseases*

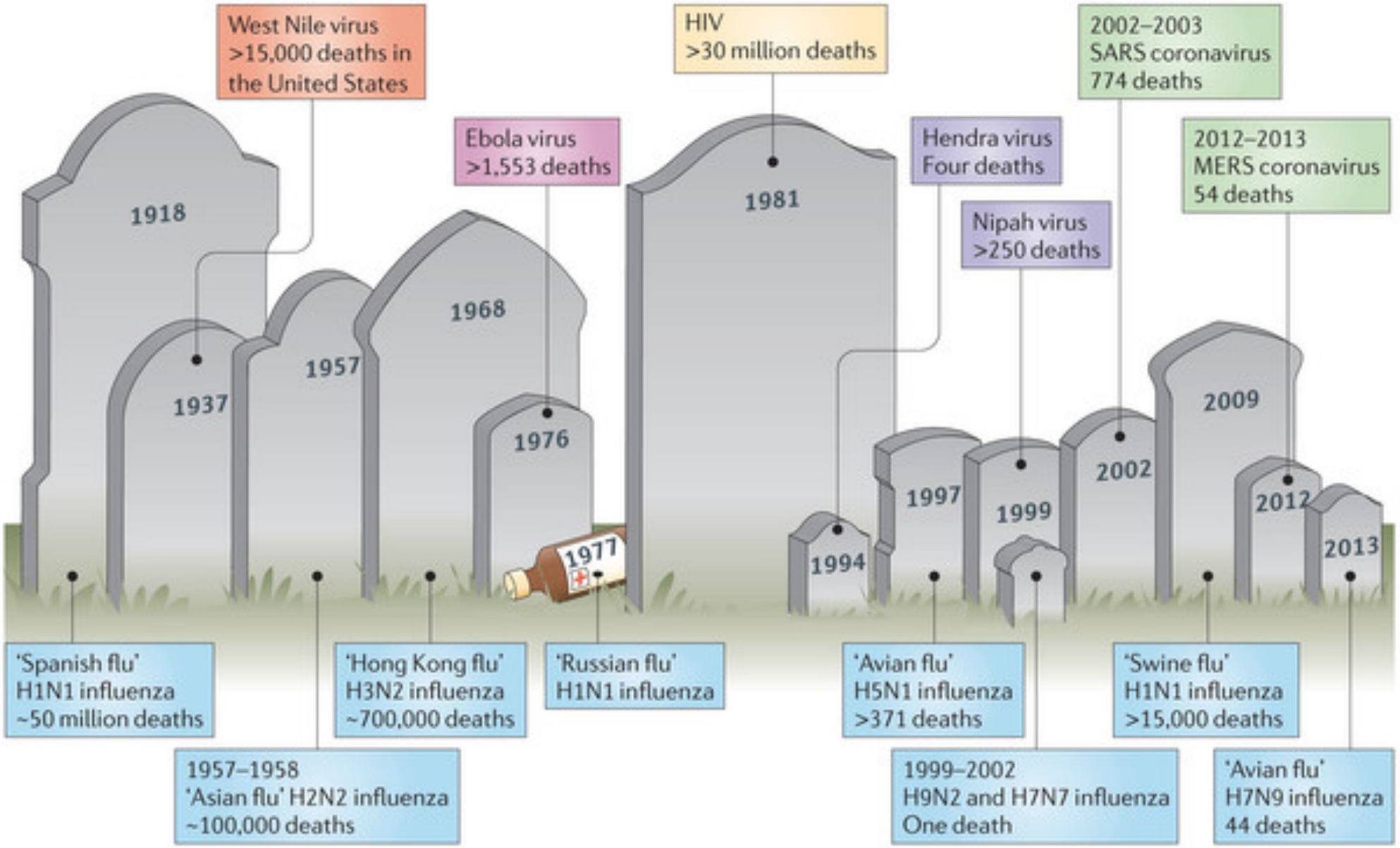



**Also on a personal level health staff will work under presure and fear**

| Year identified | Agent | Disease |
|---|---|---|
| 1973 | Rotavirus | Infantile diarrhoea |
| 1975 | Parvovirus B19 | Aplastic crisis in chronic haemolytic anaemia |
| 1976 | Cryptosporidium parvum | Acute and chronic diarrhoea |
| 1977 | Ebola Virus | Ebola haemorrhagic fever |
| 1977 | Legionella Pneumophila | Legionnaires' disease |
| 1977 | Hantaan Virus | Haemorrhagic fever with renal syndrome (HRFS) |
| 1980 | HTLV-1 | T-cell lymphoma-leukaemia |
| 1982 | E Coli O157:H7 | HUS |
| 1982 | Borrelia burgdoferi | Lyme disease |
| 1982 | HTLV-2 | Hairy cell leukaemia |
| 1983 | HIV | AIDS |
| 1983 | H Pylori | Peptic ulcer disease |
| 1986 | ~~BSE~~ Agent ? | Bovine spongiform encephalopathy in cattle (Mad cow disease) |
| 1988 | HHV-6 | Exanthem subitum |
| 1988 | Hepatitis E Virus | Enterically transmitted non-A. non-B hepatitis |
| 1989 | Hepatitis C Virus | Parenterally transmitted non-A. non-B liver hepatitis |
| 1992 | Vibrio cholerae O139 | New strain associated with epidemic cholera |
| 1992 | Bartonella henselae | Cat scratch diseases |
| 1995 | HHV-8 | Associated with Kaposi's sarcoma in AIDS patients |
| 1996 | Prion | CJD |
| 1997 | Influenza A virus (H5N1) | Avian fly (Bird flu) |
| 2003 | Corona Virus | SARS |
| 2009 | H1N1 | Pandemic A (H1N1) 2009 Influenza |

**Some recent ”emerging” diseases ofd the past-few with a significant public health impact**




West Nile virus
>15,000 deaths in the United States
HIV
>30 million deaths
2002–2003
SARS coronavirus
774 deaths
Ebola virus
>1,553 deaths
Hendra virus
Four deaths
2012–2013
MERS coronavirus
54 deaths
Nipah virus
>250 deaths
1918
1937
1957
1968
1976
1977
1981
1994
1997
1999
2002
2009
2012
2013
'Spanish flu'
H1N1 influenza
~50 million deaths
1957–1958
'Asian flu' H2N2 influenza
~100,000 deaths
'Hong Kong flu'
H3N2 influenza
~700,000 deaths
'Russian flu'
H1N1 influenza
'Avian flu'
H5N1 influenza
>371 deaths
1999–2002
H9N2 and H7N7 influenza
One death
'Swine flu'
H1N1 influenza
>15,000 deaths
'Avian flu'
H7N9 influenza
44 deaths

# Emerging Diseases

Sören Thybo

***www.promedmail.org***

## *Stay up-dated !*

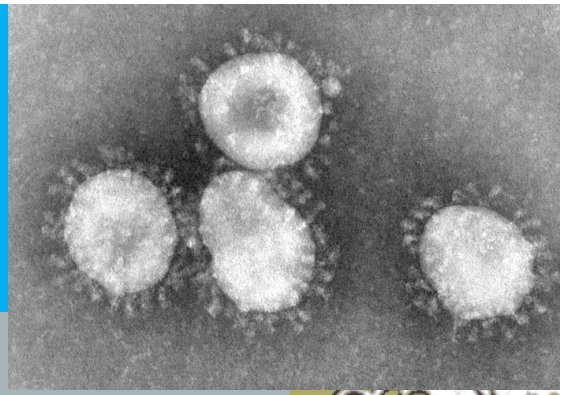
## *Very recommendable home page*

- 05 Oct 2016 Toxic spider bite - UK: false widow
- 05 Oct 2016 Zika & chikungunya viruses: comparative transmission
- 05 Oct 2016 Ciguatera poisoning - India: (KA) contaminated fish, 1st report
- 05 Oct 2016 Hospital supply contamination - Japan (02): IV bags
- 05 Oct 2016 Human coronavirus; neurologic disease
- 05 Oct 2016 Burkholderia cepacia - USA (03): long-term care, IV saline flushes, recall
- 05 Oct 2016 Legionellosis - Italy: (PR) fatal, RFI
- 05 Oct 2016 Crimean-Congo hem. fever - Pakistan (23): (SD) new case, fatal
- 05 Oct 2016 Diphtheria - Venezuela (02): (BO) resurgence, fatal, indigenous children
- 05 Oct 2016 Candida auris - Americas: emerg, drug-resist, nosocom pathogen, PAHO/WHO, alert


# Emerging Threats

**The emerging diseases since 2001 perceiced in the atmosphere of fear and terror**

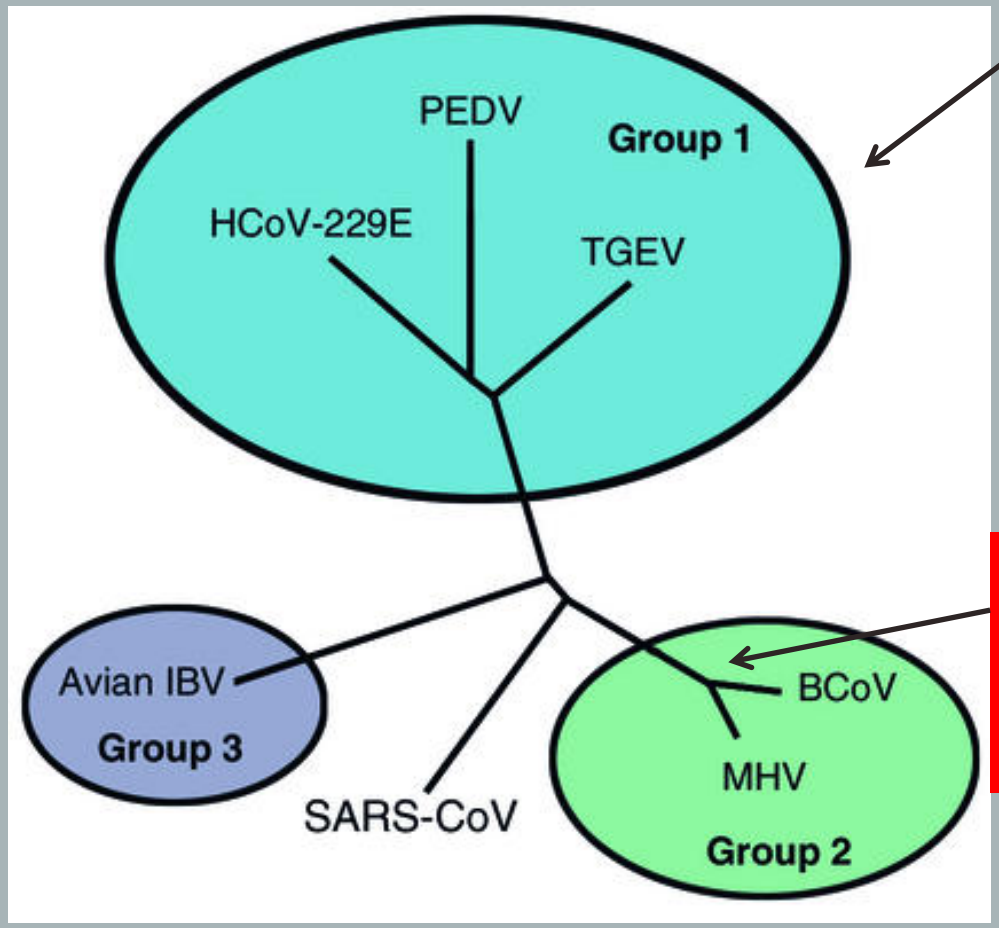
# Respiratory
# 4 groups ofCoronavirus



1. *Respiratory tract viruses*
   - *E.g. HuCoV-229E (**"Common Cold"**)+ a number of animal viruses*
     - *Gastroenteritic virus in pigs*
2. *HuCoV-OC43 (" **Common Cold**")+ more animal vira*
     - *Mouse hepatitis virus*
3. *Avian viruses, Bovine Corona virus,*
4. ***SARS-CoV** distantly related to all 3 groups*

# Coronavirus

20% of all ”common cold”




MERS corona virus

# SARS 2002-2003

- *Ongoing "silent" epidemic in Guandong province since* ***Nov. 2002***
- *Several cases stayed briefly on the same floor of a hotel in Hong Kong in* ***February 2003***
- *From there dissemination of cases to China, Vietnam, Singapore, Taiwan,* ***Canada*** *etc.*

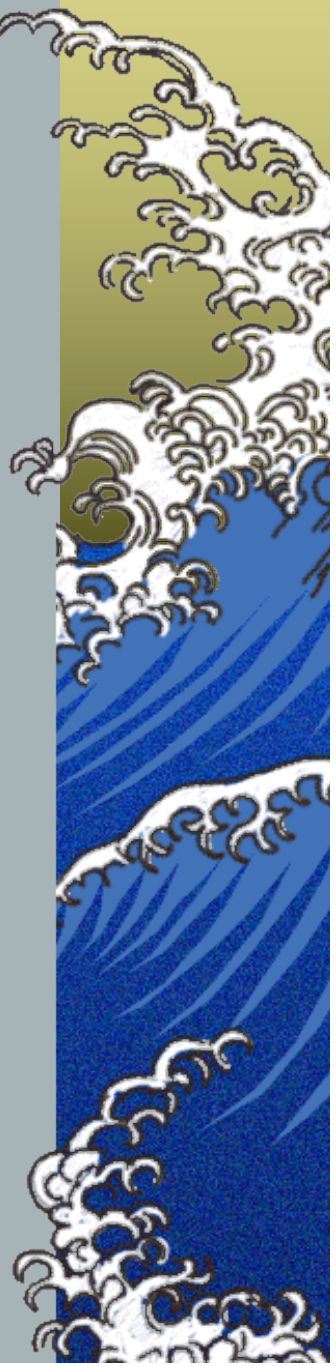


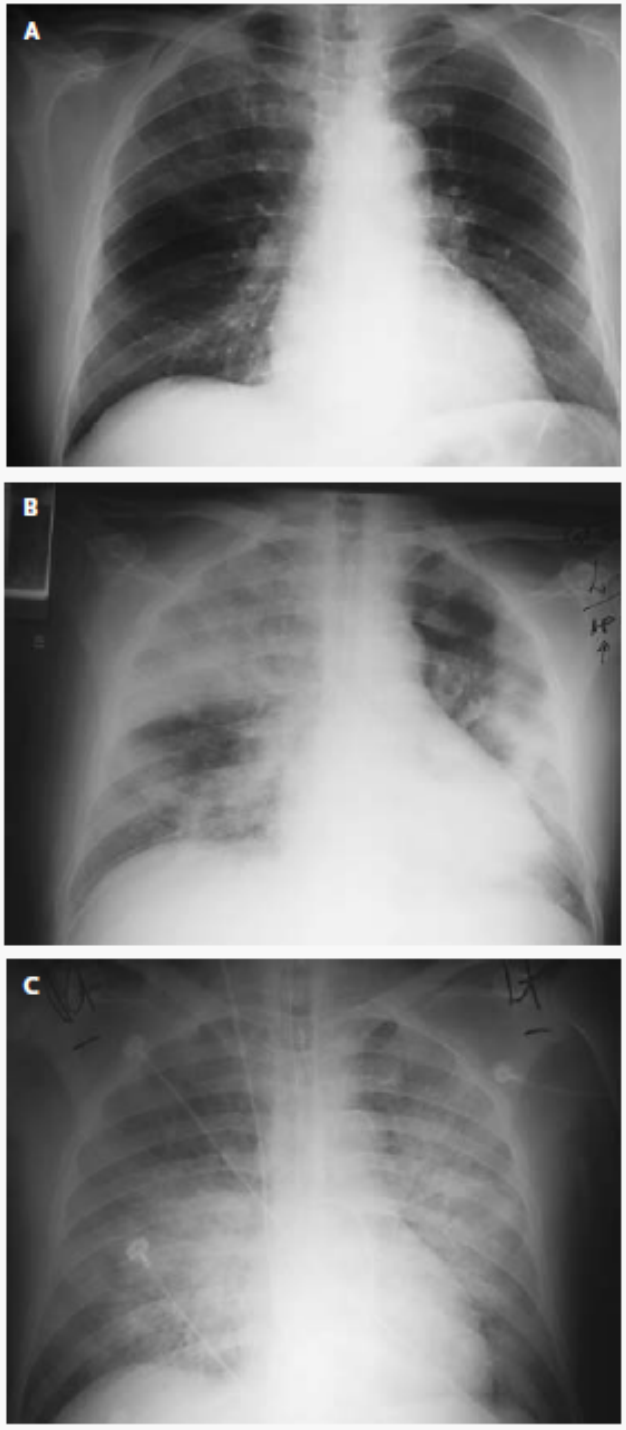
**Table 1. Clinical Features of the Canadian Patients with SARS at Presentation.**

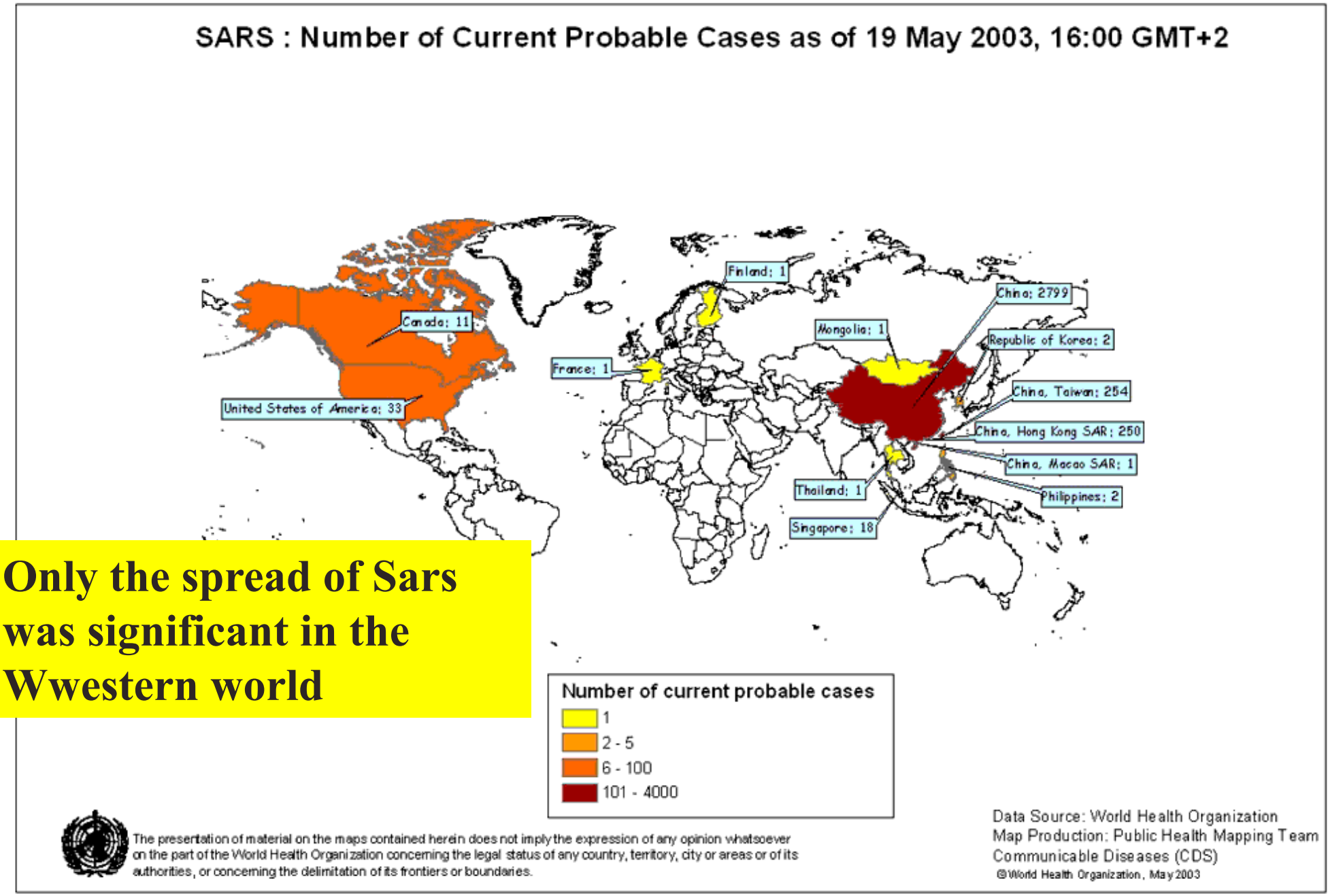
| Variable | Value (*no./no. with results (%)*) |
|---|---|
| **Symptoms** | |
| Fever | 10/10 (100)* |
| Nonproductive cough | 10/10 (100) |
| Dyspnea | 8/10 (80) |
| Malaise | 7/10 (70) |
| Diarrhea | 5/10 (50) |
| Chest pain | 3/10 (30) |
| Headache | 3/10 (30) |
| Sore throat | 3/10 (30) |
| Myalgias | 2/10 (20) |
| Vomiting | 1/10 (10) |
| **Investigations** | |
| Infiltrate on chest radiography | 9/9 (100) |
| Oxygen saturation on room air <95% | 7/9 (78) |
| Leukopenia (cell count <4×10⁹/liter) | 2/9 (22) |
| Lymphopenia (cell count <1.5×10⁹/liter) | 8/9 (89) |
| Thrombocytopenia (cell count <130×10⁹/liter) | 3/9 (33) |
| Lactate dehydrogenase (above upper limit of normal) | 4/5 (80) |
| Aspartate aminotransferase (>1.5× upper limit of normal) | 7/9 (78) |
| Alanine aminotransferase (>1.5× upper limit of normal) | 5/9 (56) |
| Creatine kinase (above upper limit of normal) | 5/9 (56) |

# SARS

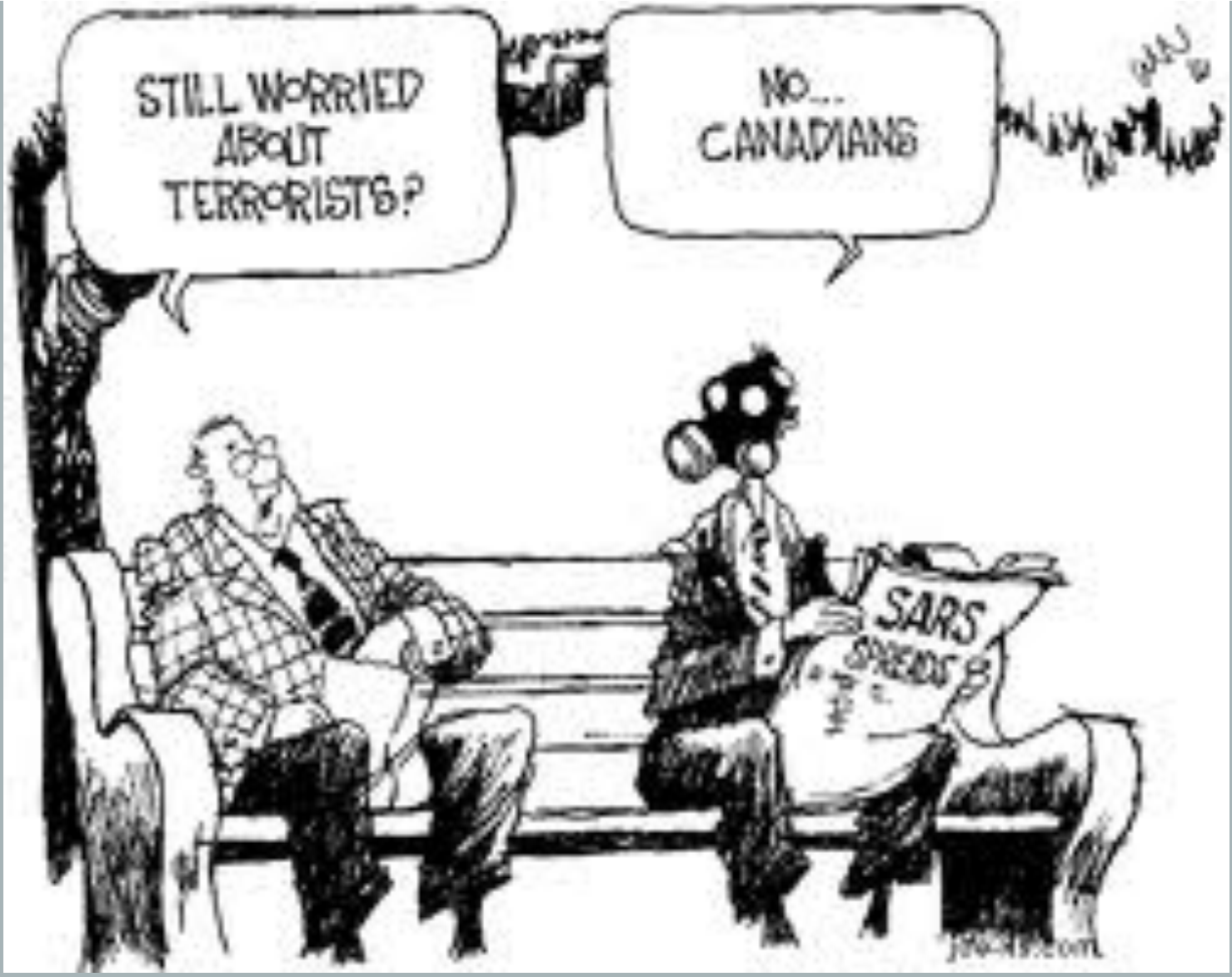
**Symptoms and infectiousness culminated in the 2nd. Week of disease**

**Incubation period 3-10 days**






**Only the spread of Sars was significant in the Wwestern world**




**”Super spreaders”**

Basic reproductive rate = 2-3

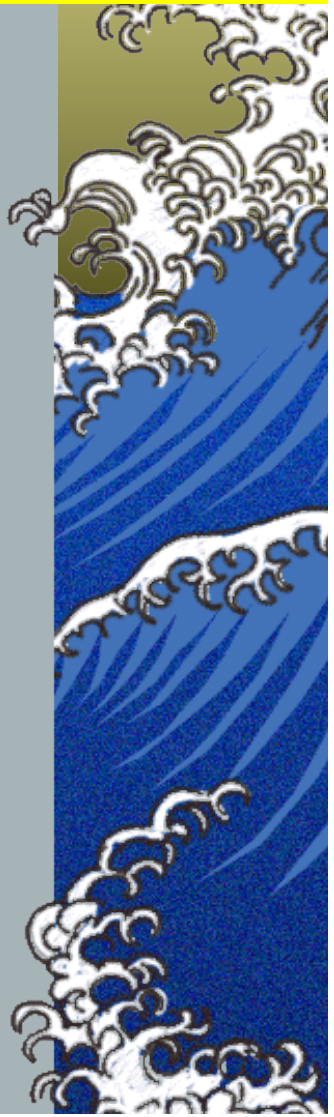
# SARS

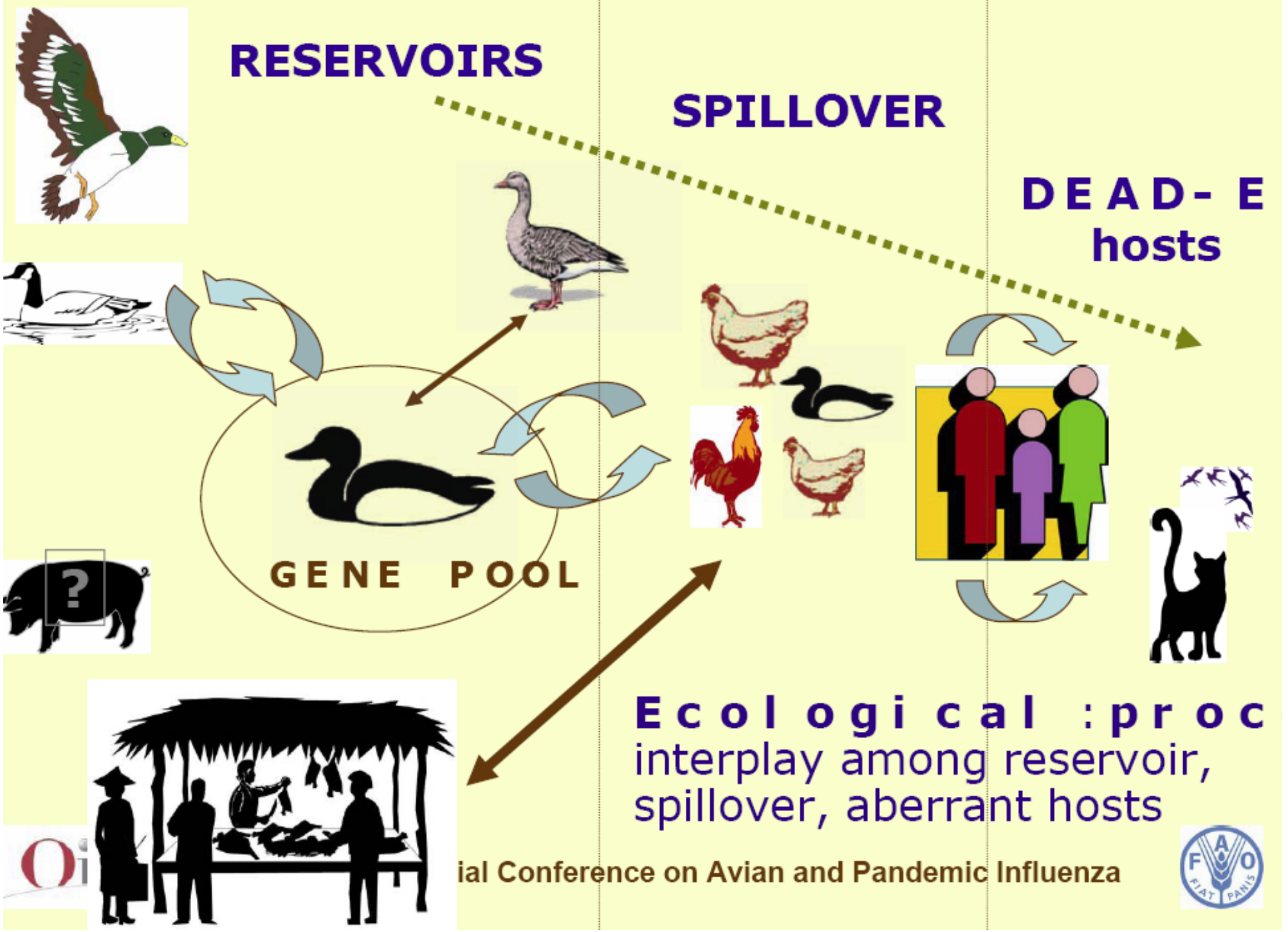
As of September 26, 2003, 8098 cases of SARS and 774 deaths due to SARS (10 percent mortality) in more than 25 countries had been reported to the World Health Organization (WHO).[1,2]

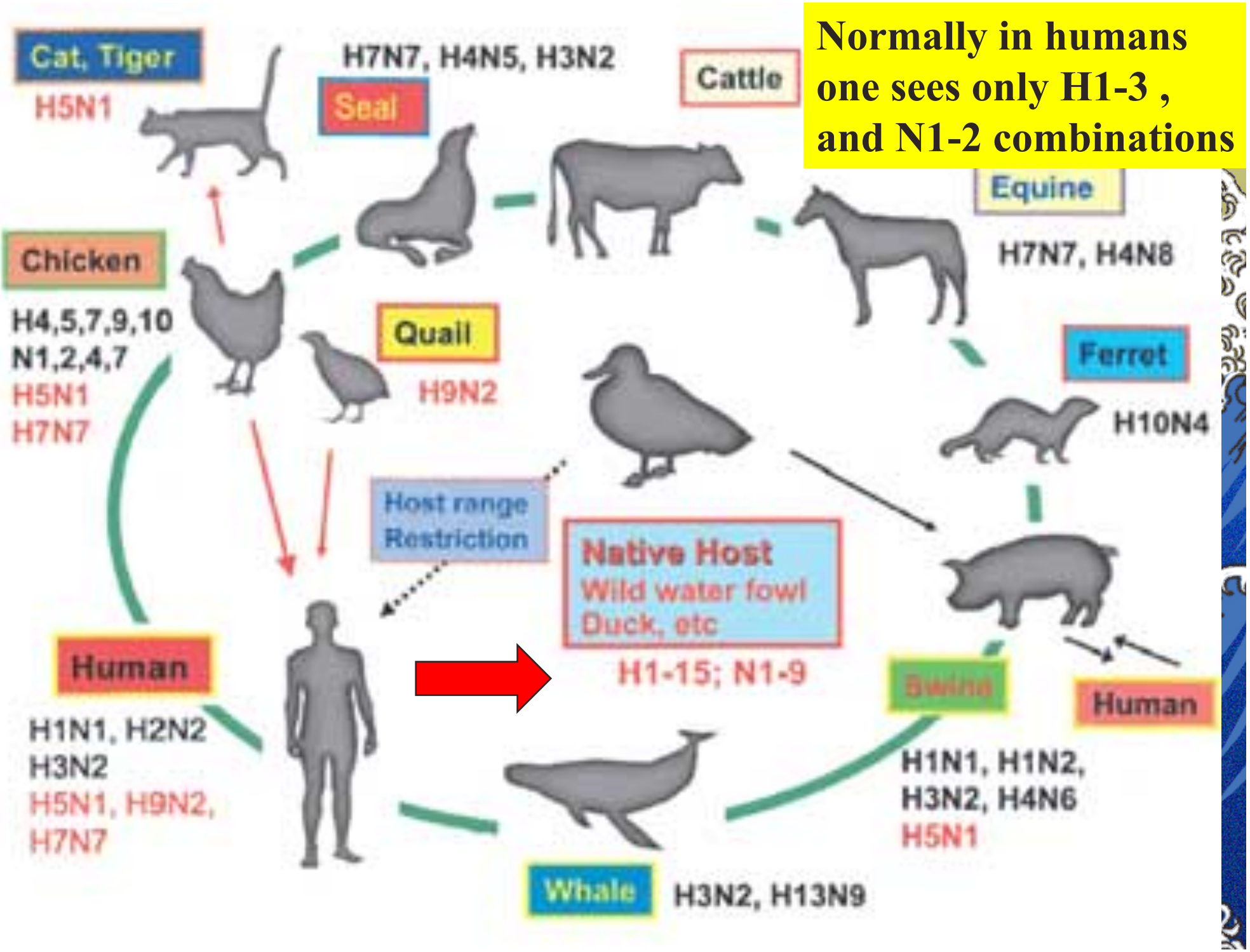
**SARS was a really dangerous disease, also for health staff but with a relatively low infectious potential and a limited Ro**

# Risk of new strains of Influenza

- ***Antigenic drift***
  - *The reason for re-design every year of flu vaccines*
- ***Antigenic shifts***
  - ***New pandemic flu virus*** *with no or little previous cohort immunity*
  - *E.g. H1N1 pdm09*

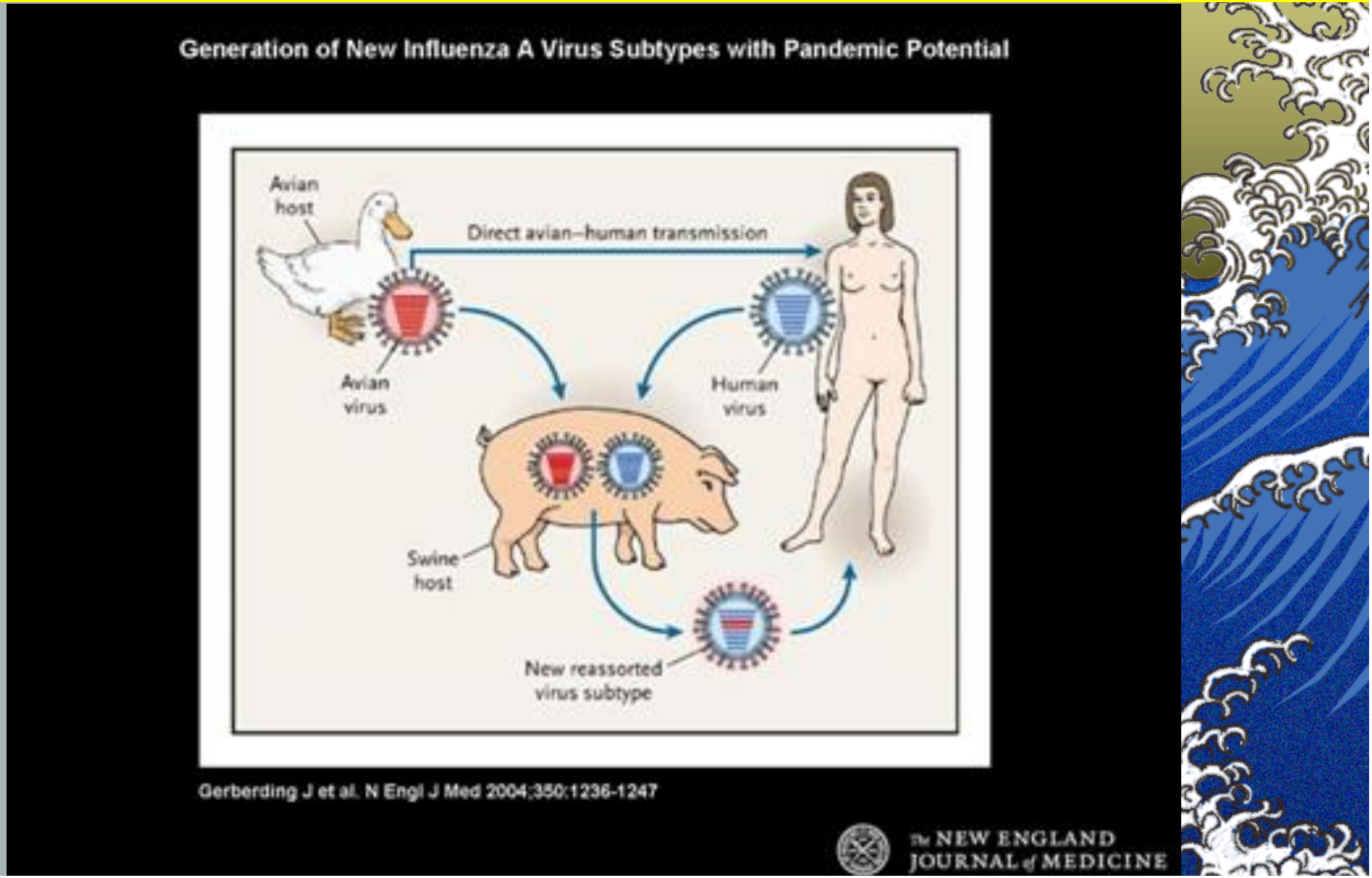



RESERVOIRS
SPILLOVER
DEAD- E
hosts
GENE POOL
?
Ecological :proc
interplay among reservoir,
spillover, aberrant hosts
ial Conference on Avian and Pandemic Influenza

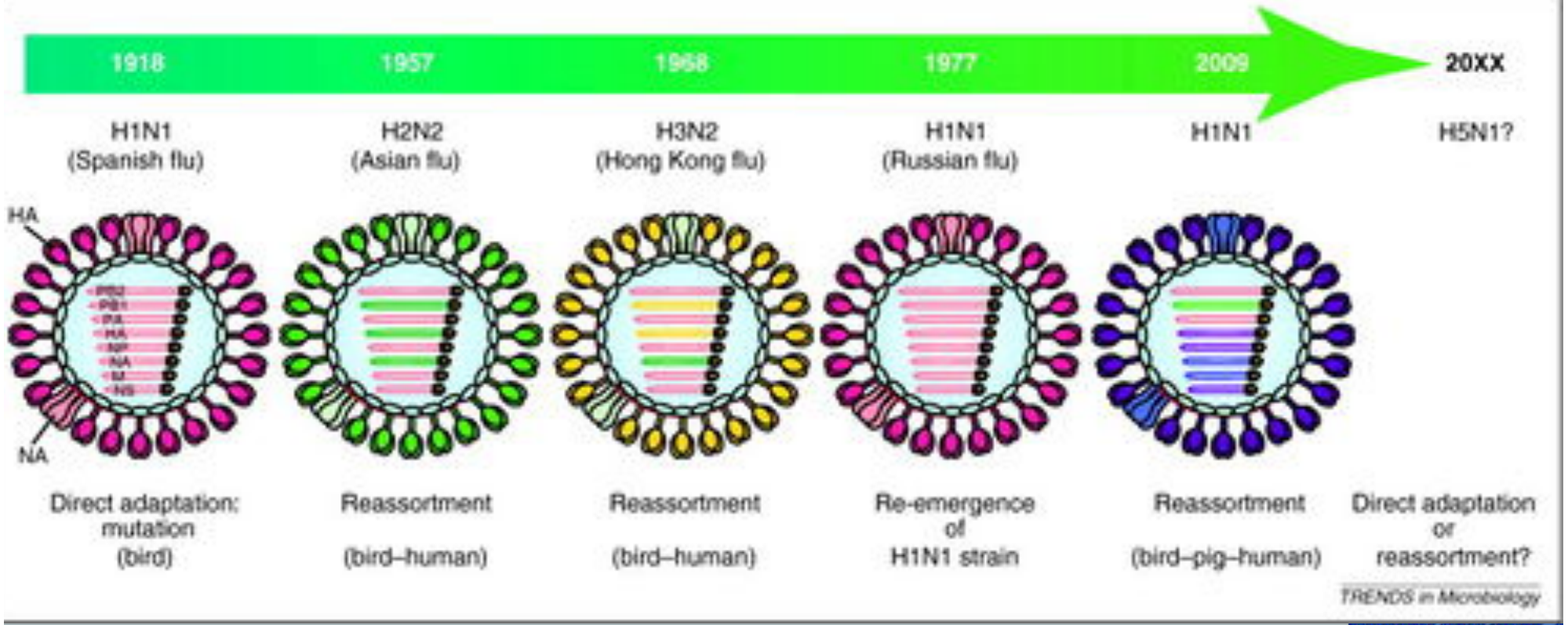

Normally in humans one sees only H1-3 , and N1-2 combinations
Cat, Tiger
H5N1
H7N7, H4N5, H3N2
Seal
Cattle
Equine
H7N7, H4N8
Chicken
H4,5,7,9,10
N1,2,4,7
H5N1
H7N7
Quail
H9N2
Ferret
H10N4
Host range Restriction
Native Host
Wild water fowl
Duck, etc
H1-15; N1-9
Human
H1N1, H2N2
H3N2
H5N1, H9N2,
H7N7
Swine
H1N1, H1N2,
H3N2, H4N6
H5N1
Human
Whale
H3N2, H13N9

# The risk of new highly pathogenic Influenza types

The pig as a possible source of new flu virus re-combinations as it is susceptible to more H+N combinations from birds than humans



# The flu pandemics of the 20th. And 21st. century

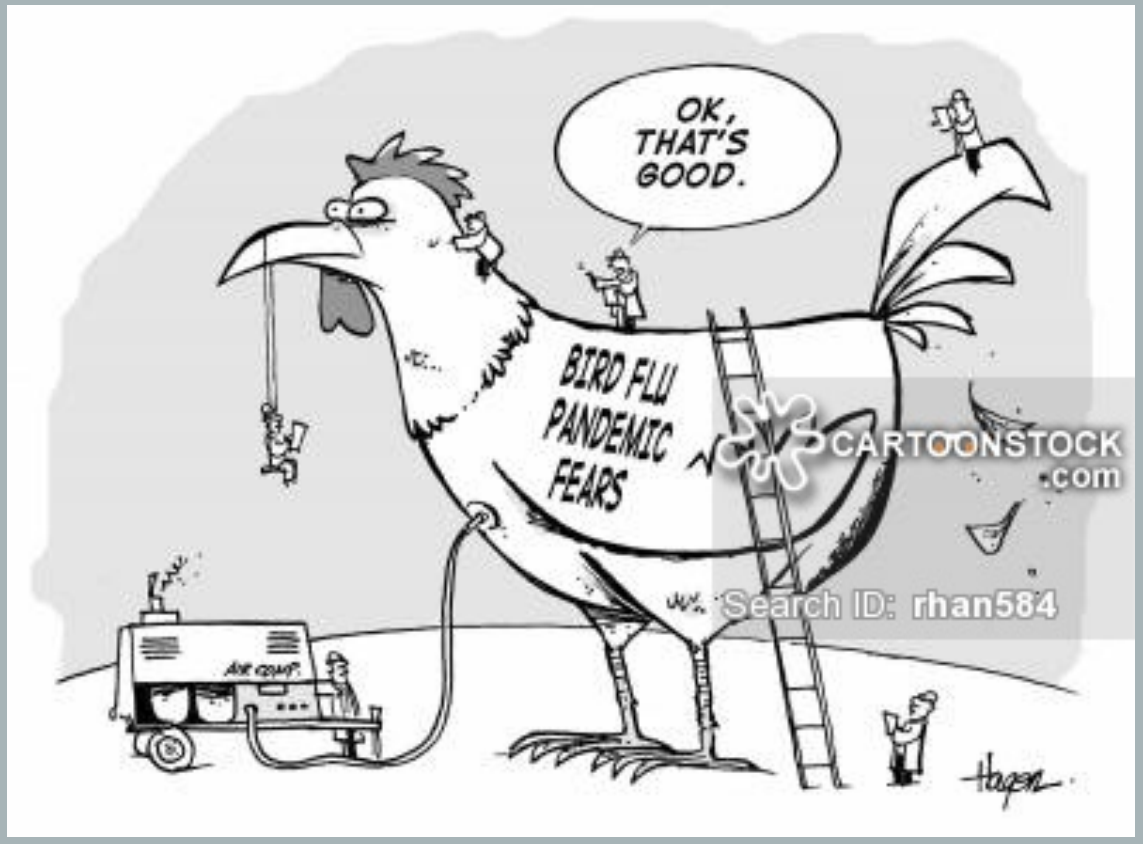


# Avian Influenza H5N1 Outbreak 2003

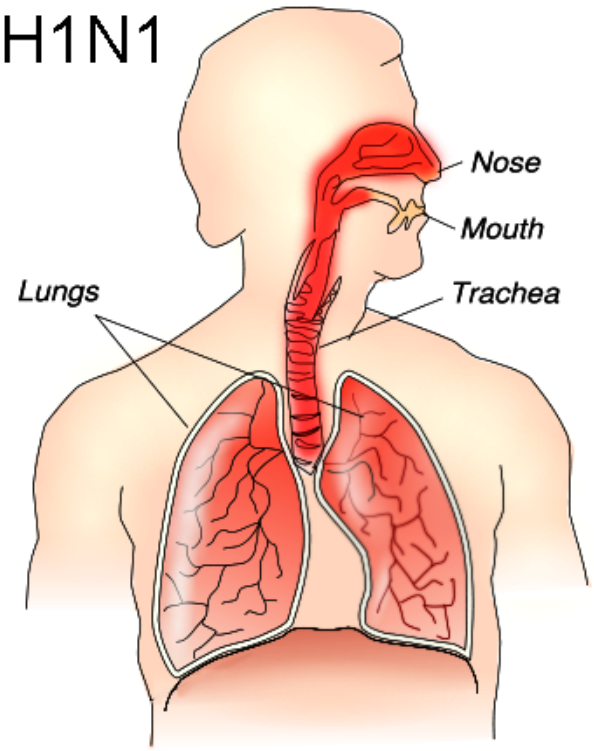
# Avian Influenza H5N1 Outbreak 2003-

# Avian Influenza H5N1
# cuilling of flocks of farm birds


ATCHÍS!
NO!
IT`S NO FUNNY AT ALL !!
DO YOU HEAR ME?
JM NIETO

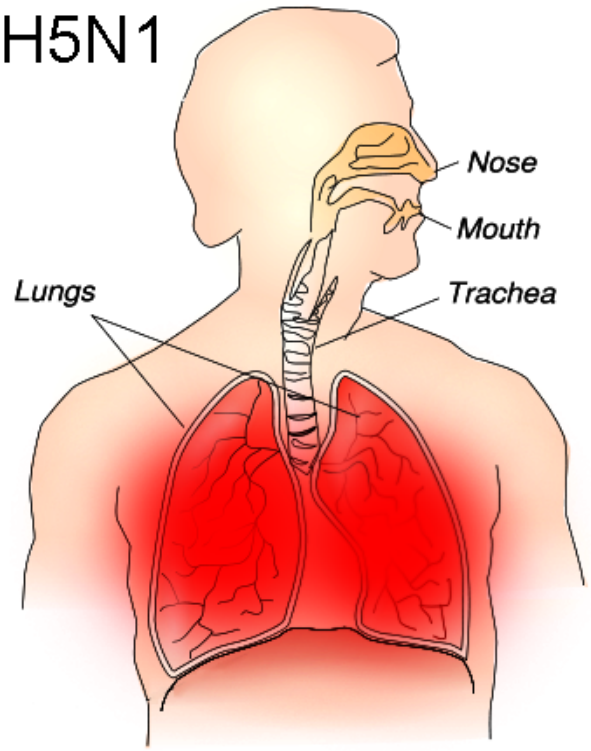

OK, THAT'S GOOD.
BIRD FLU PANDEMIC FEARS
CARTOONSTOCK .com
Search ID: rhan584
Hagen

H1N1




Easily spread
Rarely fatal

H5N1

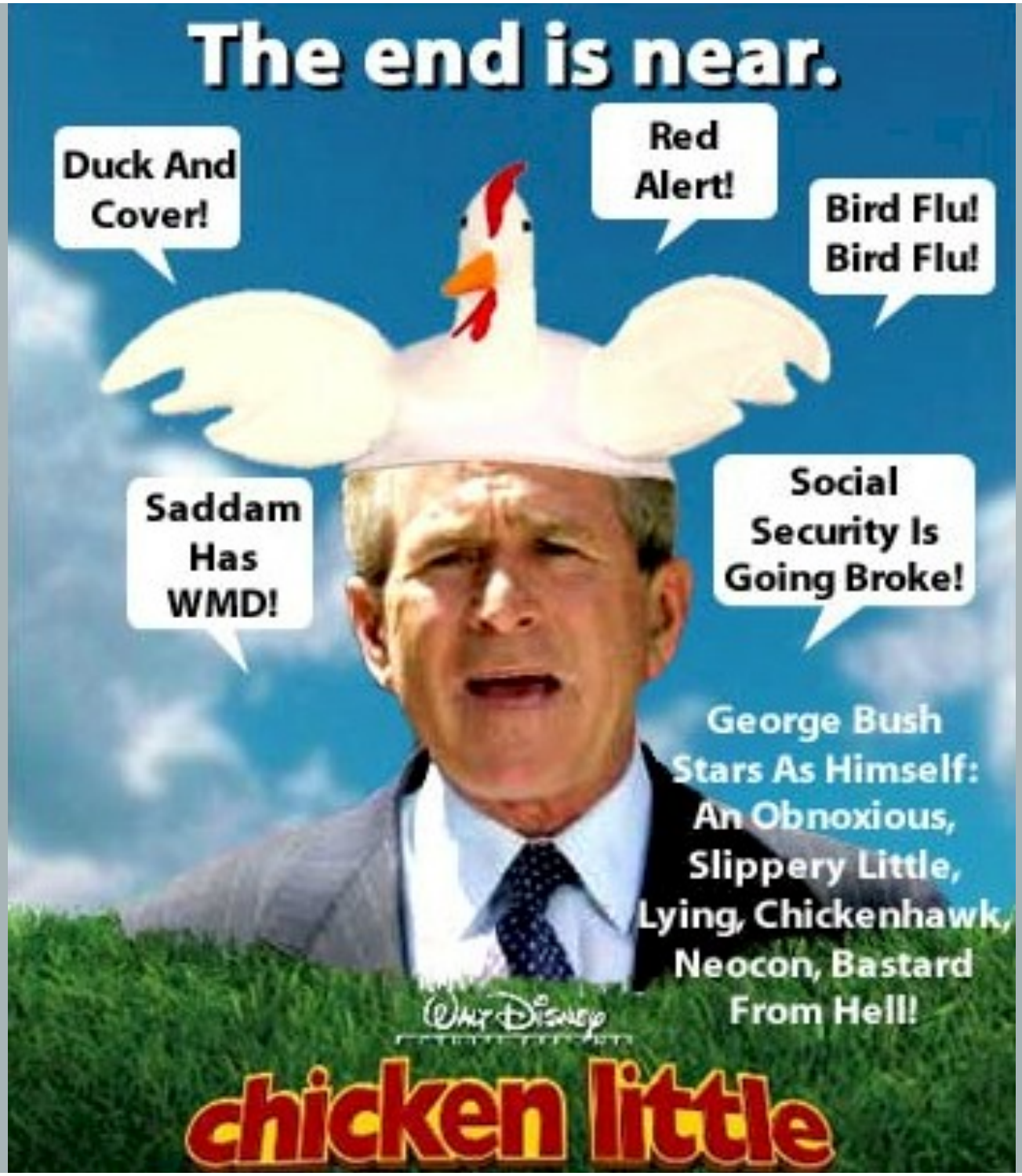



Spreads slowly
Often fatal

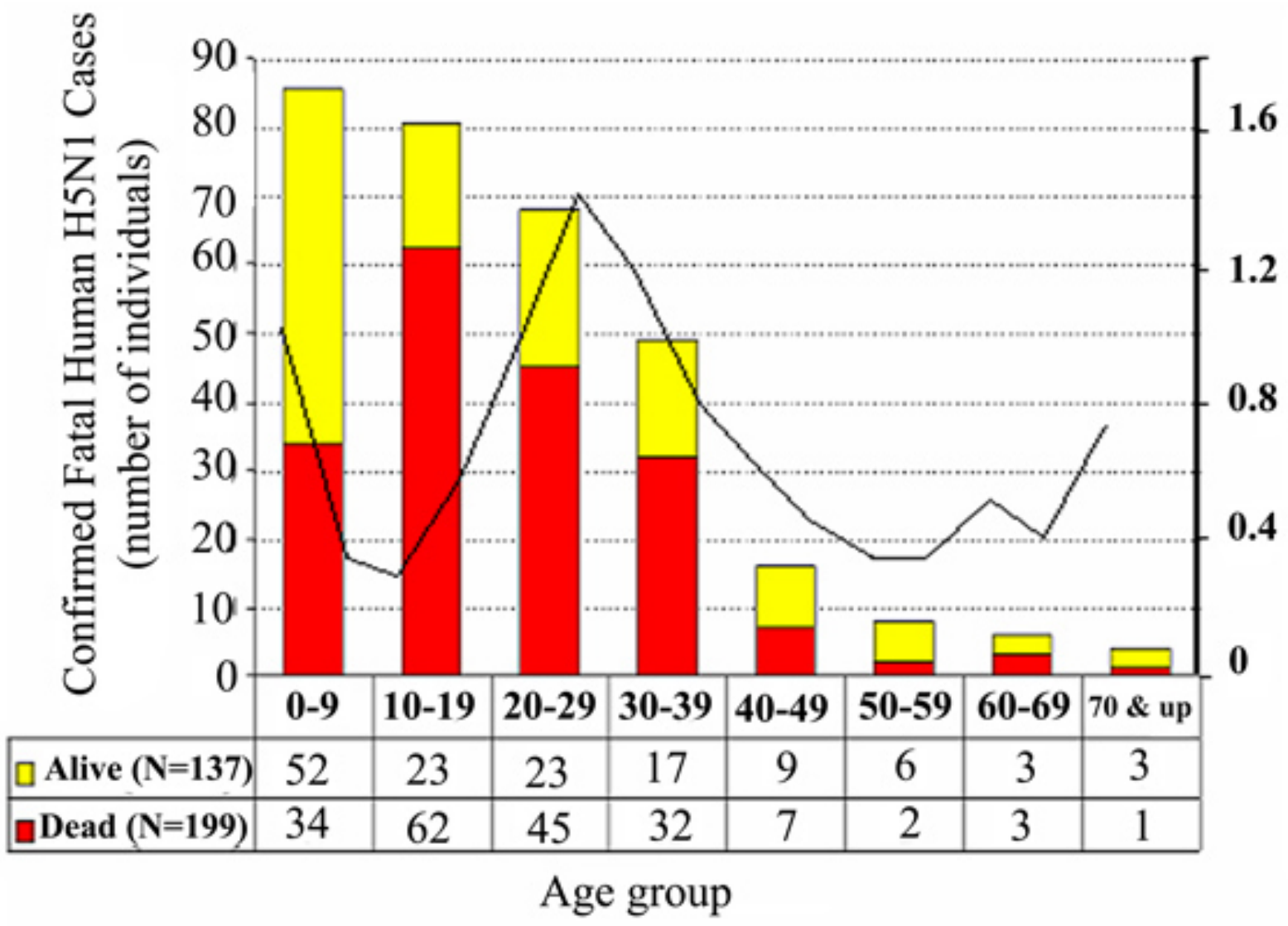
**Case-fatality rate of H5N1:**
**≈ 50%**
**But no human to human infections**

**Haemaglutinin *alpha 2,6* mucosal receptors**
**.**
**Human *upper* airways**

**Haemaglutinin *alpha 2,3* mucosal receptors.**
**Bird intestine**
**Human *Lower* airways**


The end is near.
Duck And Cover!
Red Alert!
Bird Flu! Bird Flu!
Saddam Has WMD!
Social Security Is Going Broke!
George Bush Stars As Himself: An Obnoxious, Slippery Little, Lying, Chickenhawk, Neocon, Bastard From Hell!
Walt Disney
chicken little

# Spanish Flu, Bird flu H5N1




| | 0-9 | 10-19 | 20-29 | 30-39 | 40-49 | 50-59 | 60-69 | 70 & up |
|---|---|---|---|---|---|---|---|---|
| Alive (N=137) | 52 | 23 | 23 | 17 | 9 | 6 | 3 | 3 |
| Dead (N=199) | 34 | 62 | 45 | 32 | 7 | 2 | 3 | 1 |

# The ”political economy” of pandemics

- *In the preparation for a new flu pandemic which some felt would present case fatality rates of up to 50% - as seen in the H5N1-all countries prepared ”national Pandemic action Plans”*
- *Although know as a drug with low capacity to limit flu, and no proven effect on mortality Oseltamivir (**Tamiflu**®)- in the absence of available vaccines should the pandemic come suddenly became identified by among others WHO as a useful weapon.*

# The ”political economy” of pandemics

- *Donald Rumfeld , before becoming US secretary of defence wass CEO of Orphan drugs, that developed Tamiflu. The patency was sold to ROCHE (years before its ”pandemic” use.*
- *La Roche managed to become an important pressure group and Tamiflu were bought in huge quantities by a number of countries.*
- *In Denmark a limited lot of 1,5 tons was bought- never used ,and now expired and probably destroyed*


Nooo!!!
Not
Tamiflu!

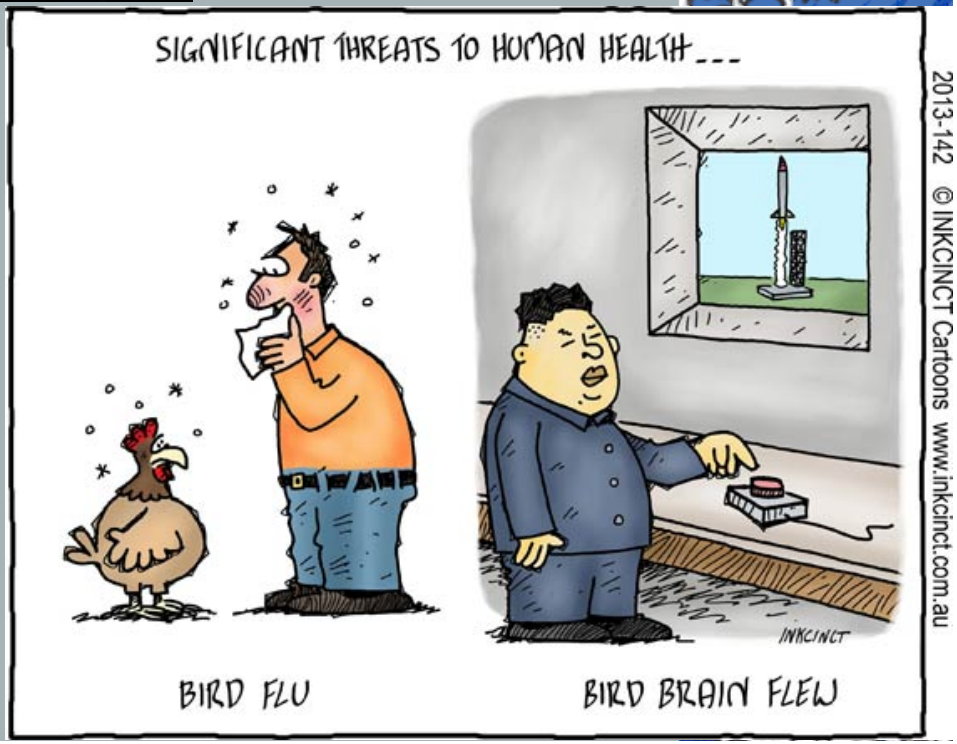

Tamiflu®
DIN 02241472
Oseltamivir phosphate capsules
Gélules de phosphate d'oseltamivir
75 mg
10 capsules/gélules
Roche


Tamiflu 75 mg

# Avian Influenza H5N1

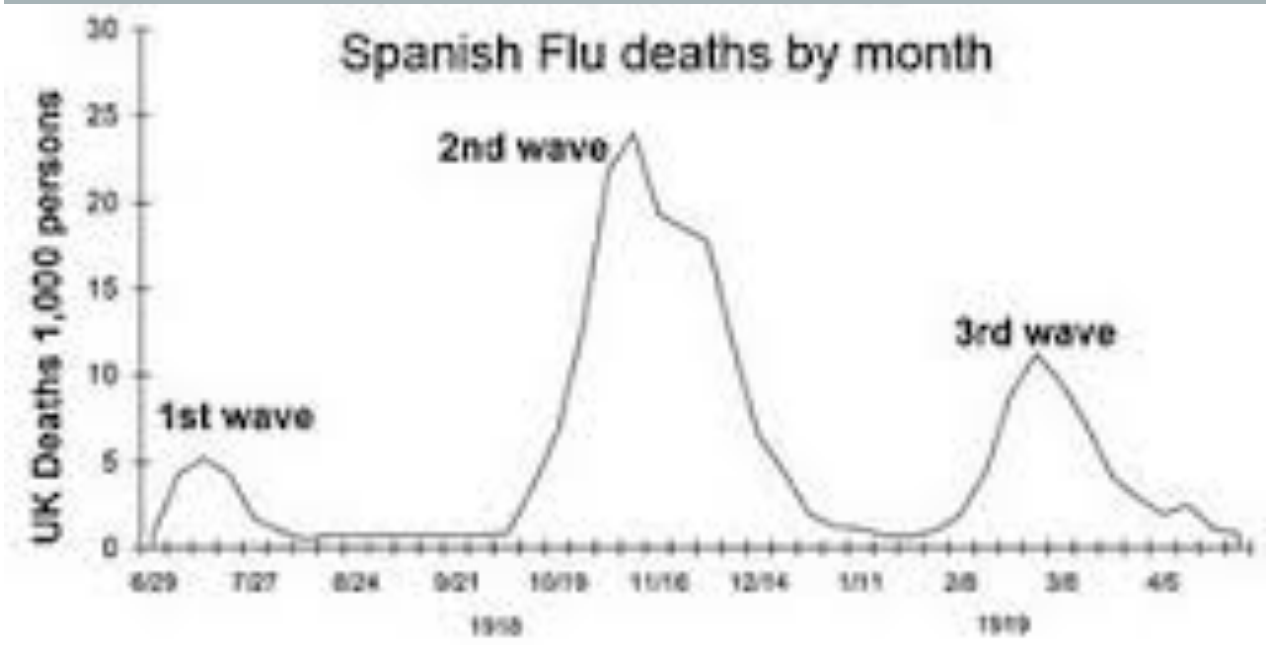
## Cumulative number of confirmed human cases for avian influenza A(H5N1) reported to WHO, 2003-2016

| Country | 2003-2009* | | 2010-2014** | | 2015 | | 2016 | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | cases | deaths | cases | deaths | cases | deaths | cases | deaths | cases | deaths |
| Azerbaijan | 8 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 5 |
| Bangladesh | 1 | 0 | 6 | 1 | 1 | 0 | 0 | 0 | 8 | 1 |
| Cambodia | 9 | 7 | 47 | 30 | 0 | 0 | 0 | 0 | 56 | 37 |
| Canada | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 |
| China | 38 | 25 | 9 | 5 | 6 | 1 | 0 | 0 | 53 | 31 |
| Djibouti | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Egypt | 90 | 27 | 120 | 50 | 136 | 39 | 8 | 1 | 354 | 117 |
| Indonesia | 162 | 134 | 35 | 31 | 2 | 2 | 0 | 0 | 199 | 167 |
| Iraq | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 2 |
| Lao People's Democratic Republic | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 |
| Myanmar | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Nigeria | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| Pakistan | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 |
| Thailand | 25 | 17 | 0 | 0 | 0 | 0 | 0 | 0 | 25 | 17 |
| Turkey | 12 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 4 |
| Viet Nam | 112 | 57 | 15 | 7 | 0 | 0 | 0 | 0 | 127 | 64 |
| **Total** | **468** | **282** | **233** | **125** | **145** | **42** | **8** | **1** | **854** | **450** |

# 1918 Spanish flu:


**The mother of all flu epidemics**





FLU PRECAUTION
PLEASE
DO NOT
KISS
ME


## April 2009

The first cases of the new ”swine” H1N1Pan09 were Reported from Mexican Hospitals.

Tremendous reporting/ selction bias and the case fatality rates proved to be among the most moderate seen ever registered – Even less than in the usual annual endemic flu episodes

# p H1N1v  Swine flu

# H1N1v
## Severe Cases

- ***Groups of greatest risk for severe development of flu**:*
  - ***children younger than 2 years of age***
  - ***people with chronic lung (& heart) disease**, including asthma.*
  - ***pregnant women**, especially during the third trimester of pregnancy,*
  - ***Very obese persons***
  - *But not people* **> 65 years** *of age*

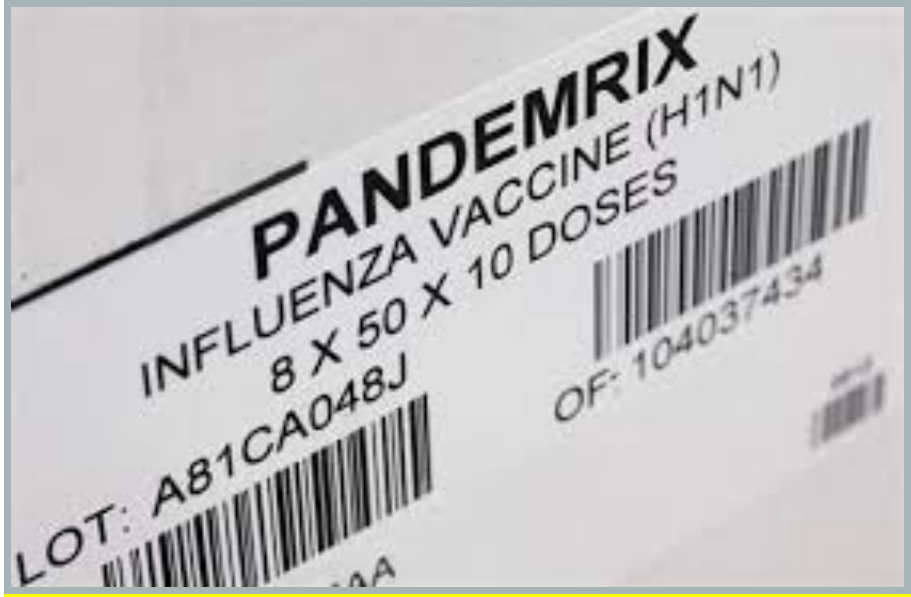

H1N1
SCREENING CENTER
H1N1
SCREENING
CENTER

**When a pandemic vaccine was developed around september 2009 it was launced after a minimal safety procedure and never through a proper phase 3 trial**

**Subsequently a number of severe adverse reactions (e.g. narcolepsia was seen among children: Below some news paper head lines**

***Brain-Damaged Victims Of Swine Flu Vaccine Win $63 Million Lawsuit***

***GSK has paid out $9.1 billion since 2003***





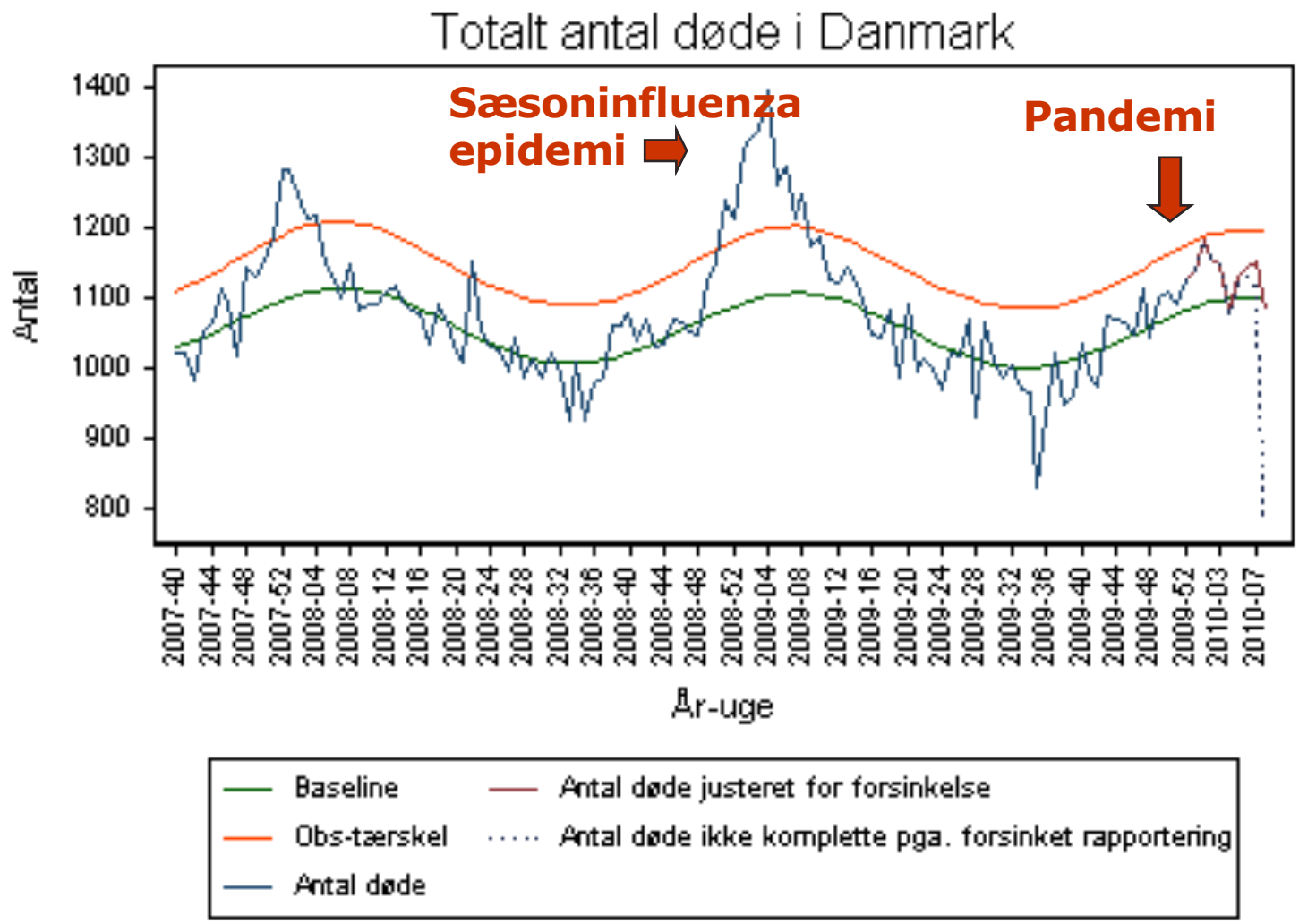
**New Flu Shots Could Make The Flu The Least Of Your Problems**

# Hvor mange blev syge?
# Aldersfordeling og andel af befolkningen

Estimeret fra: Sentinel data, %-positiv, ca. 7 tilfælde i pr ILS i praksis

| *Aldersgruppe* | *Antal syge* | *Andel* |
|---|---|---|
| *0–4 år* | *24.648* | *7,6%* |
| *5–14 år* | *103.830* | *15,4%* |
| *15-64 år* | *140.169* | *3,9%* |
| *65 +* | *4.996* | *0,6%* |
| *I alt* | *273.613* | *4,9%* |

# **H1N1pdm09** : no effect on general mortality!

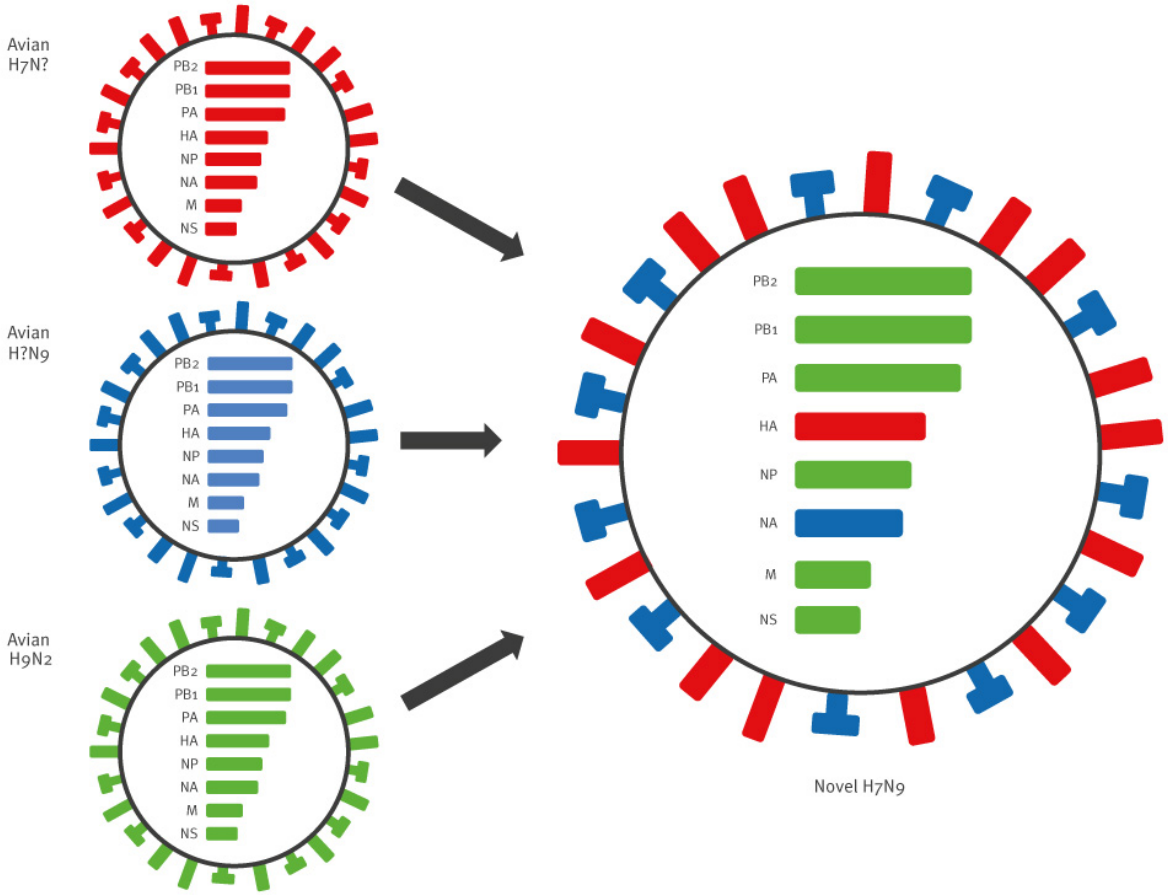


# H7N9

## A new recombination seen only in China emerghed in 2012-3

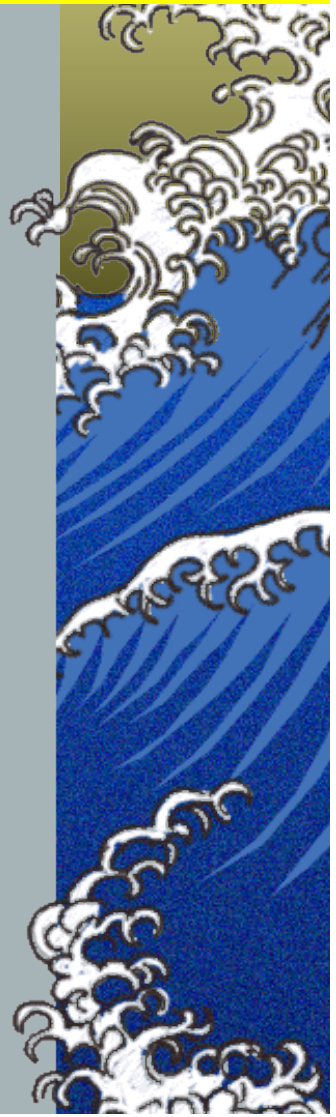
**FIGURE 3**

Schematic diagram of novel influenza A(H7N9) virus generation




HA: haemagglutinin; NA: neuraminidase.

The novel influenza A(H7N9) viruses are likely to have acquired their HA gene from an avian H7 virus of unknown NA subtype, their NA gene from an avian N9 virus of unknown HA subtype, and their remaining six viral segments from avian H9N2 viruses circulating in poultry.



**Hundred of millions of Chinese people will travel to celebrate New Year with their families and**

## eat poultry !

# Chinese New year

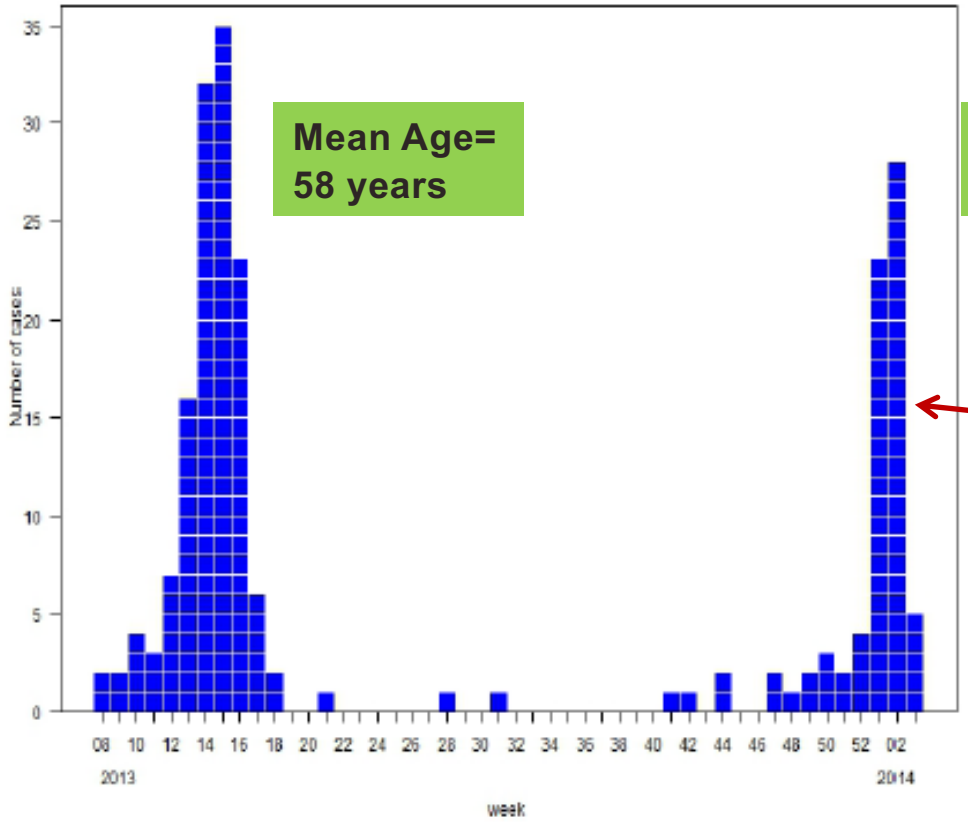
## 31. January 2014, Year of the Horse

**Hundred of millions of Chinese people will** travel to celebrate New Year with their families and

**eat poultry !**

# Chinese Avian Flu **H7N9** 2013-14

Fig 1: Laboratory-confirmed cases of human infection with avian influenza A(H7N9) virus by week of onset

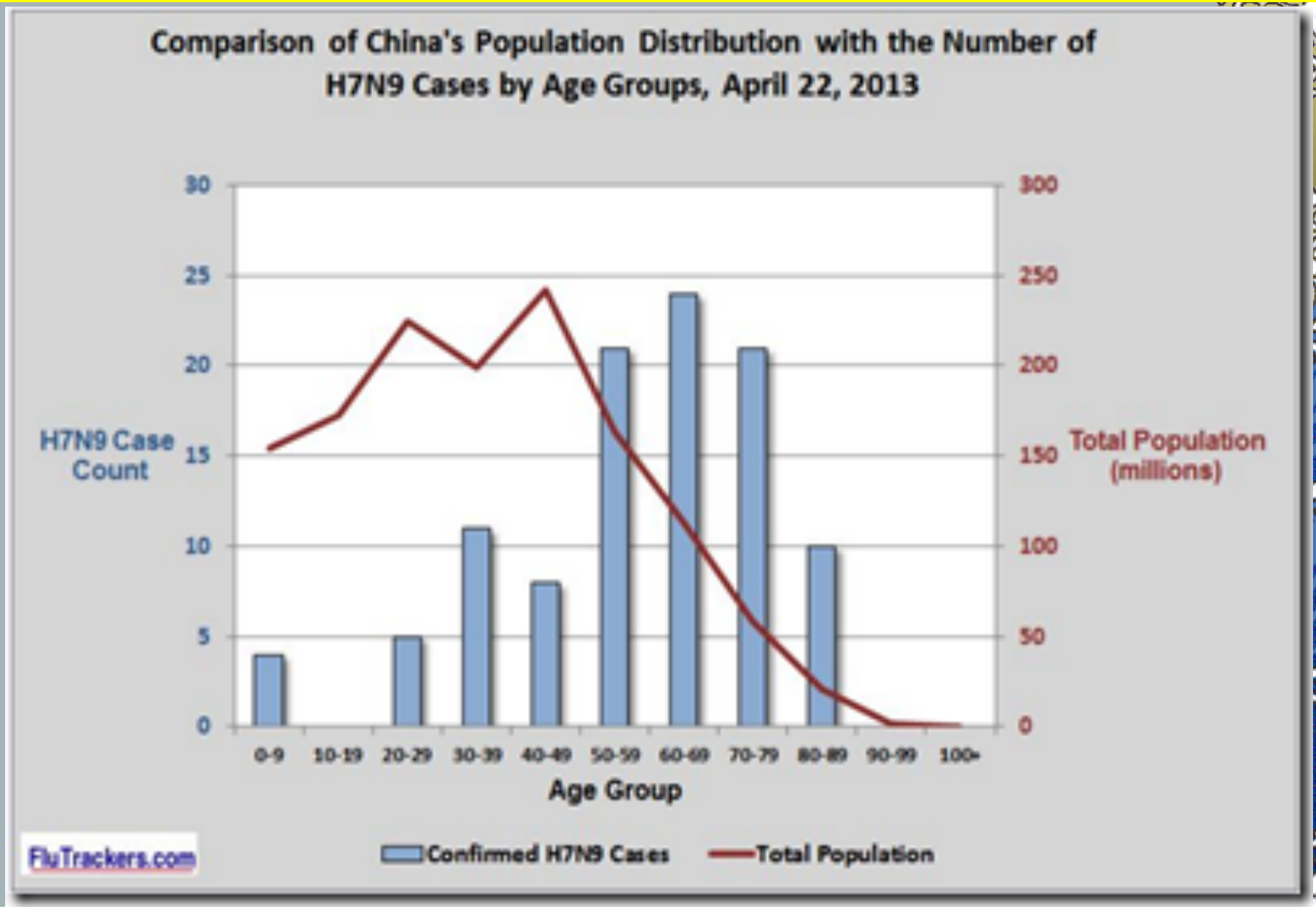



[1] For the analysis, the cases reported over summer are included in the second wave.

**110 cases as of 2nd.Feb. 2014**

**Mortality roughly 20%**

# H7N9


Comparison of China's Population Distribution with the Number of H7N9 Cases by Age Groups, April 22, 2013
H7N9 Case Count
Total Population (millions)
0
5
10
15
20
25
30
0
50
100
150
200
250
300
0-9
10-19
20-29
30-39
40-49
50-59
60-69
70-79
80-89
90-99
100+
Age Group
FluTrackers.com
Confirmed H7N9 Cases
Total Population

# Avian Flu **2014**

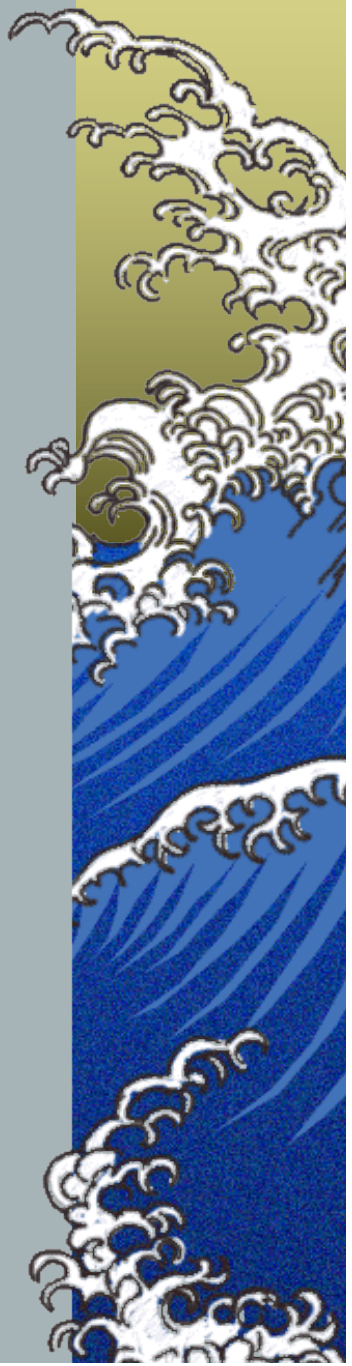
- ***Human to Human transmission**:*
  - ***Very few, if any, clusters** of cases found, where human-to-human transmission could have be possible*
    - *And no further spread from there*
  - *Only one **health worker** ( in the 2nd. Wave) with H7N9 identified*
    - *Not associated to other patients with H7N9*
      - *But an association with contact to a poultry market*

# A new disease ?

- ***March/april 2012***
  - *Jordan (Zarga): 11 patients (10 HCWs !!) with severe respiratory disease reported from an ICU.*
  - *Unknown etiology.*

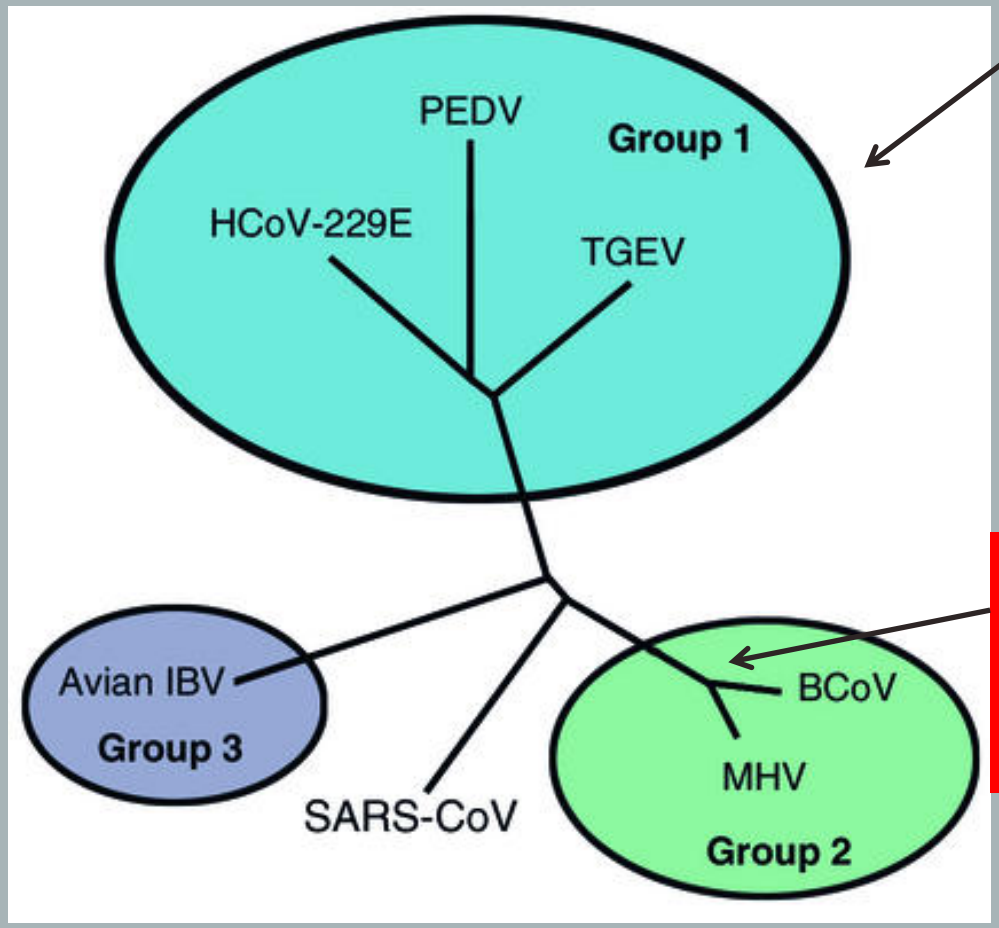
# The new CoronaVirus

- ***The same new type of non-SARS Coronavirus was sequenced from 2 patients in 2012:***
  - *49 year old man from* **Qatar**, *who had been to Saudi and from the 7th. Sept. admitted to an ITU in Doha, and transfered to London*
  - *Fatal case (June 2012), 60 y.o.* **Saudi-arabian** *citizen*



# Coronavirus

20% of all ”common cold”




MERS corona virus

# The new Middle East Respiratory Syndrome **(MERS)**

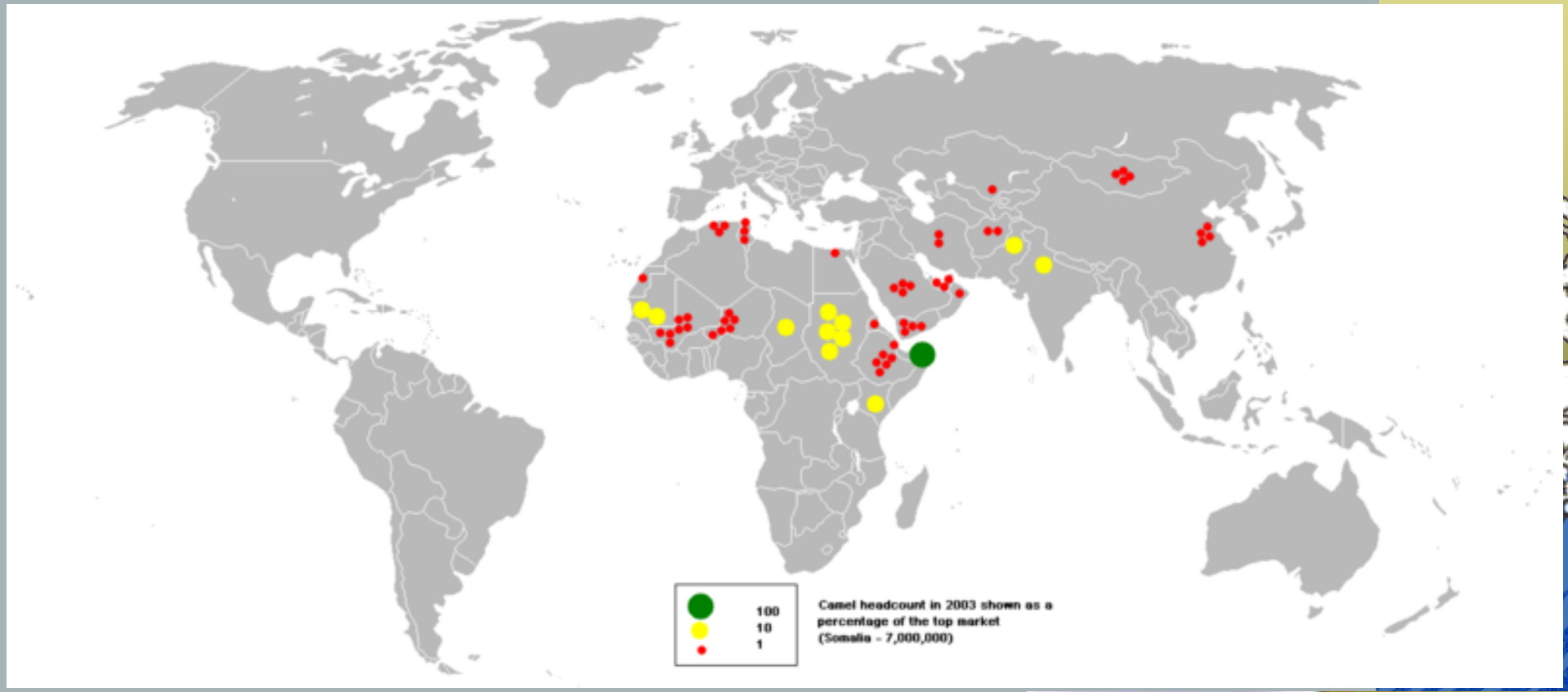
- ***Status 29th.of Sept. 2016:***
- ***1457*** *laboratory-confirmed cases*
- ***611 deaths***
  - ***Case fatality rate: 41.9 %)***
  - *All cases were linked directly or indirectly to the Arabian peninsular (especially Saudi Arabia)*
  - *75% had at least one underlying medical condition*

**20 million camels globally**

(e.g.360 000 camels in the UAE ( 9 mill inhab.))

***Camelus dromedarius***
**(90%)**

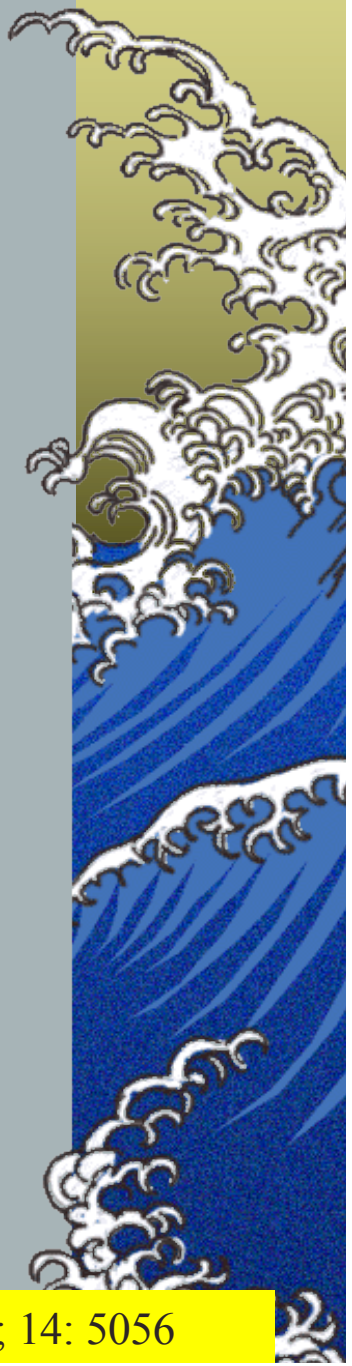
***Camelus bactrianus***
**(10%)**


100
10
1
Camel headcount in 2003 shown as a percentage of the top market (Somalia - 7,000,000)

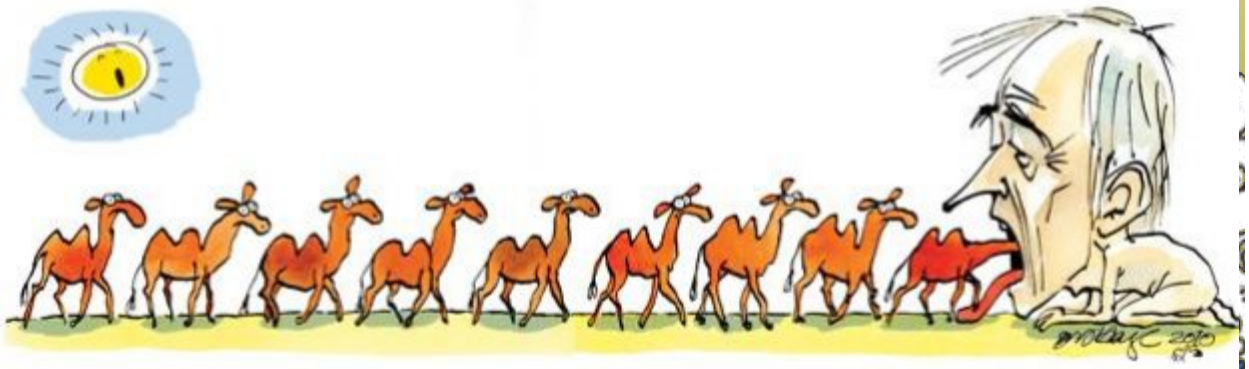

AL AIN
Camel
MILK
100% PURE

# MERS 2012-13

- *Epidemiology based on index cases gives an upward, biased impression of R0 and case fatality rates (74%)*
- *Based on secondary cases case fatality rates are 20%*
- ***R0 is calculated to be between 0.8- 1.3***
- ***Conclusion**: **A slowly growing epidemic, which will die out if infection control is implemented.***



Cauchemaz S et al. MERS quantification of the extent of epidemic… Lancet Infect 2014; 14: 5056



**The ”camel” one would have to swallow is that this MERS epidemic reflecvts very poor hygiene and safgety levels in Arabian world hospitals.**

**It would be probably be more difficult for a previous health person to get MERS than for a camel to go through the eye of a needle- cases seen mainly in older adults with DM**