

Emerging infectious diseases (Respiratory)

Objectives

- Define and understand emerging and re-emerging diseases
- Understand the viral antigenic variations of influenza virus
- List the different hosts for influenza (according to influenza type), MERS-Cov and SARS-Cov
- Be familiar with the famous pandemics for each of these viral infections, and measures used to contain spread
- Provide appropriate prevention and control measures for each of these viral infections

Definitions

Emerging infectious diseases: •

Diseases that are recognized in the human host for the first time •

Re-emerging diseases: •

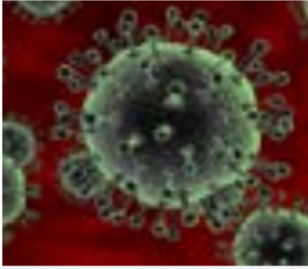
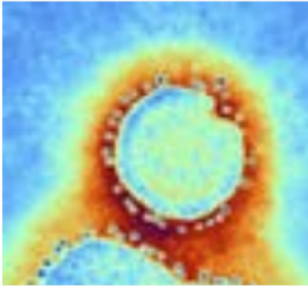
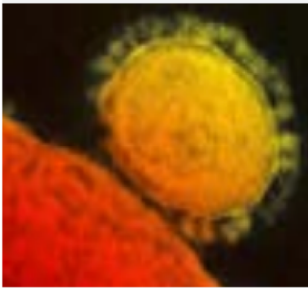
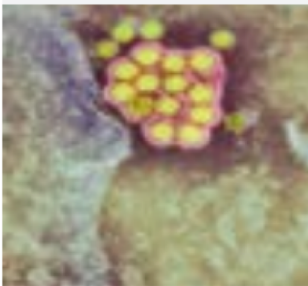
Diseases that historically have infected humans, but continue to •
appear in new locations or in drug-resistant forms, or that reappear
after apparent control or elimination

Table 1. Some major factors that underlie disease emergence and reemergence [2,5].

<u>The Microbial Agent</u>	<u>The Human Host</u>	<u>The Human Environment</u>
Genetic adaptation and change	Human susceptibility to infection	Climate and weather
Polymicrobial diseases	Human demographics and behavior	Changing ecosystems
	International trade and travel	Economic development and land use
	Intent to harm (bioterrorism)	Technology and industry
	Occupational exposures	Poverty and social inequality
	Inappropriate use of antibiotics	Lack of public health services
		Animal populations
		War and famine
		Lack of political will

doi:10.1371/journal.ppat.1003467.t001

Important zoonotic emerging infectious diseases reported to WHO, January to November 2013

	Emerging infection	Countries	Summary of cases	Control measures
	Avian influenza A/H5N1	Cambodia, Egypt, China, Indonesia, Bangladesh, Vietnam	20 cases including 11 deaths reported in Cambodia Sporadic reports of cases (11 in total) from other countries	Rapid response teams deployed Enhanced surveillance measures Public health education campaigns
	Avian influenza A/H7N9	China	139 laboratory confirmed cases with 45 deaths (March-November 2013). Linked to live bird markets with no sustained human to human transmission	Temporary closure of live bird markets in some affected areas Culling of live birds in wholesale markets in some affected areas
	Middle East respiratory syndrome corona virus	Saudi Arabia, Oman, France, Italy, Jordan, Qatar, Tunisia, United Arab Emirates, UK	150 laboratory confirmed cases and 64 deaths (September 2012-November 2013). Most case occurred in Saudi Arabia with cases in other countries in single figures. Limited human to human spread	Increase surveillance of sudden acute respiratory illness across WHO member states Elderly and chronically ill people asked to limit visit to the Hajj this year
	Yellow fever	Chad, Ethiopia, Cameroon, Democratic Republic of Congo	Small numbers of laboratory confirmed cases have been notified across several African countries	Increased surveillance activity and mass vaccination campaigns carried out in affected countries

Why are they matter of concern?

Heavy global burden, mainly when they become epidemics or •
pandemics.

They generally have a high mortality rate and spread across countries •
very rapidly causing panic and fear.

It is estimated that more than 15 million people all over the planet •
lose their life's directly because of infectious disease, and millions
more due to the complications of chronic ones

Key messages

- Most emerging infectious diseases occur where animals meet humans
- The world's increased demand for meat has been one cause of disrupted ecosystems and increased the potential for emerging infections
- Since 2005 there has been a change of emphasis from control to prevention or minimisation at the source, but more must be done to show its cost effectiveness
- One Health brings together researchers and workers from health, agriculture, environment, and commerce to tackle the problem from all angles It is hoped that this approach will improve human health and reduce economic costs by preventing emerging infections at their source

What is Middle East respiratory syndrome coronavirus (MERS-CoV)?

MERS Co V

Middle East respiratory syndrome (MERS) is a viral respiratory disease caused by a novel coronavirus (Middle East respiratory syndrome coronavirus, or MERS-CoV) that was first identified in Saudi Arabia in 2012 •

Coronaviruses are a large family of viruses that can cause diseases ranging from the common cold to Severe Acute Respiratory Syndrome (SARS). •

Approximately 35% of reported patients with MERS have died •

Human-to-human infections in health care settings, dromedary camels are a major reservoir host for MERS-CoV and an animal source of MERS infection in humans. •

The virus does not seem to pass easily from person to person unless there is close contact, such as occurs when providing unprotected care to a patient. •

Health care associated outbreaks have occurred in several countries, with the largest outbreaks seen in Saudi Arabia, United Arab Emirates, and the Republic of Korea. •

History of origin; cases and clusters:

First identified in Saudi Arabia in June 2012 : Jeddah, hospitalized with pneumonia, ARDS, acute kidney injury.....Died. MERS-CoV was isolated from his sputum. •

September 2012: Qatar A patient with acute kidney injury, ARDS I. •
He had recently traveled to Saudi Arabia. •

April 2012: Jordan

11 pneumonia cases(8 HCWs) •

One patient: pneumonia and pericarditis •

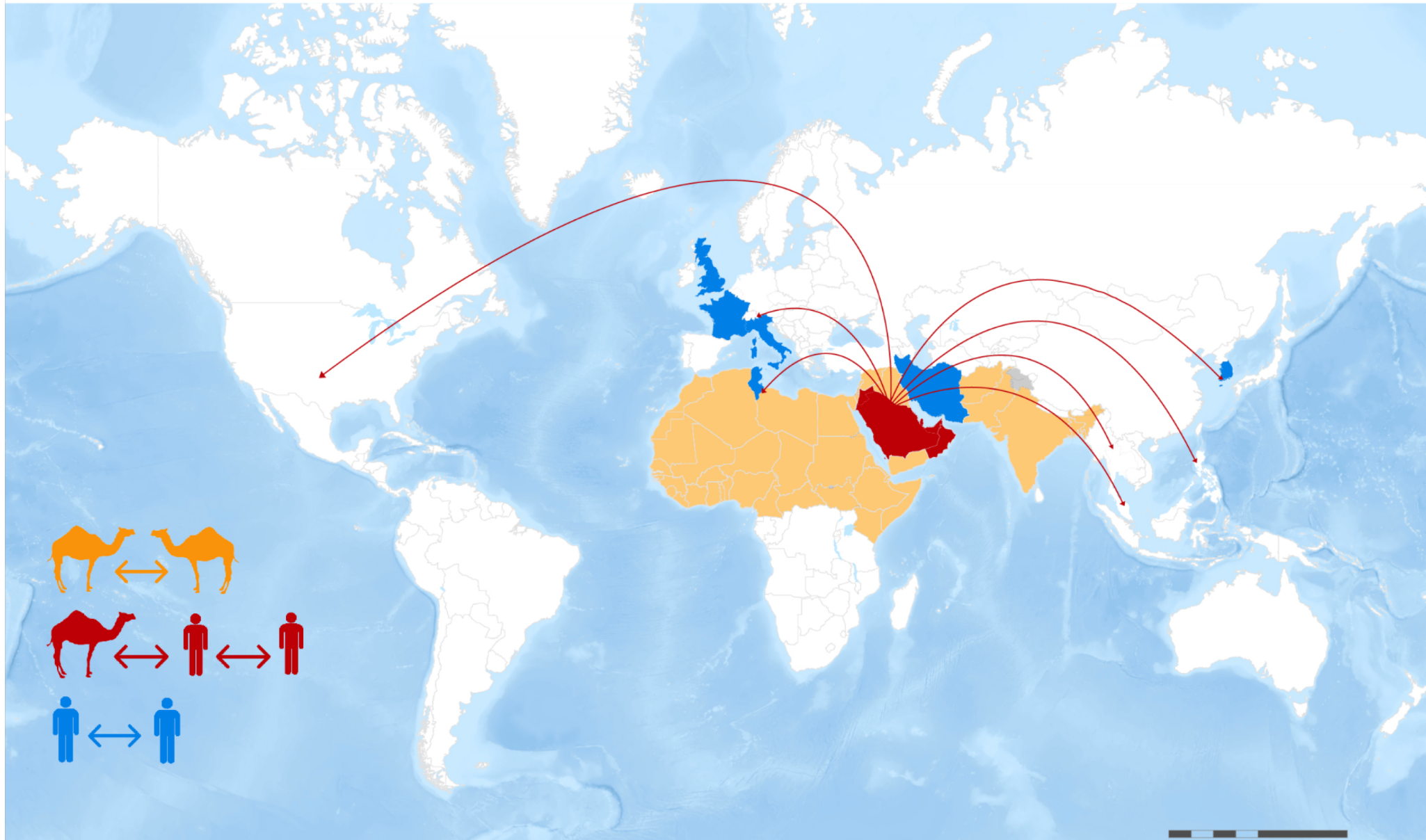
Other: pneumonia and DIC •

MERS-COV TRANSMISSION AND GEOGRAPHIC RANGE



World Health Organization

MAP DATE: 19 January 2018



Data Source: World Health Organization
Map Production: WHO Health Emergencies Programme

The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

© World Health Organization 2018. All rights reserved.

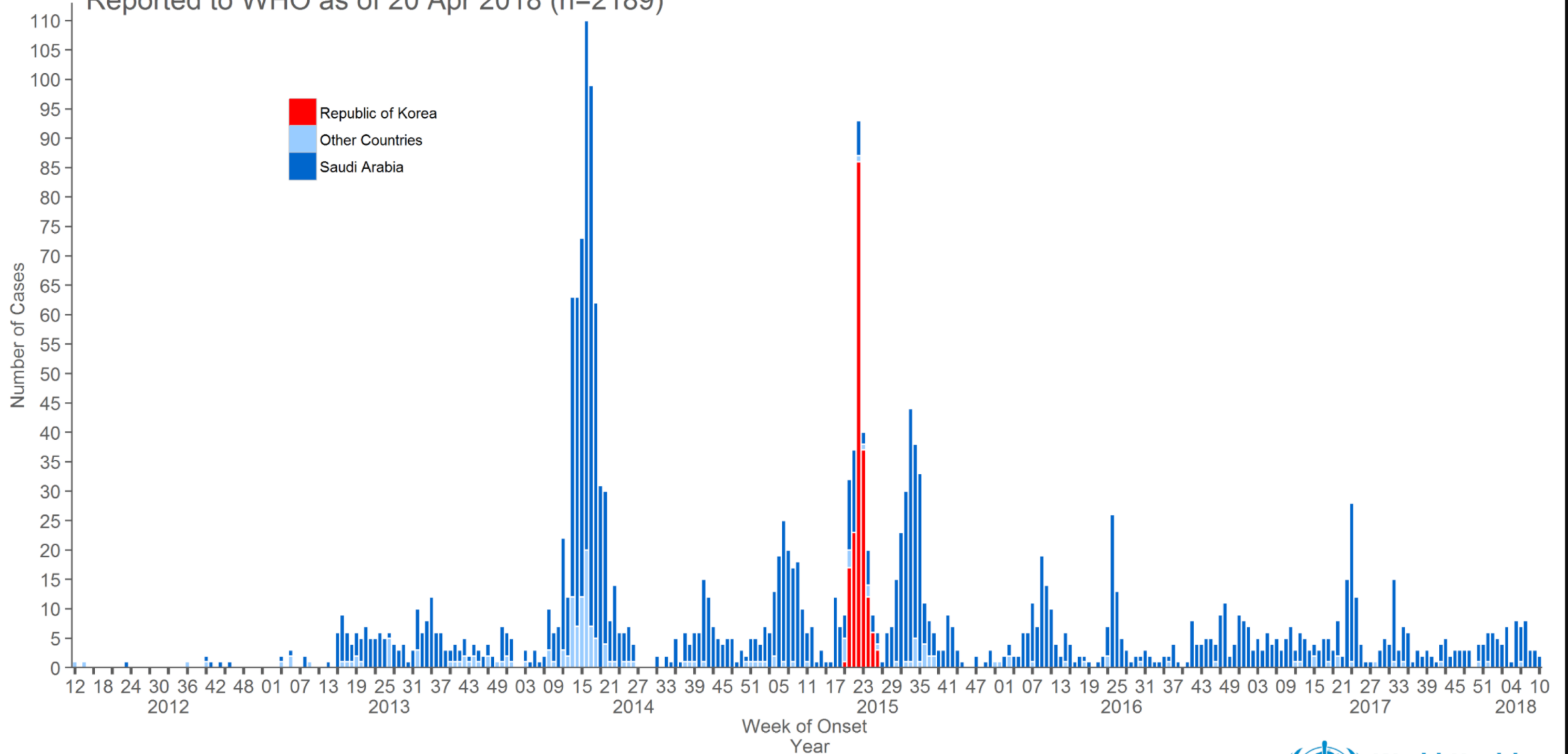
Table 1. Number of laboratory-confirmed MERS cases reported by countries, by year, since 2012*

Country reporting	Number of laboratory-confirmed MERS-CoV cases reported
Algeria	2
Austria	2
Bahrain	1
China	1
Egypt	1
France	2
Germany	3
Greece	1
Iran	6
Italy	1
Jordan	28
Kuwait	4
Lebanon	2
Malaysia	2
Netherlands	2
Oman	11
Philippines	2
Qatar	19
Republic of Korea	185
Saudi Arabia	1,854
Thailand	3
Tunisia	3
Turkey	1
United Kingdom	4
United Arab Emirates	86
United States of America	2
Yemen	1
Total	2,229

* Data as of 30 June 2018

Confirmed global cases of MERS-CoV

Reported to WHO as of 20 Apr 2018 (n=2189)



Other countries: Algeria, Austria, Bahrain, China, Egypt, France, Germany, Greece, Iran, Italy, Jordan, Kuwait, Lebanon, Malaysia, Netherlands, Oman, Philippines, Qatar, Thailand, Tunisia, Turkey, United Arab Emirates, United Kingdom, United States of America, Yemen

Please note that the underlying data is subject to change as the investigations around cases are ongoing. Onset date estimated if not available.



Who are risk?

Populations in close contact with dromedaries (e.g. farmers, abattoir workers, shepherds, dromedary owners) •

health care workers caring for MERS-CoV patients •

Healthy adults infected with MERS-CoV tend to have mild subclinical or asymptomatic infections. •

To date, limited human-to-human transmission has occurred between close contacts of confirmed cases in household settings. •

The case clusters in the UK, Tunisia, Italy, and in HCWs in Saudia Arabia and France strongly suggest that human to human transmission occurs. •

MERS-CoV does not yet have pandemic potential. •

Recommendation: Who are risk?

Anyone visiting farms, markets, barns, or other places where dromedary camels and other animals are present should practice general hygiene measures, including regular hand washing before and after touching animals, and should avoid contact with sick animals. •

Consumption of raw or undercooked animal products, including milk and meat, carries a high risk of infection from a variety of organisms that might cause disease in humans. •

Animal products that are processed appropriately through cooking or pasteurization are safe for consumption, but should also be handled with care to avoid cross contamination with uncooked foods. •

Camel meat and camel milk are nutritious products that can continue to be consumed after pasteurization, cooking, or other heat treatments. •

Case definitions:

Limited data •

Fever, chills/rigors, headache, non-productive cough, dyspnea, and •
myalgia.

Sore throat, coryza, sputum production, dizziness, nausea, and •
vomiting, diarrhea, and abdominal pain.

Who needs to be monitored? (Patient Under Investigation):

A. Fever AND pneumonia or ARDS AND EITHER: •

HX. of travel within 14d •

Close contact with a symptomatic traveler within 14d •

A member of a cluster of patients with severe acute respiratory illness? MERS •

Case definitions:

Confirmed case: •

Laboratory confirmation •

Probable case: a PUI with absent or inconclusive laboratory results for MERS-CoV infection who is a close contact of a laboratory-confirmed MERS-CoV case. •

Close contact...definition:

Includes anyone who provided care for the patient, including a HCWs • or family member or another individual who had other similarly close physical contact, and anyone who lived with or visited a case while the case was symptomatic.

Clinical manifestations:

Incubation period: •

5.2 days in S.Arabia •

9-12 days: France •

2-14 d •

WHO, CDC: MERS-CoV be considered in individuals with a syndrome •
of MERS who returned from travel to the Arabian countries within the
past **14 days**.

Clinical features:

Severely ill with **pneumonia and ARDS**, acute kidney injury. •

Many patients required mechanical ventilation. •

Gastrointestinal symptoms(anorexia, nausea, vomiting, abdominal pain, diarrhea). •

Comorbidities •

Study: in 47 patients with MERS 96 % had underlying comorbidities(DM, Hypertension, chronic cardiac disease, chronic kidney disease, prednisolone) •

Old age •

Laboratory findings:

Leukopenia •

Lymphopenia •

Thrombocytopenia •

Virus isolation from lower respiratory tract urine, feces, serum •

Nasopharyngeal and oropharyngeal swab specimen •

Whom to test?

A person with an acute respiratory infection, which may include history of fever and cough and evidence of **pulmonary parenchymal disease (pneumonia, ARDS)** based upon clinical or radiographic evidence of consolidation, who requires admission to hospital. •

The disease is in **a cluster** that occurs within a 14-day period, without regard to place of residence or history of travel. •

Cluster: workplace, household,... •

HCW who has been working in an environment where patients with severe acute respiratory infections are being cared. •

HX. Of travel to the Middle East within 14 days before onset of illness. •

Person with acute respiratory illness of any severity who, within 14 days before onset of illness, was in close physical contact with a confirmed or probable case of MERS-CoV infection while that patient was ill •

Treatment:

No vaccine or specific treatment is currently available. •

Treatment is supportive and based on the patient's clinical condition. •

No antiviral agents are recommended for the treatment of MERS-CoV •
infection.

Prevention:

There is no licensed vaccine for MERS-CoV. •

Infection control: standard, contact, and airborne precautions for the •
management of hospitalized patients.

Travel recommendations:

WHO does not recommend the application of any travel or trade •
restrictions or entry screening related to MERS-CoV

Traveling to the Arab peninsula has not been prohibited (Umrah & Hajj) •

Caution: •

>65yr •

<12yr •

Pregnant women •

Immunocompromised patients •

Chronic disease(heart dis., kidney dis., respiratory dis., diabetes) •

Patients with a terminal illness •

Mers Co V

<https://www.youtube.com/watch?v=m0R4LvLI17k&feature=youtu.be> •

Influenzas

Definition

Seasonal influenza is an acute respiratory infection caused by •
influenza viruses which circulate in all parts of the world.

4 types :A, B, C and D. •

Influenza A and B viruses circulate and cause **seasonal epidemics** of •
disease

Subtypes

Influenza A viruses •

A(H1N1)..... A(H1N1)pdm09.....pandemic in 2009 •

A(H3N2) influenza viruses. •

Only influenza type A viruses are known to have caused pandemics. •

Influenza B viruses are not classified into subtypes, but can be broken •
down into lineages. Currently circulating influenza type B viruses belong to
either B/Yamagata or B/Victoria lineage.

Influenza C virus is detected less frequently and usually causes mild •
infections, thus does not present public health importance.

Influenza D viruses primarily affect cattle and are not known to infect or •
cause illness in people.

Epidemiology

All age groups can be affected •

Pregnant women, •

Children under 59 months •

Elderly, •

Individuals with chronic medical conditions (such as chronic cardiac, •
pulmonary, renal, metabolic, neurodevelopmental, liver or hematologic
diseases)

HIV/AIDS, receiving chemotherapy or steroids, or malignancy •

Health care workers are at high risk acquiring influenza virus infection due •
to increased exposure to the patients and risk further spread particularly to
vulnerable individuals.

Transmission

Crowded areas including schools and nursing homes. •

When an infected person coughs or sneezes, droplets containing viruses •
(infectious droplets) are dispersed into the air and can spread up to one meter,
and infect persons in close proximity who breathe these droplets in.

The virus can also be spread by hands contaminated with influenza viruses. •

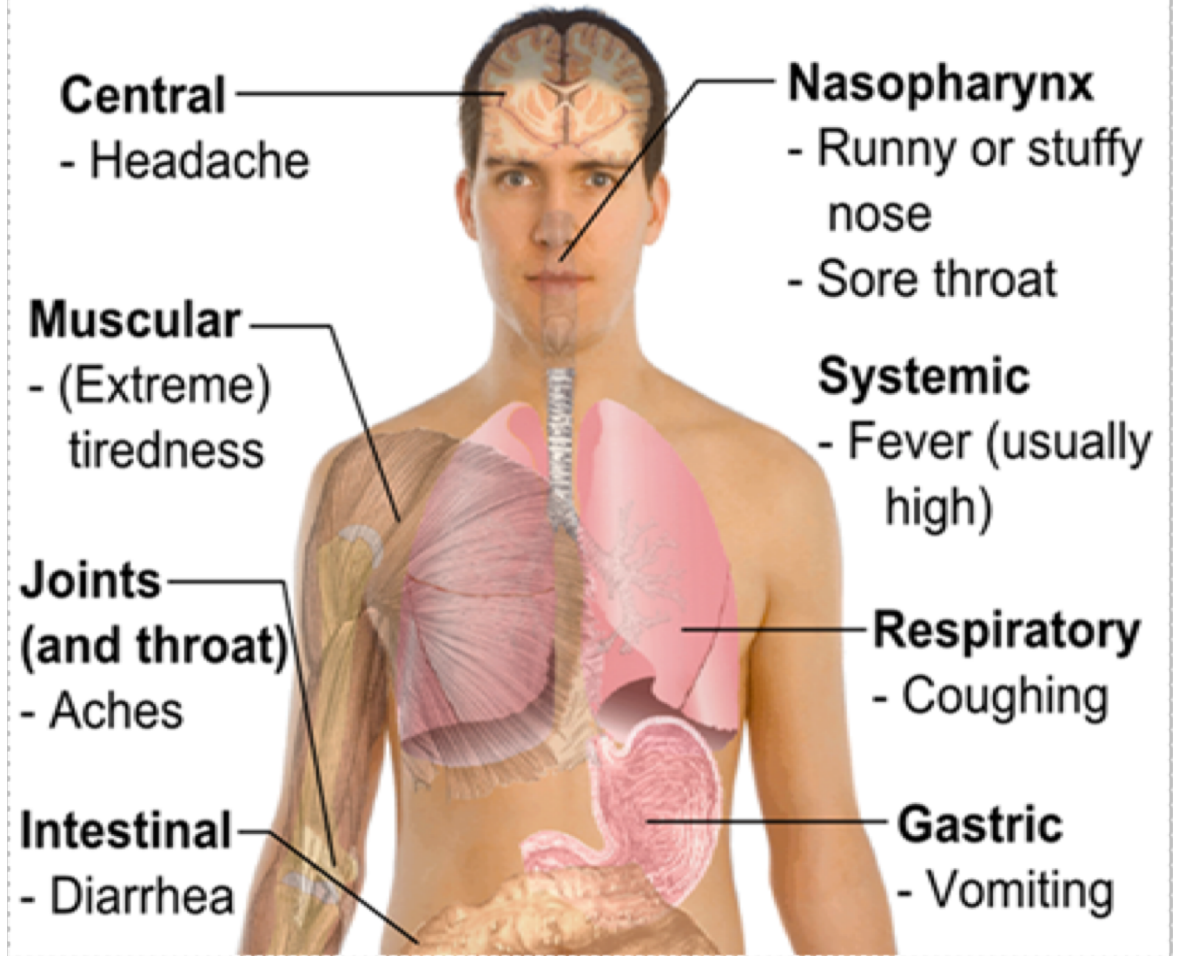
To prevent transmission, people should cover their mouth and nose with a tissue •
when coughing, and wash their hands regularly.

Seasonal epidemics occur mainly during winter, while in tropical regions, •
influenza may occur throughout the year, causing outbreaks more irregularly.

Incubation period, 2 days, but ranges 1- 4 days. •

•

Symptoms of Influenza



Avian Influenza

Avian influenza is an infectious disease of birds caused by type A ■
strains of the influenza virus.

These viruses occur naturally among wild aquatic birds worldwide ■
and can infect domestic poultry and other bird and animal species. The
disease, which was first identified in Italy more than 100 years ago.

Avian Influenza

Fifteen subtypes of influenza virus are known to infect birds, thus providing an extensive reservoir of influenza viruses potentially circulating in bird populations. ■

H5N1; the strain of avian flu known as has been behind outbreaks of deadly avian flu. ■

Avian Influenza

Avian influenza transmitted by birds usually through feces or saliva. ■

Avian influenza is not usually passed on to humans, although it has ■
been contracted by people who have handled infected birds or touched
surfaces contaminated by the birds.

Avian Influenza

Migratory water birds, especially wild ducks. They may do not show clinical disease. The virus colonizes the intestinal tract and is spread in . . . They act as a reservoir for the infection of other species the feces

Pigs can be infected by bird influenza (as well as by the form of influenza that affects humans) and can pass on the flu to humans.

Bird flu and danger to humans

Bird flu, or avian flu, has a high mortality rate in humans, but as of yet, can ~~not~~ be transmitted from person to person.

... WHO, February 20th, 2006:
"Human infections remain a rare event."

Infection with type A virus H5N1

1 Most virulent bird flu virus; mutates rapidly, altering its genetic material

2 Humans infected by close contact with live infected poultry

3 Birds carry virus and excrete it in feces, which dries, becomes pulverized and then can be inhaled or taken in by touch

4 Humans have no immunity against this virus

Reason for concern

Humans infected with bird flu could serve as a host for a new genetic subtype that can be transmitted from person to person

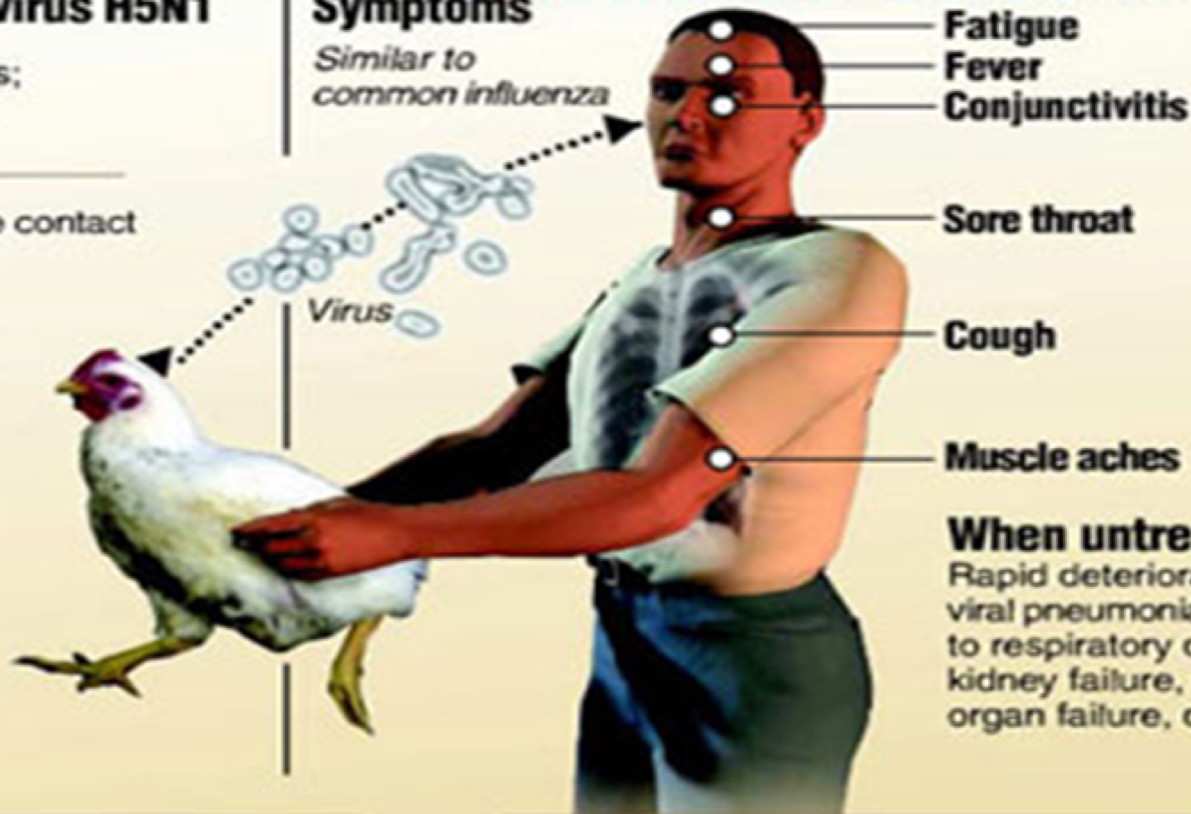


Might start influenza pandemic



Symptoms

Similar to common influenza



Fatigue

Fever

Conjunctivitis

Sore throat

Cough

Muscle aches

When untreated

Rapid deterioration; viral pneumonia leading to respiratory distress, kidney failure, multi-organ failure, death



Source: WHO Source: WHO

Swine Flu

Swine influenza (swine flu) is a respiratory disease of pigs caused by type A influenza virus that regularly cause outbreaks of influenza in pigs. ■

Like human influenza viruses, there are different subtypes and strains of swine influenza viruses. The main swine influenza viruses circulating in U.S. pigs in recent years are: H1N1 influenza virus, H3N2 virus, H1N2 virus. ■

Swine Flu

Influenza in swine was first recognized as an epizootic disease in 1918. ■

Swine influenza virus was first isolated from humans in 1974. ■
Serologic evidence of infections with a swine influenza virus in humans has also been obtained. Viruses of swine may be a potential source of epidemic disease for humans.

Swine Flu

Symptoms and Signs/ In pigs

Fever, lethargy, sneezing, coughing, difficulty breathing and ■
decreased appetite.

Although mortality is usually low (around 1–4%), the virus can ■
produce **weight loss** and **poor growth**, causing economic loss to farmers.

In some cases, the infection can cause **abortion**. ■

Swine Flu

Symptoms and Signs/In Human

Systemic: fever ■

Nasopharynx: Runny nose; sore throat ■

Respiratory: Coughing ■

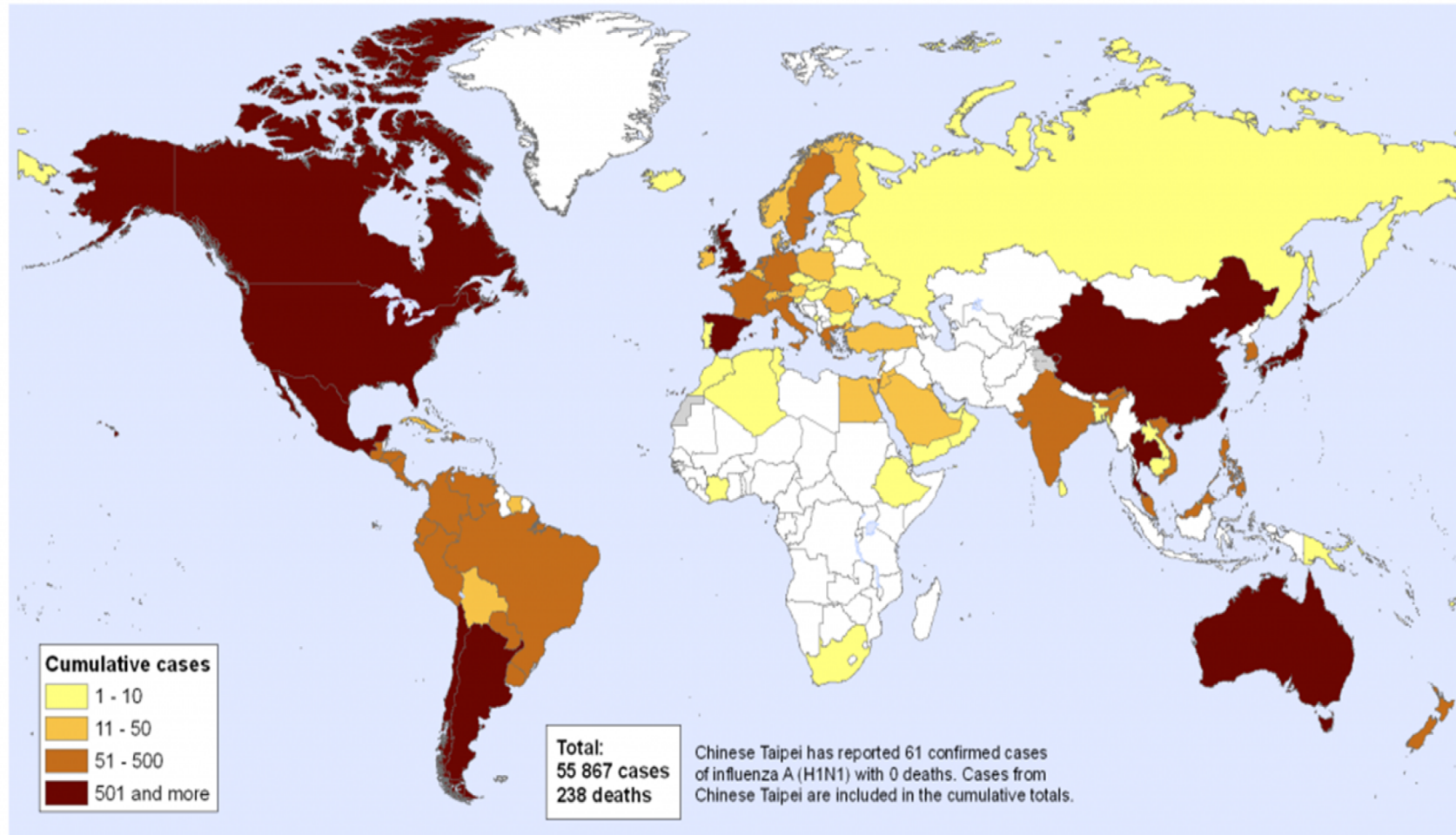
Gastric: Nausea; Vomiting ■

Intestinal: Diarrhea ■

Psychological: Lethargy; Lack of appetite ■

New Influenza A (H1N1),
Number of laboratory confirmed cases as reported to WHO

Status as of 24 June 2009
06:00 GMT



The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

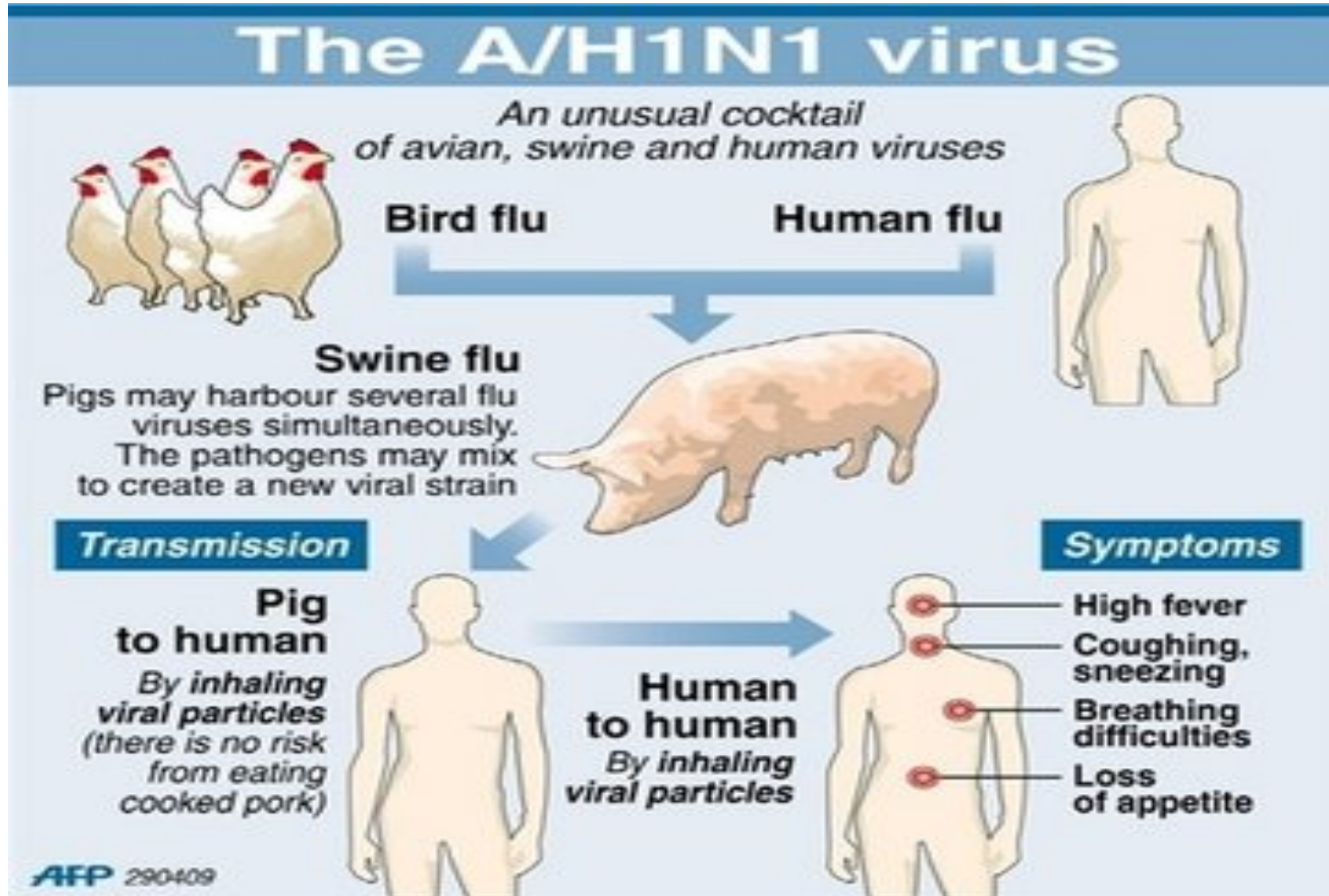
Data Source: World Health Organization
Map Production: Public Health Information
and Geographic Information Systems (GIS)
World Health Organization



© WHO 2009. All rights reserved

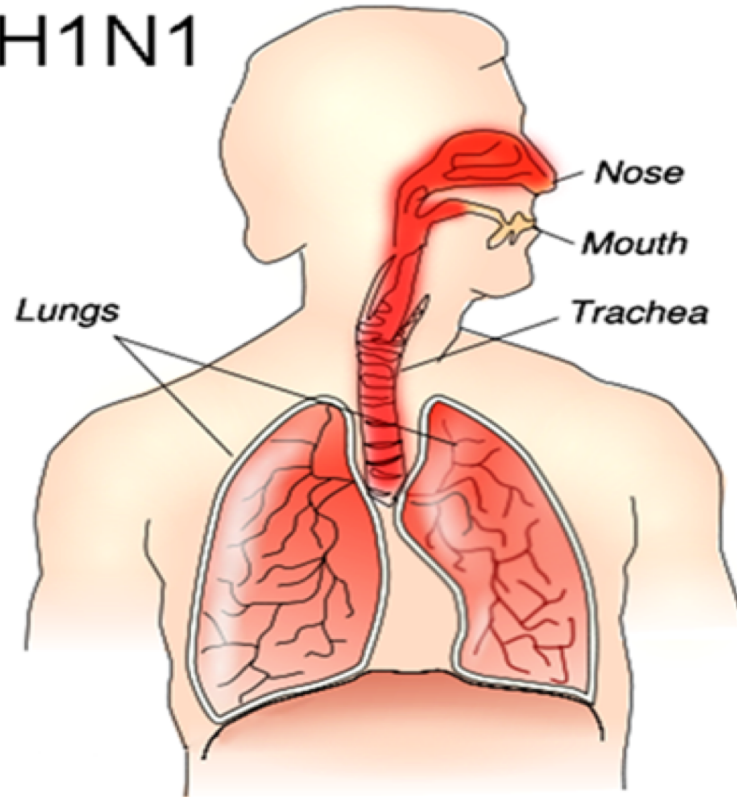
Map produced: 24 June 2009 10:00 GMT

The H1N1



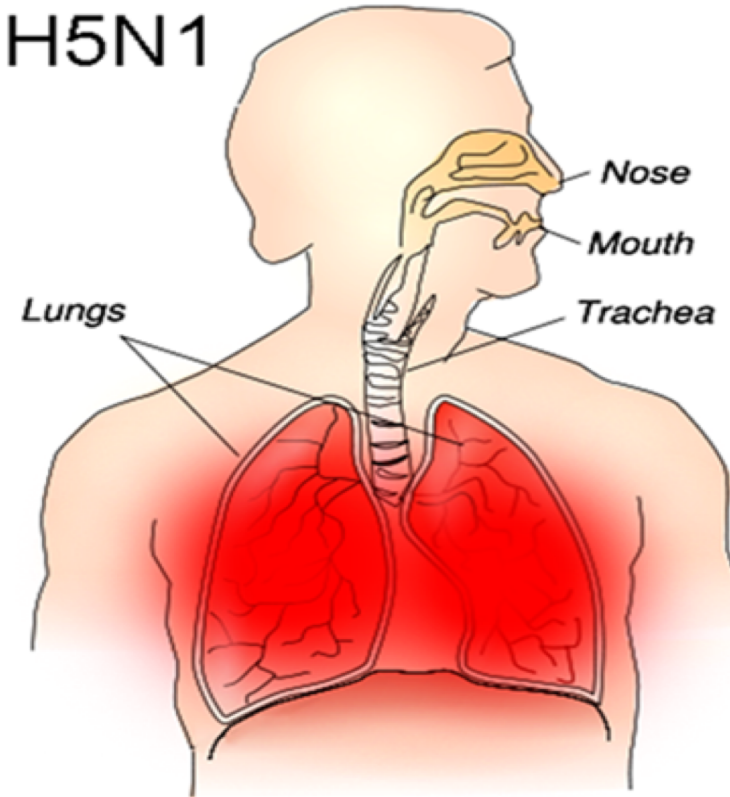
H1N1/H5N1

H1N1



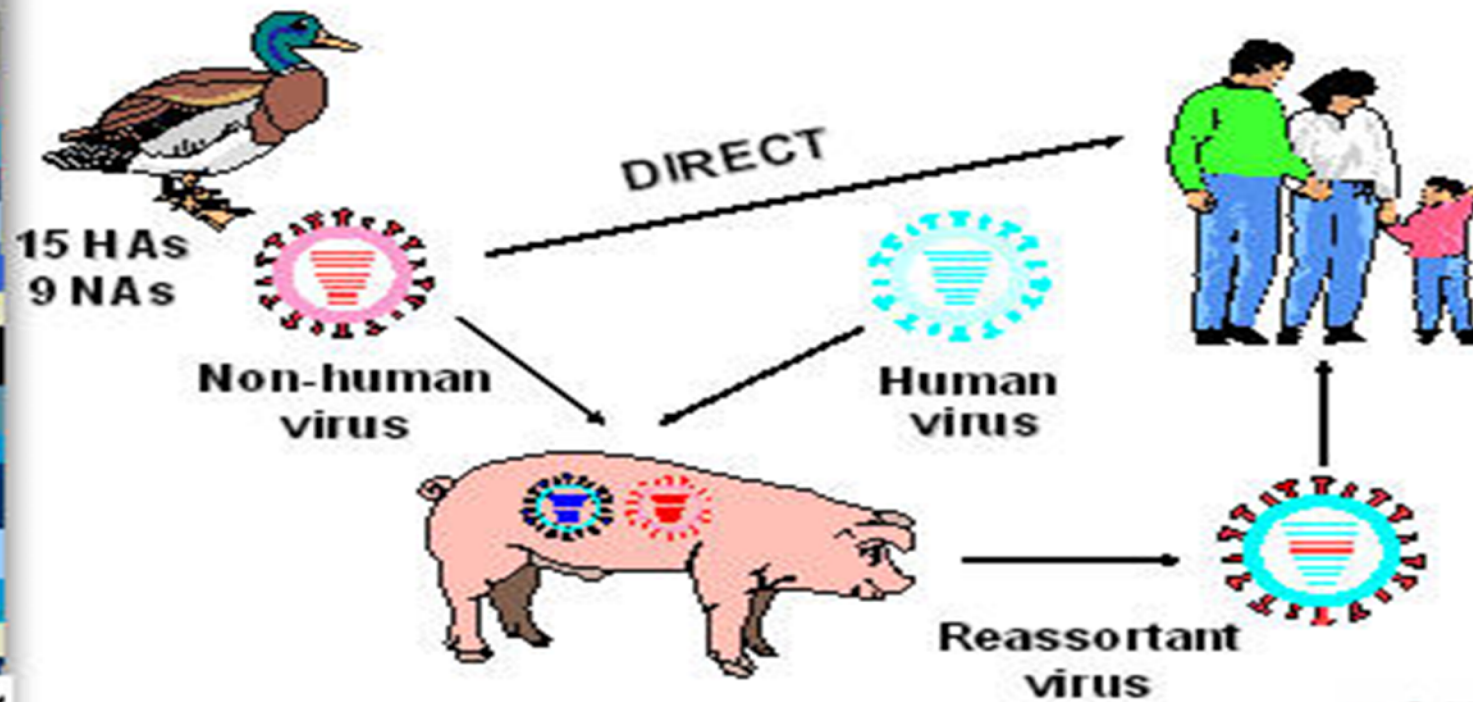
Easily spread
Rarely fatal

H5N1



Spreads slowly
Often fatal

Genesis of New Human Influenza Viruses



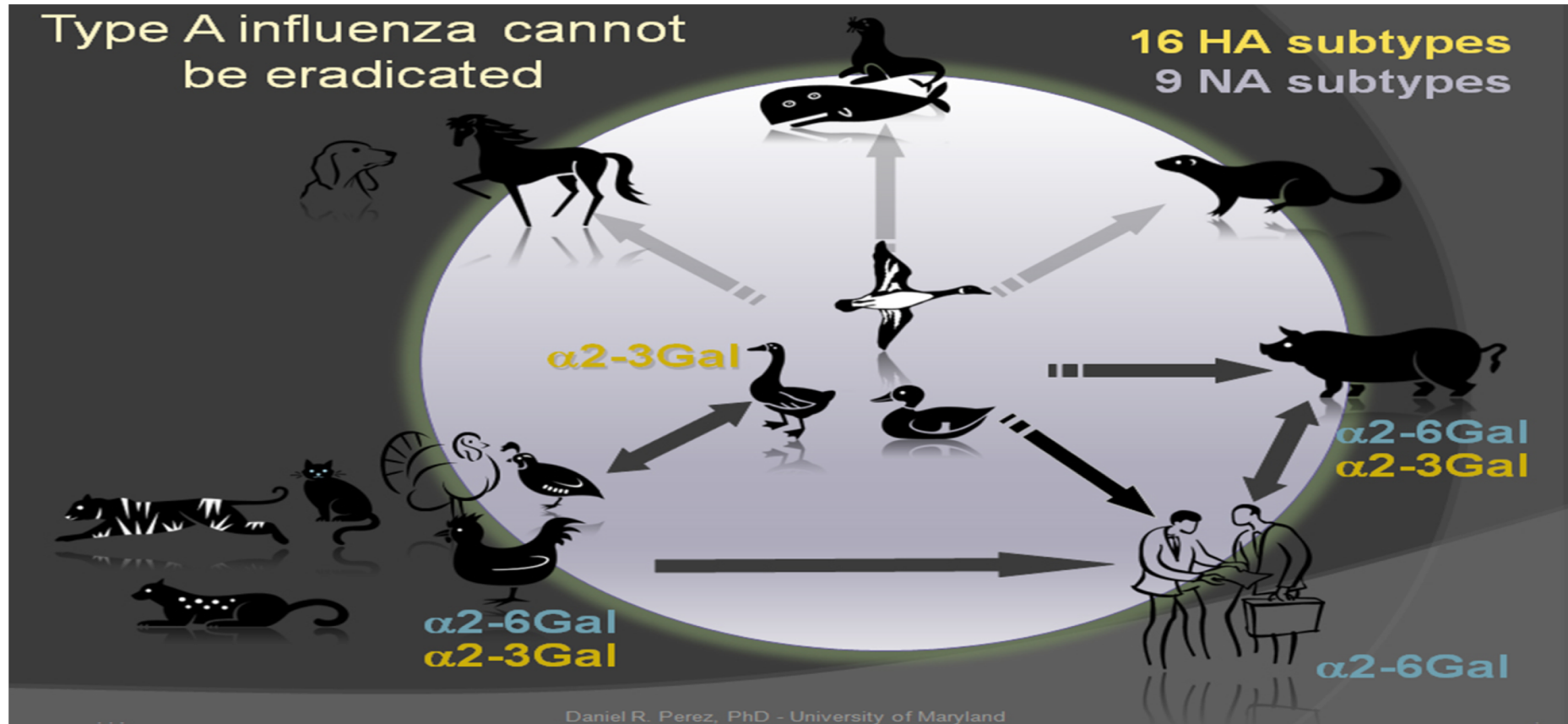
Seasonal flu/ Pandemic flu

Epidemic (seasonal) influenza which occurs annually and is ■ attributable to minor changes in genes that encode proteins on the surface of circulating influenza viruses. These are known as interpandemic epidemics.

Pandemic influenza which occurs when more significant changes in ■ the influenza A virus arises when human virus strains acquire genes from influenza viruses of other animal species. When this happens, everyone in the world is susceptible to the new virus, and a worldwide epidemic or pandemic can result.

Type A Influenza Can not be Eradicated

Continous emergence of new virus variant •



Infection Control



1 CLEAN

Wash your hands often.

Scrub your hands for at least 20 seconds with soap and water or use an alcohol-based hand cleaner.



2 COVER

Cover your cough.

Use a tissue to cover your mouth and nose when you cough or sneeze.

Don't have a tissue? Your sleeve will do.



3 CONTAIN

Contain germs by steering clear of others who are sick.

If you do get sick, stay at home until you're well again, so you don't spread more germs.

Vaccination

Flu shot

Inactivated vaccine
Killed virus

Indicated in healthy people and chronic medical condition patients
6 month of age and older

Nasal spray flu vaccine

Live attenuated virus vaccine (LAIV)

Indicated in healthy people 2-49 years old
Non pregnant

Vaccination/ Common side effects include:

Local reactions at the injection site (soreness, swelling, redness). ■

Possibly some systemic reactions (fever, headache, muscle or joint aches). ■

In almost all vaccine recipients, these symptoms are mild, self-limited and last 1-2 days. ■

Treatment

Treatment with oseltamivir (trade name Tamiflu®) or ■
zanamivir (trade name Relenza®) is recommended for all
people with suspected or confirmed influenza who require
hospitalization.

References

Information on MERS Co V. Available at: https://www.cdc.gov/coronavirus/mers/downloads/factsheet-mers_en.pdf •

Middle East respiratory syndrome Case definition for reporting to WHO. Available at: •
https://www.who.int/csr/disease/coronavirus_infections/mers-interim-case-definition.pdf?ua=1

Emerging infectious diseases: MERS-COV, the new Betacoronavirus pandemic. International Journal of Community Medicine and Public Health, February 2018, Vol 5, Issue 2. DOI: •
<http://dx.doi.org/10.18203/2394-6040.ijcmph20180042>

Prevention is better than cure for emerging infectious diseases. BMJ 2014;348:g1499. •

Morens DM, Fauci AS (2013) Emerging Infectious Diseases: Threats to Human Health and Global Stability. •
PLoS Pathog 9(7): e1003467. doi:10.1371/journal.ppat.1003467