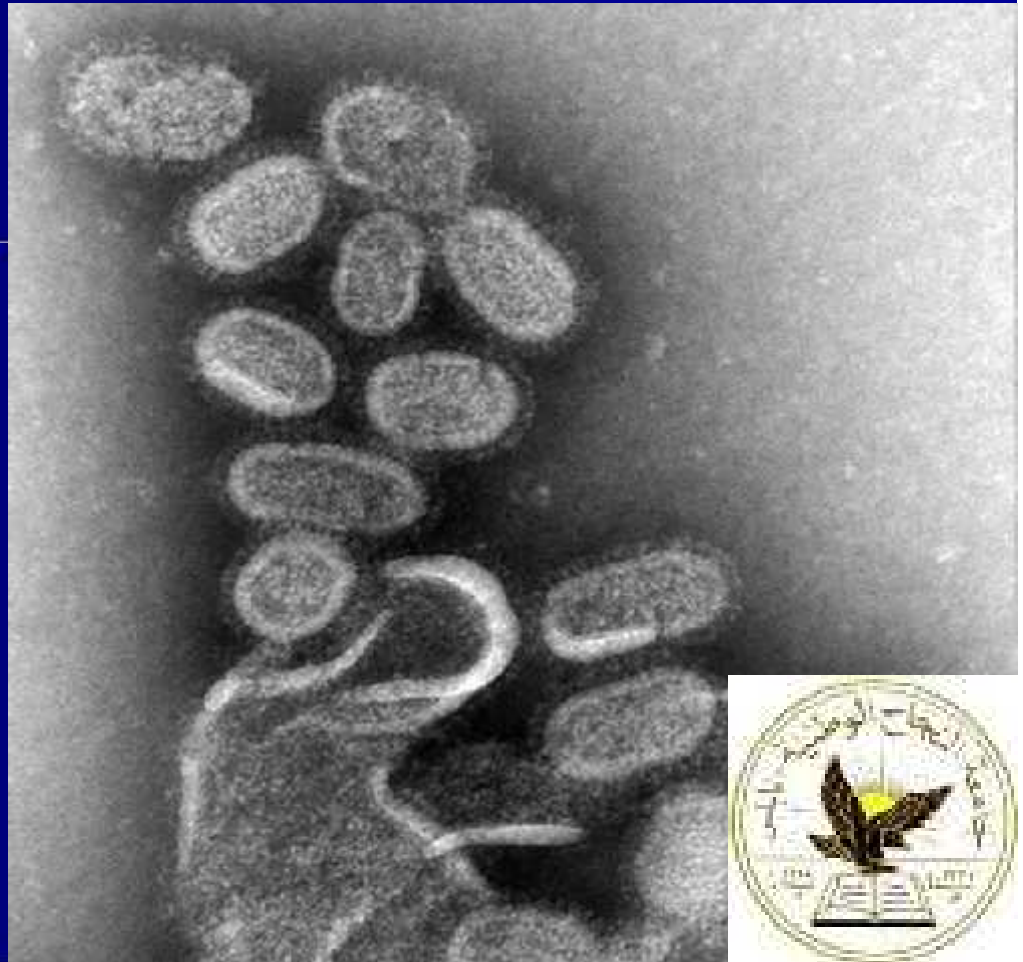


# Influenza A (H1N1) Swine Influenza A Virus

Swine  
Flu



# What are viruses

Viruses: are particles composed of an internal core containing either DNA or RNA covered by a protective protein coat. Some have an envelope, and which can replicate only within a specific host cell (obligate intracellular parasite) and viewed by Electron microscope



# Composition of the viruses

1. Nucleic acid

2. Protein Coat (Capsid)

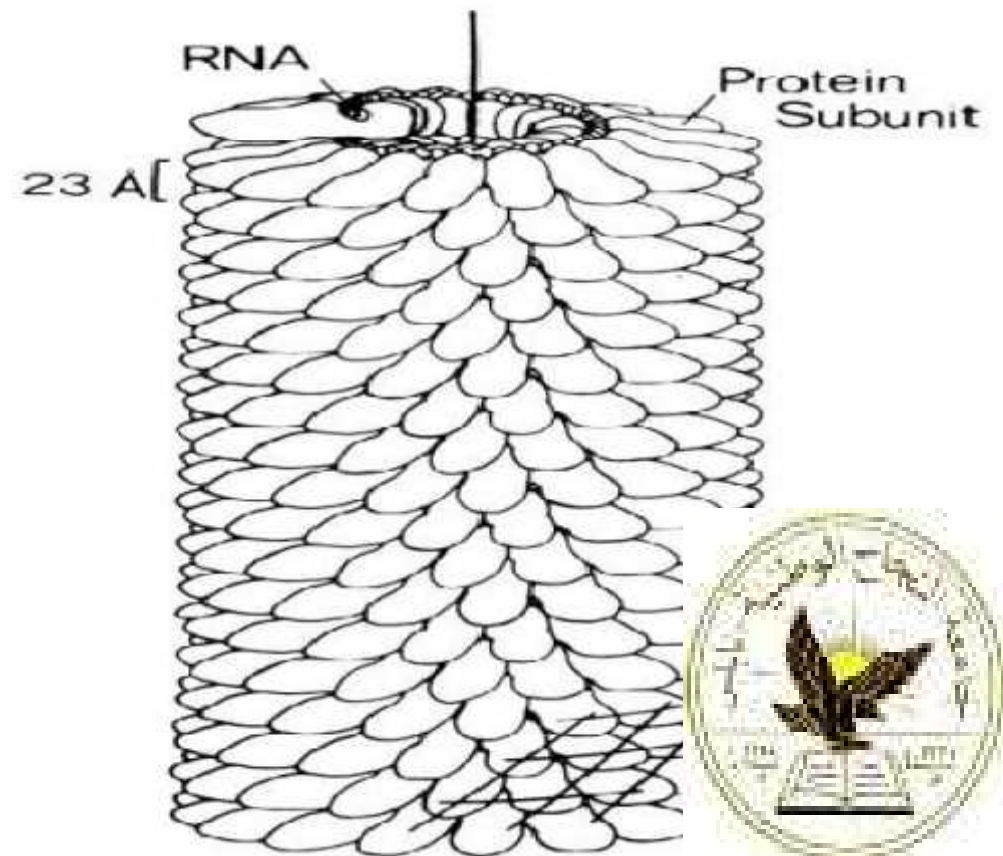
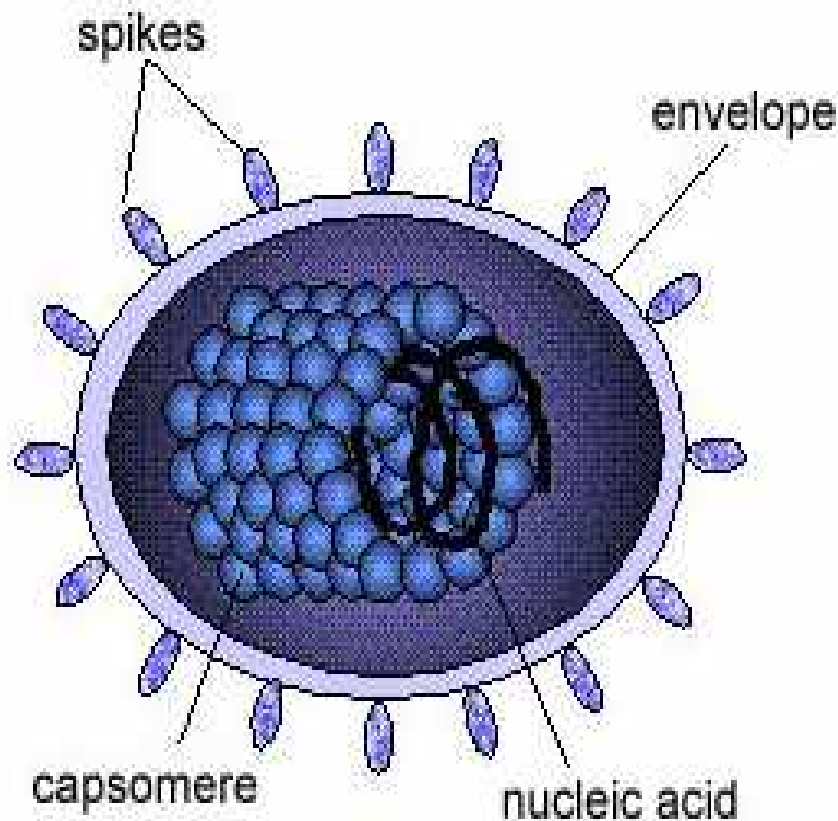
nucleocapsid (nucleic acid + capsid)

3. Envelope



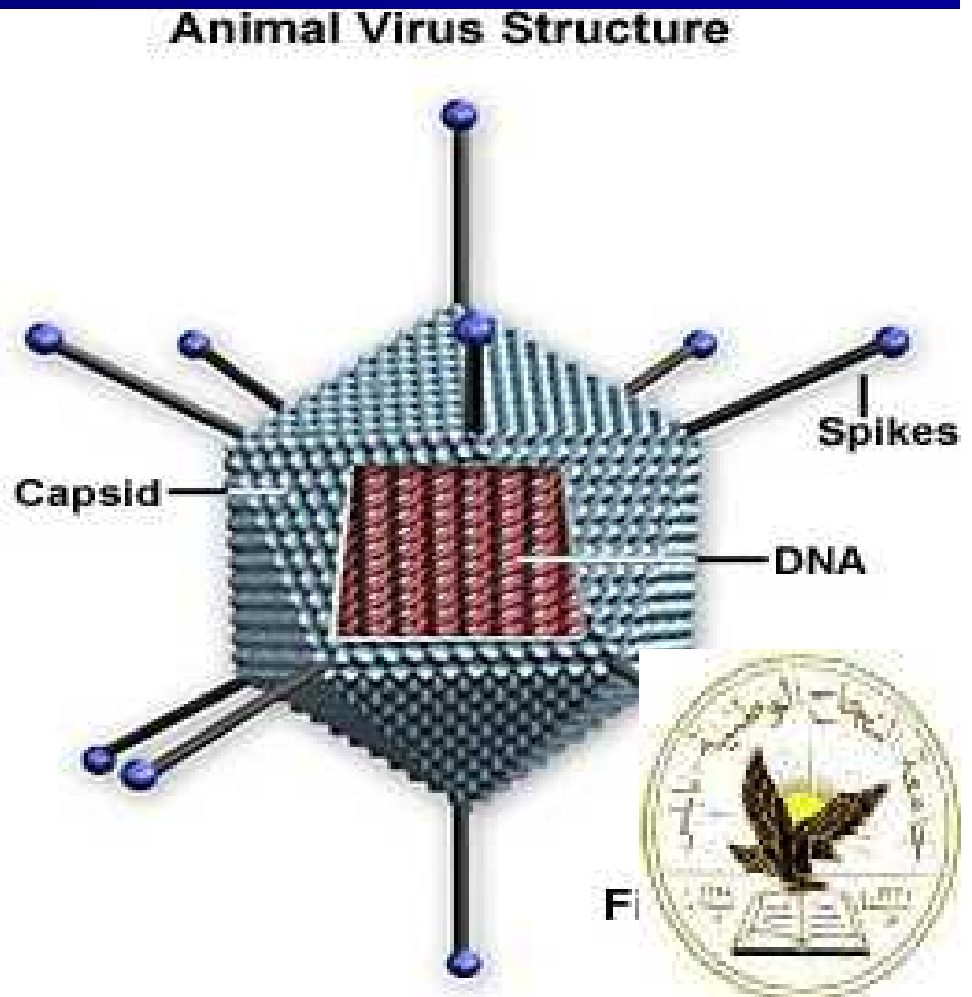
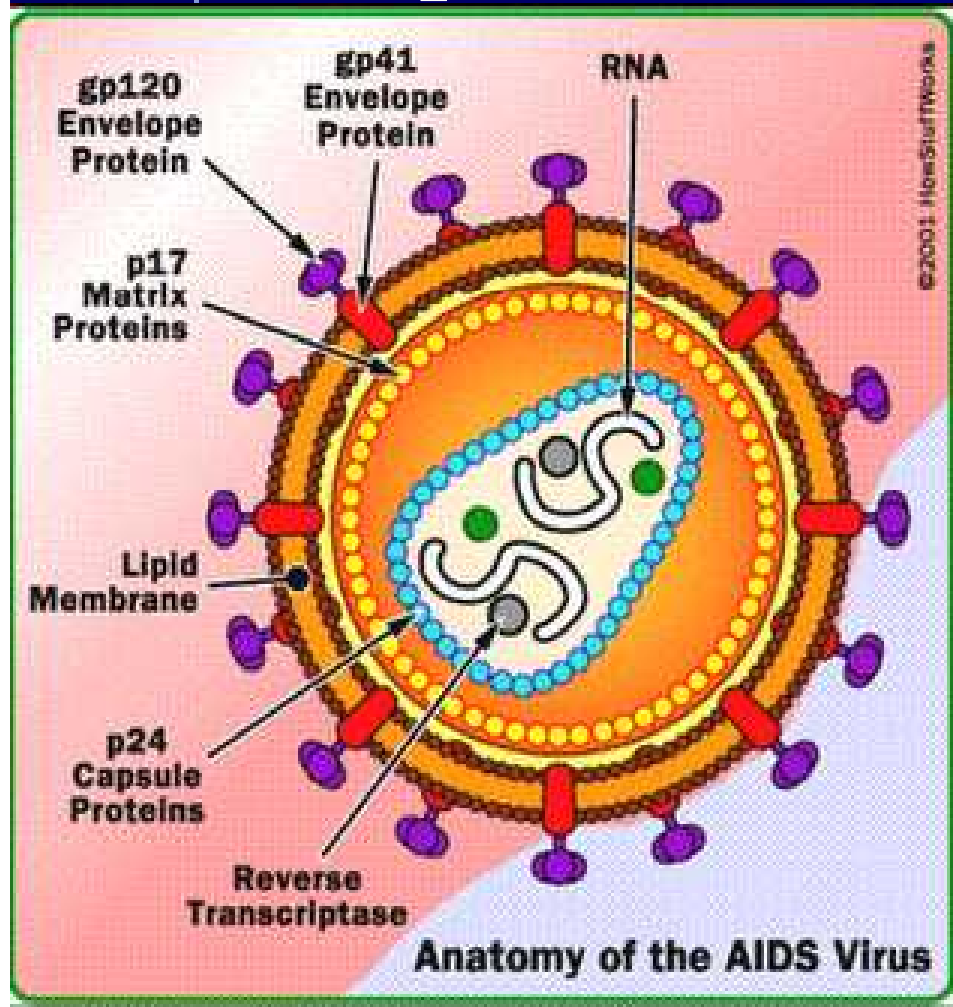
# GENERAL MORPHOLOGY

## 1. Helical virus (May be enveloped or non-enveloped)



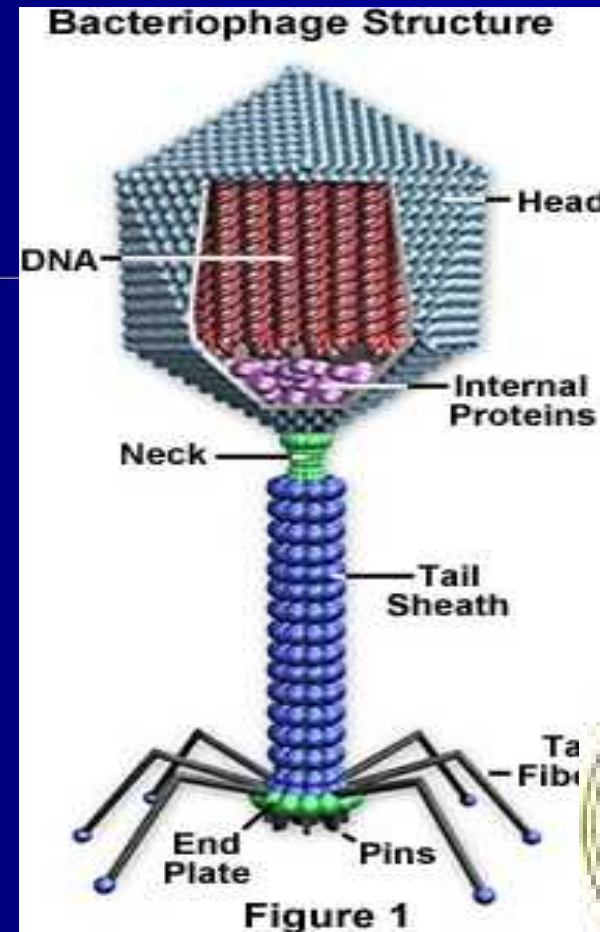
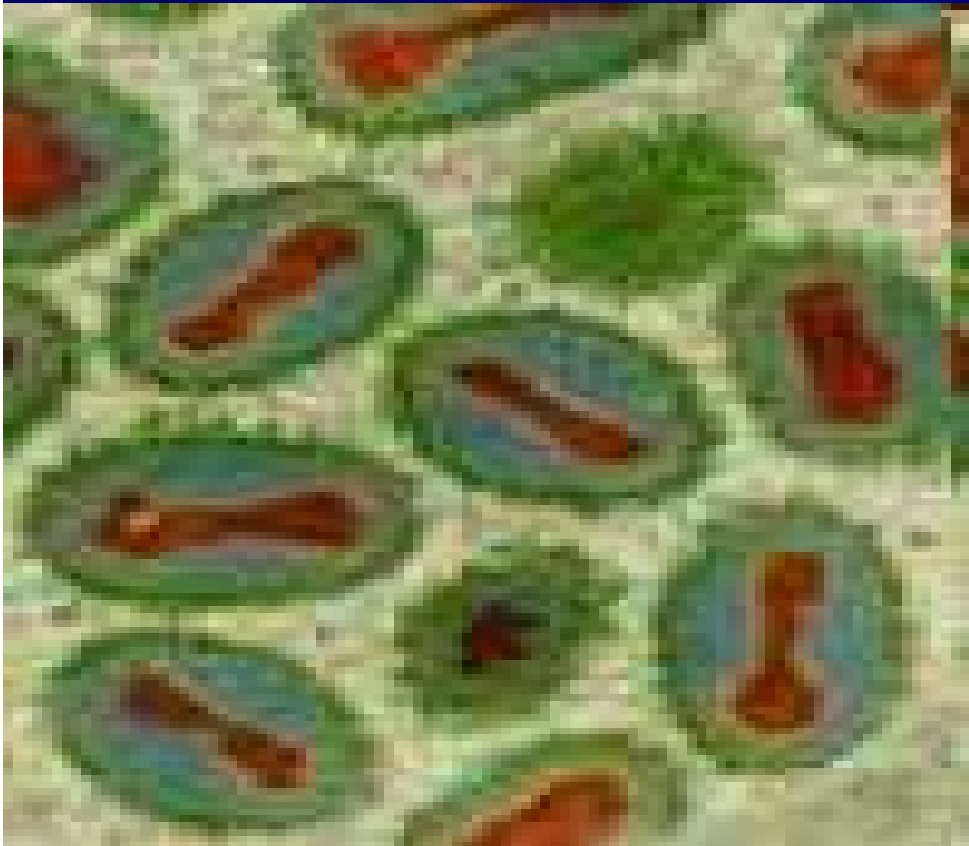
# Continued

## 2. Polyhederal virus (icosahederal) may be enveloped or non-enveloped

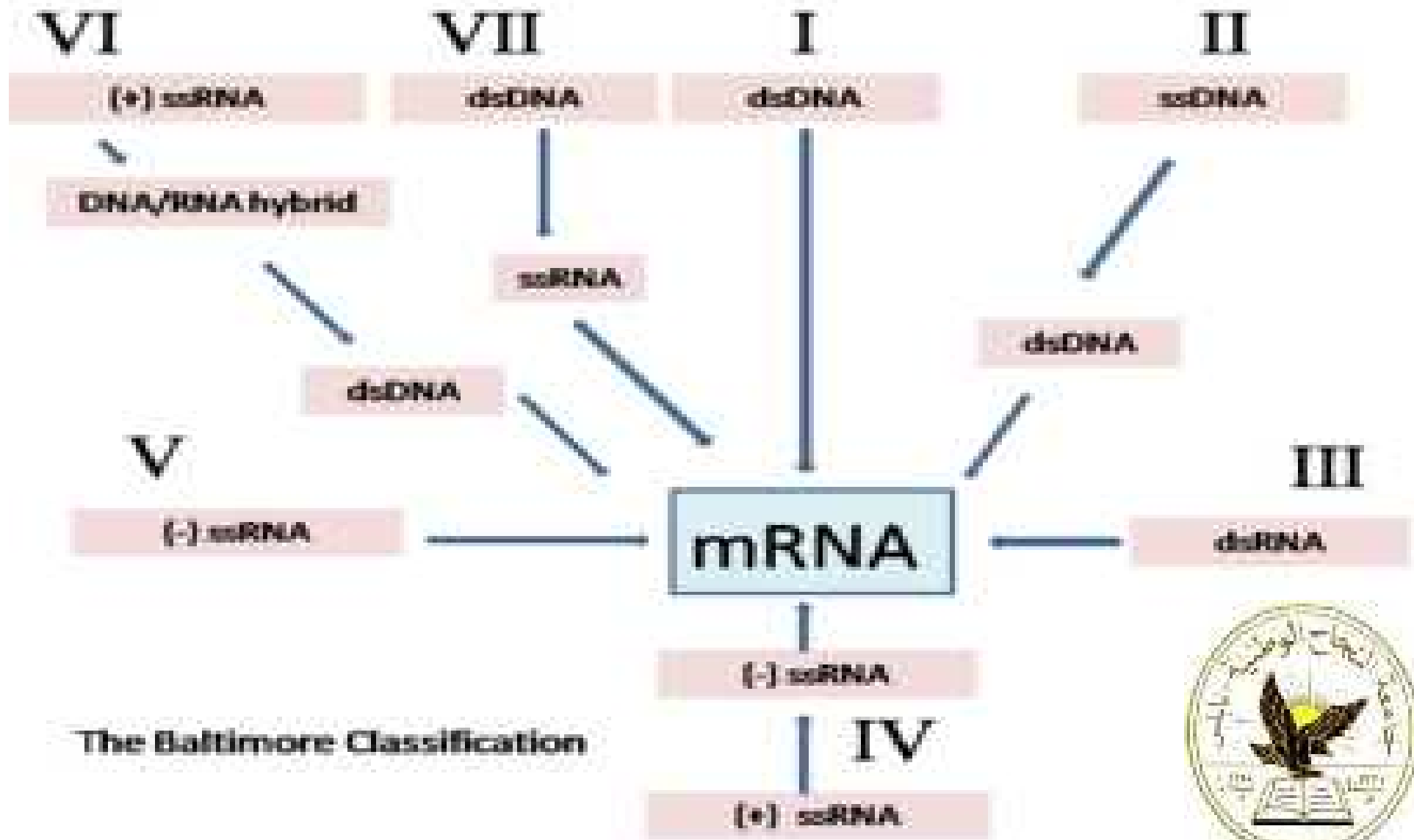


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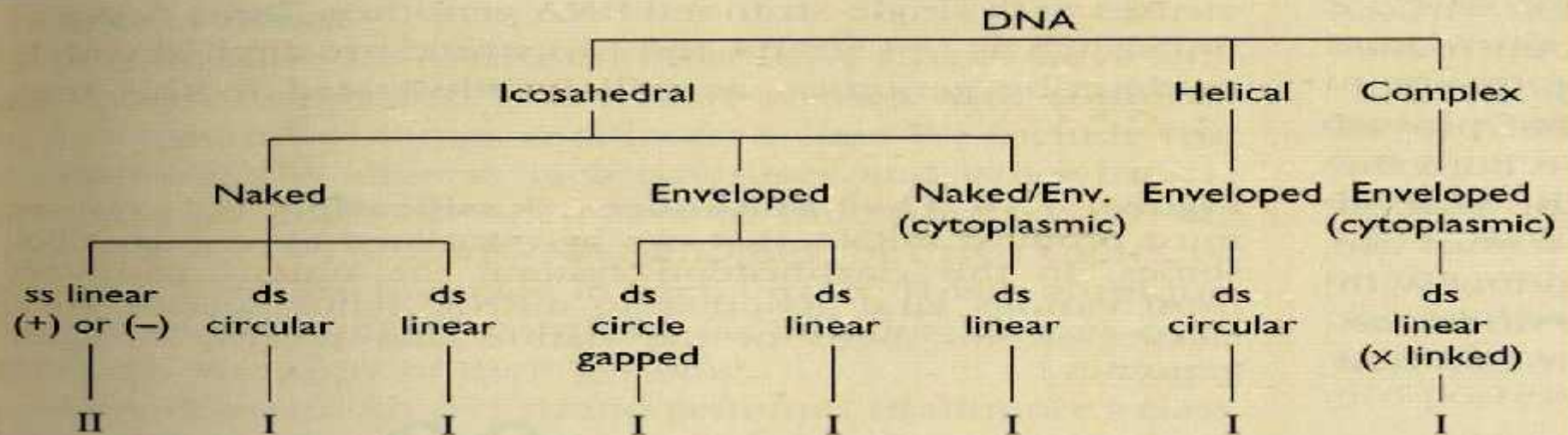
## 3. Complex virus: Neither helical nor icosahedral



# CLASSIFICATION OF VIRUSES



# DNA Viruses

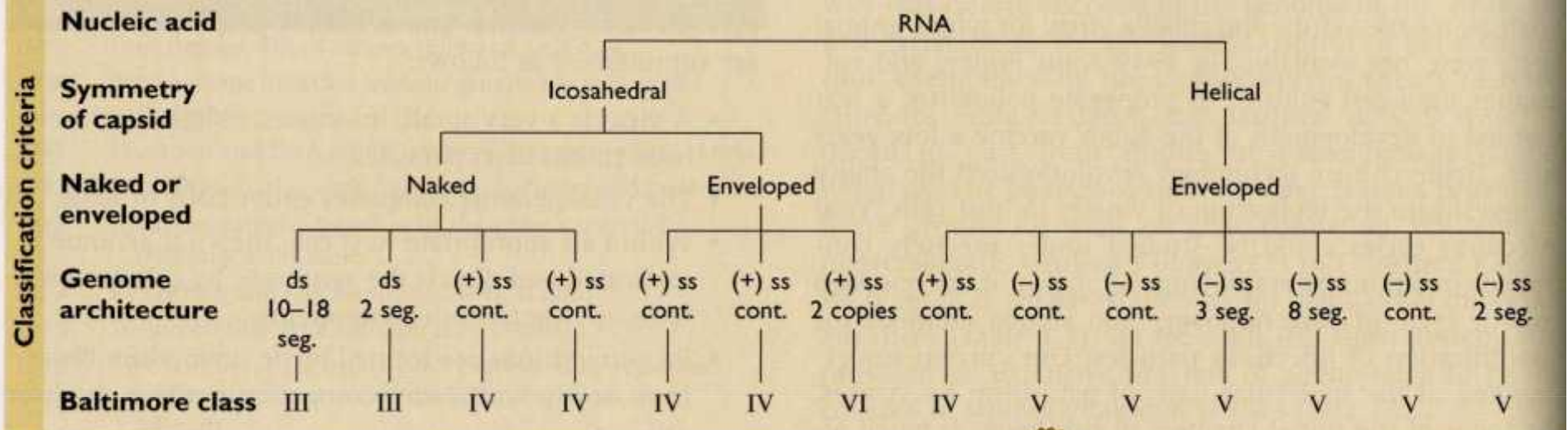


Parvo	Papova	Adeno	Hepadna	Herpes	Irido	Baculo
(-)	(-)	(-)	(+)	(-)	(-)	(-)
18-26	45-55	70-90	42	150-200	125-300	60 x 300
5	5-8	36-38	3.2	120-200	150-350	100





# RNA viruses



**Properties**

<b>Family name</b>	Reo	Birna	Calici	Picorna	Flavi	Toga	Retro	Corona	Filo	Rhabdo	Bunya	Orthomyxo	Paramyxo	Arena
<b>Virion polymerase</b>	(+)	(+)	(-)	(-)	(-)	(-)	(+)	(-)	(+)	(+)	(+)			
<b>Virion diameter (nm)</b>	60-80	60	35-40	28-30	40-50	60-70	80-130	80-160	80 x 790-14,000	70- 85 x 130-380	90-120	90-120		
<b>Genome size (total in kb)</b>	22-27	7	8	7.2-8.4	10	12	3.5-9	16-21	12.7	13-16	13.5-21			



# Family: *Orthomyxoviridae*

Negative ssRNA viruses, segmented, helical, enveloped

Main 3 genera:

1. Influenzavirus A
2. Influenzavirus B
3. Influenzavirus C

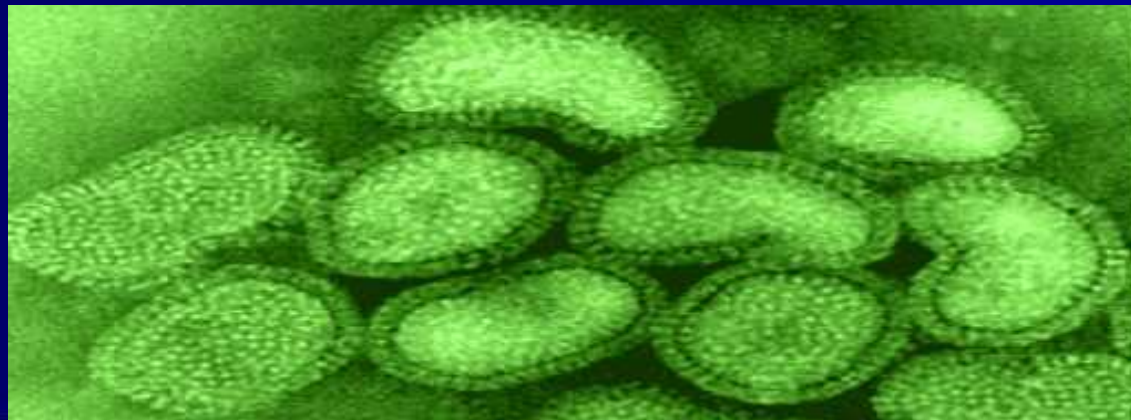
These are identified by antigenic differences in their nucleoproteins and matrix proteins.



# Hosts

The three genera infect invertebrates as following:

1. Influenzavirus A cause of all flu pandemics and infect **humans**, other **mammals** and **birds**
2. Influenzavirus B infect **humans** and **seals**
3. Influenzavirus C infect **humans** and **pigs**



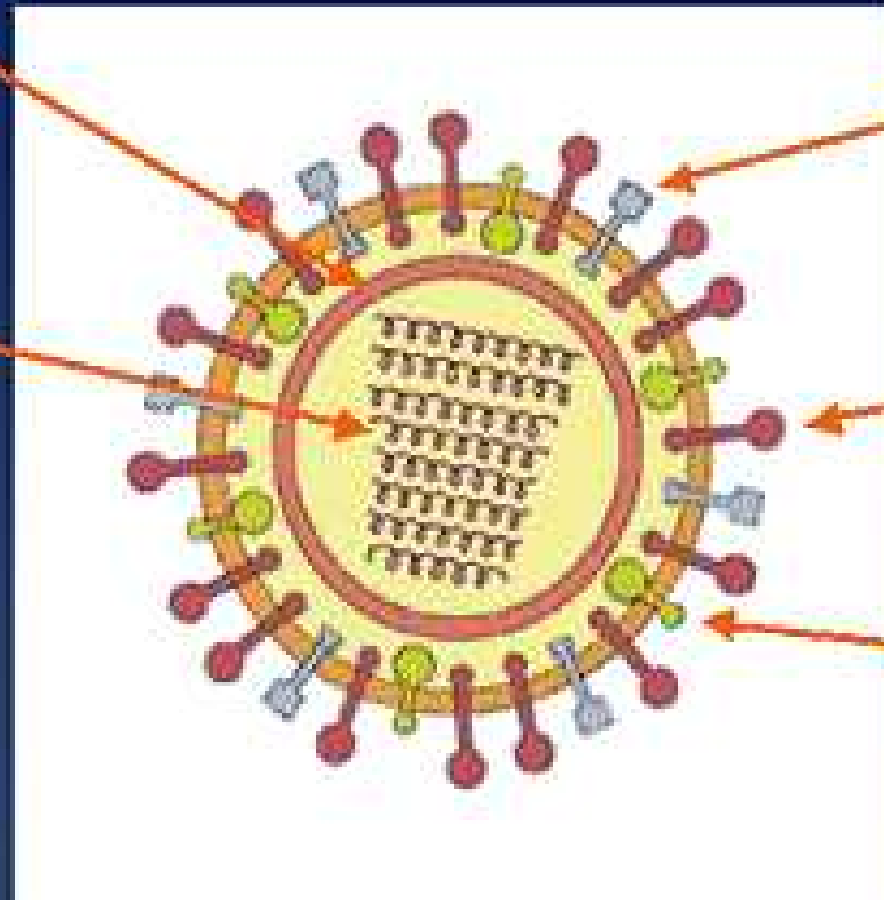
# Structure of influenza virus

## The Influenza Virus

### Influenza Type A

Matrix protein

Segmented  
RNA genome



Neuraminidase  
(NA)

Hemagglutinin  
(HA)

M2 ion channel  
protein

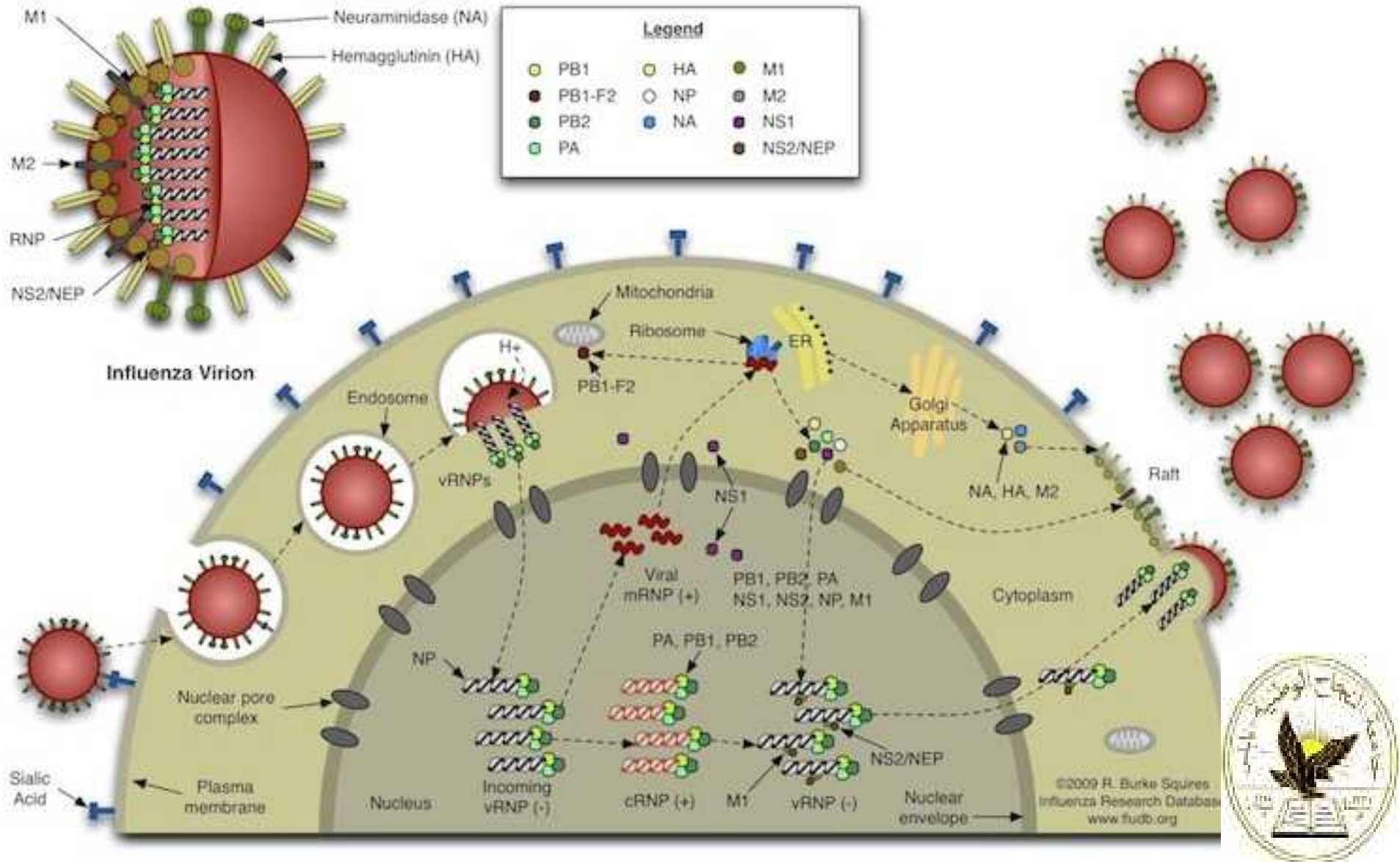


# Influenza A virus genes and proteins

Gene ID	Segment	Protein name	Protein function
1	Polymerase B2 (PB2)	Polymerase B2 (PB2)	Internal protein, virus replication
2	Polymerase B1 (PB1)	Polymerase B1 (PB1) PB1-F2	Internal protein, virus replication Mitochondrial targeting and apoptosis
3	Polymerase A (PA)	Polymerase A (PA)	Internal protein, virus replication
4	Hemagglutinin (HA)	Hemagglutinin (HA)	Surface glycoprotein, viral attachment, antigenic determinant, subtype specific (H1 through H16)
5	Nucleoprotein (NP)	Nucleoprotein (NP)	Nucleocapsid protein, RNA coating, nuclear targeting, RNA transcription, type (A,B,C) specific
6	Neuraminidase (NA)	Neuraminidase (NA)	Surface glycoprotein, antigenic determinant, viral release from host cells, subtype specific (N1 through N9)
7	Matrix (M)	Matrix 1 (M1) Matrix 2 (M2)	Membrane protein stability, type (A,B,C) specific Membrane protein, viral uncoating, type (A,B,C) specific
8	Non-structural (NS)	Non-structural 1 (NS1) Non-structural 2 (NS2)	Internal proteins Regulation of virus life cycle especially mRNA transcrip and localization of vira ribonucleic proteins



# Life cycle



# Subtypes of Influenza A viruses

1. 16 HA (hemagglutinin) and 9 NA (neuraminidase) subtypes
2. All 16H and 9N subtypes recognized currently have been recorded in birds in most possible combinations.
3. HA attachment to infect host cells NA remove neuraminic acid from mucin and release from cell



# Continued

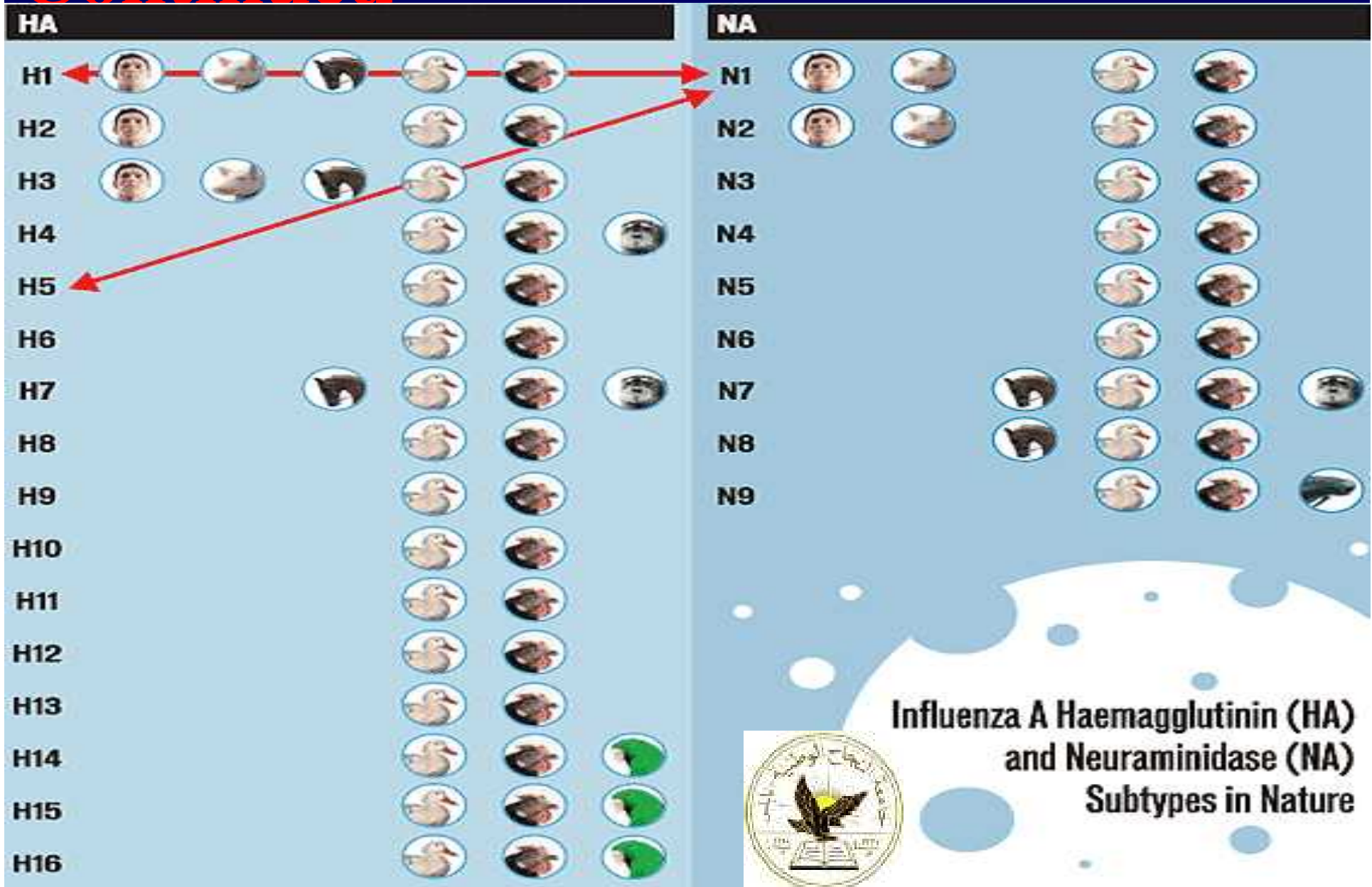
4. The most common subtypes that can infect humans and cause serious outbreaks are H1N1, H2N2, and H3N2

5. H5N1, H7N2, H7N3, H7N7, and H9N2 infect human but not appear to spread from human to another or inefficient transmission





# Continued



Influenza A Haemagglutinin (HA)  
and Neuraminidase (NA)  
Subtypes in Nature



# What is a Pandemic

1. Is a global outbreak of disease that occurs when a new virus appears or “emerges” in the human population, causes serious illness, and then spreads easily from person to person worldwide.
2. Pandemic outbreaks are caused by new subtypes that have never circulated among people, or by subtypes that have not circulated among people for a long time.
3. Pandemic viruses emerge as a result of a process called “antigenic shift,” which causes an abrupt or sudden, major change in influenza A viruses.



# History of Influenza A virus During Last Century

Date	Subtype	Notes
<b>1918</b>	<b>H1N1</b>	<b>pandemic of "Spanish" flu</b>
<b>1957</b>	<b>H2N2</b>	<b>pandemic of "Asian" flu</b>
1962	H2N2	epidemic
1964	H2N2	epidemic
<b>1968</b>	<b>H3N2</b>	<b>pandemic of "Hong Kong" flu</b>
1976	H1N1	swine flu in recruits
1977	H1N1	Russian Flu Threat (not true pandemic)
1997	H5N1	Avian Flu Threat
1999	H9N2	Avian Flu Threat



# 20th Century pandemics: comparison of main characteristics

Year	subtype	Mortality	Age groups most affected
1918-1919	A H1N1	20-50 million	Young adult
1957-1958	A H2N2	1-4 million	mostly Children
1968-1969	A H3N2	1-4 million	all age groups



# Why are we so worried about this pandemic possibility when hundreds thousands die every year from seasonal epidemics?

1. H1N1 is a new virus and one to which most people have no or little immunity
2. No safe and effective vaccine
3. H1N1 spreading fast particularly among young people (from ages 10 to 45)



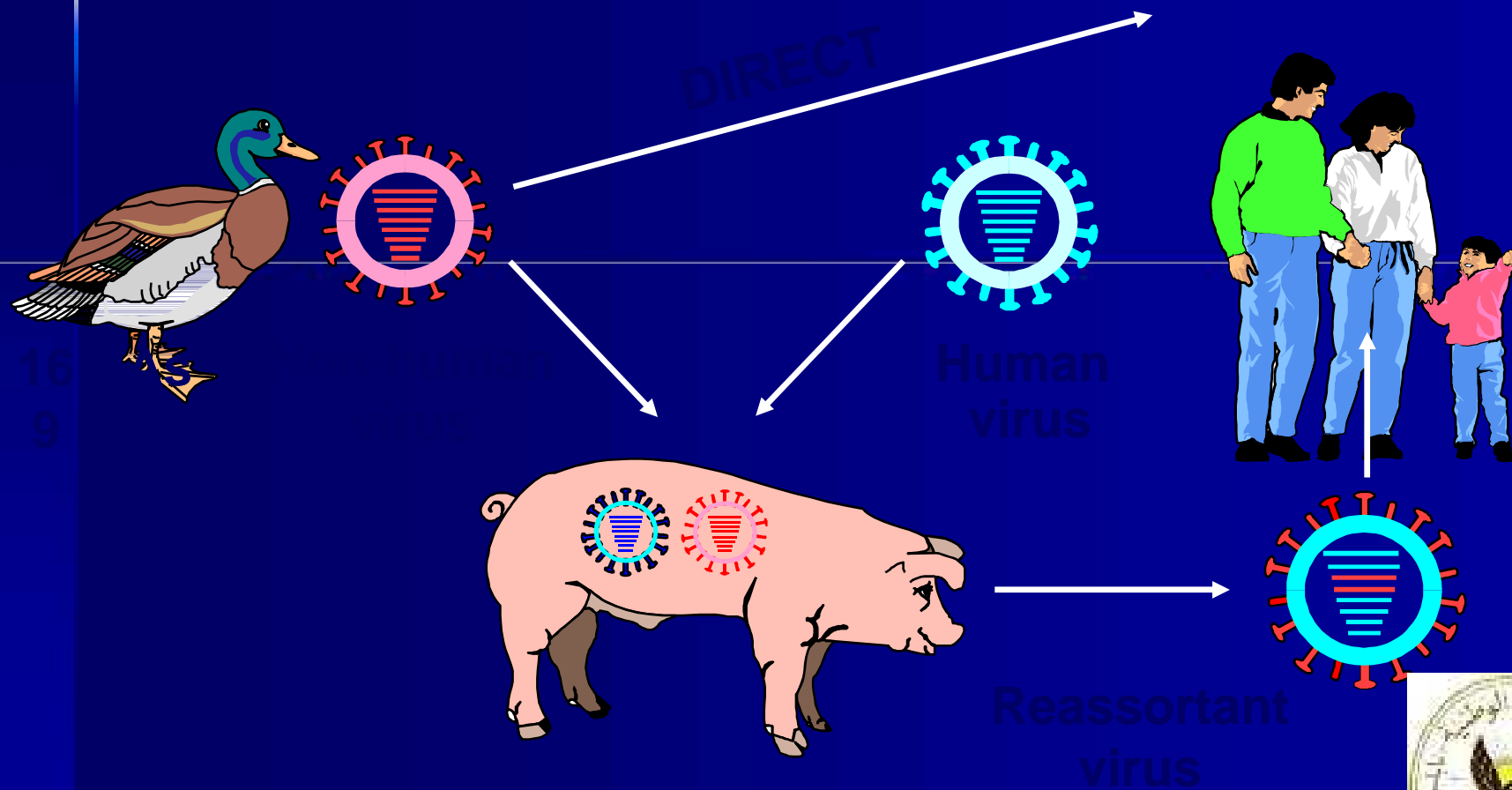
# Why are Pigs important in this cycle?

- Pigs are susceptible to infection with both **Avian** and **Mammalian** viruses, including **Human** strains, they can serve as a “**mixing vessel**” for the scrambling of genetic material from human and avian viruses, resulting in the Emergence of a novel subtype.

**Reassortment** is the mixing of the genetic material of two similar viruses that are infecting the same cell to produce a novel viral strain .



# Mechanisms of Influenza Virus Antigenic “Shift” (Genetic Re-assortment) May result in Pandemic



# Antigenic drift

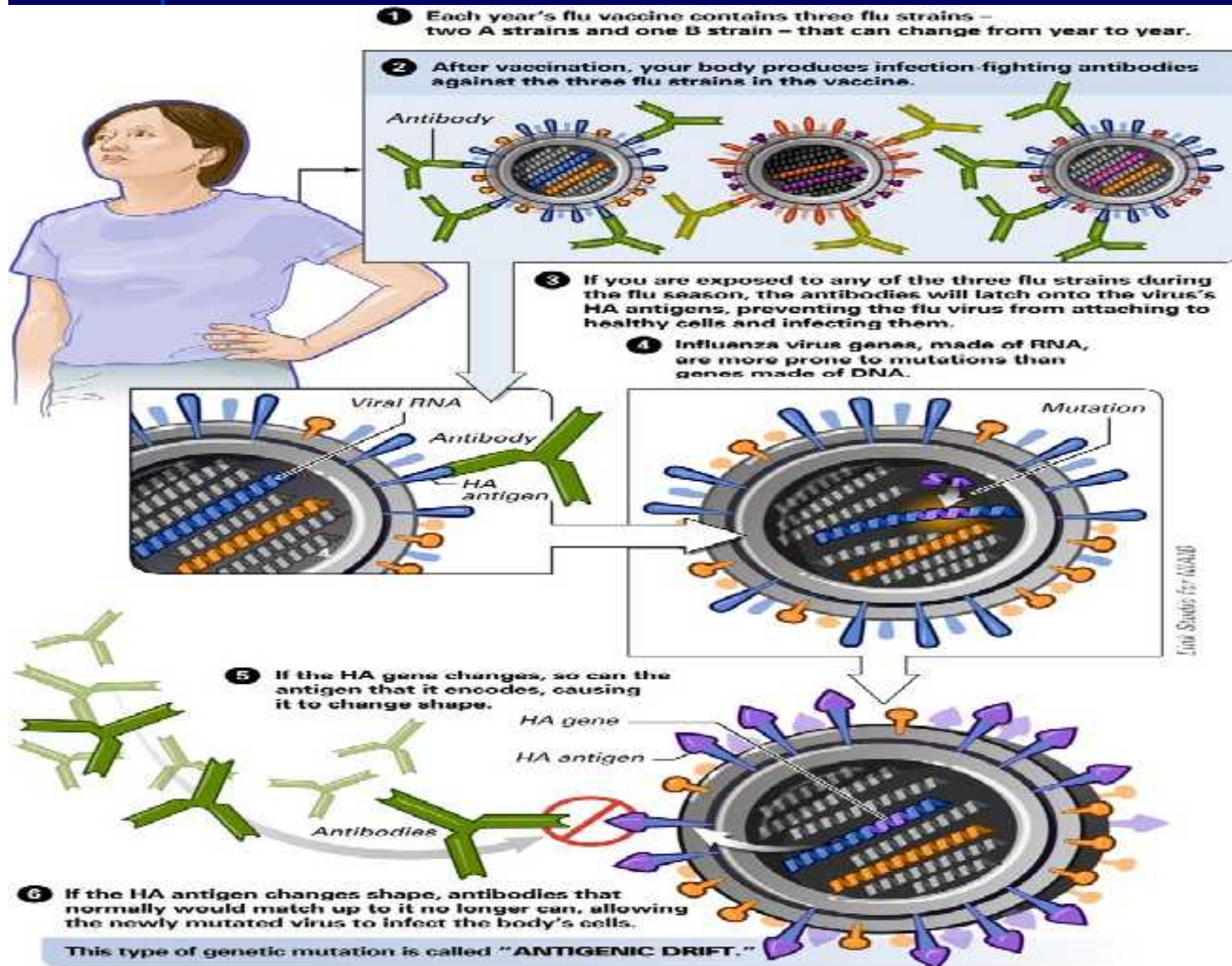
**Drift:** a continual, gradual change in influenza A virus antigens.

1. These small changes result from point mutations in NA and HA that cause minor changes in surface proteins
2. Produces new strains that antibodies to previous infection may not recognize
3. Is the rationale for global surveillance to select Strains for annual vaccines



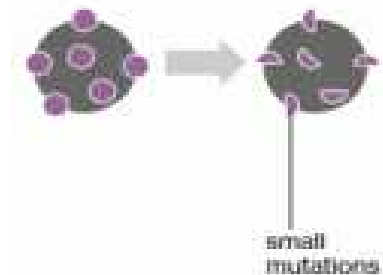


# Continued



Mutation

Antigenic drift



# What is the new H1N1 (Swine Influenza)?

This is a new influenza A(H1N1) virus that has never before circulated among humans. This virus is not related to previous or current human seasonal influenza viruses.

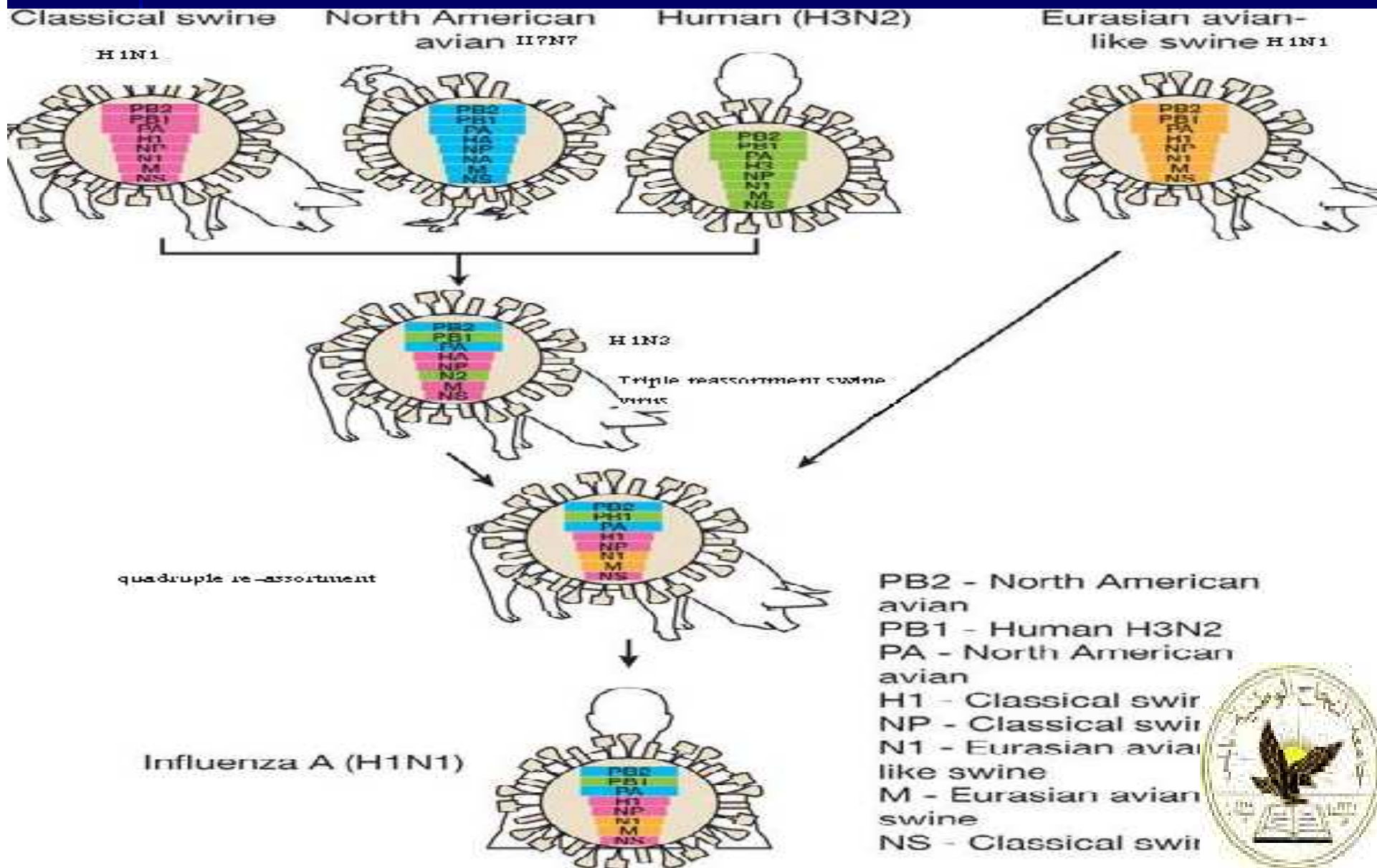


# Why is this new H1N1 virus sometimes called “swine flu”?

1. Because laboratory testing showed that many of the genes in this new virus were very similar to influenza viruses that normally occur in pigs in North America.
2. further study has shown that this new virus is very different from what normally circulates in North American pigs.
3. It has two genes from flu viruses that normally circulate in pigs in Europe and Asia and avian genes and human genes. Scientists call this a “quadruple re-assortment” virus.



# Genesis of swine-origin H1N1 influenza viruses.



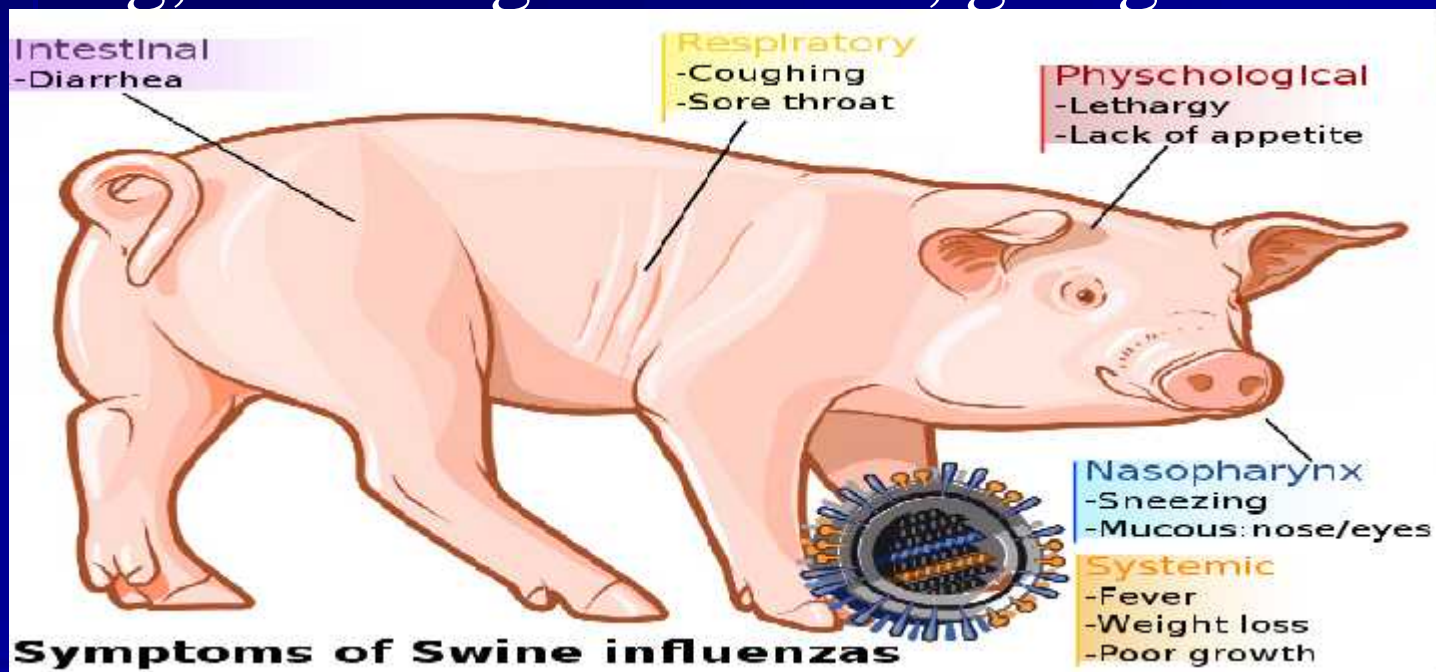
# Is this new H1N1 virus contagious?

CDC has determined that this new H1N1 virus is contagious and is spreading from human to human.



# Signs of swine flu in pigs include

Fever, depression, coughing (“barking”) discharge from the nose, eye redness or inflammation sneezing, breathing difficulties, going off feed



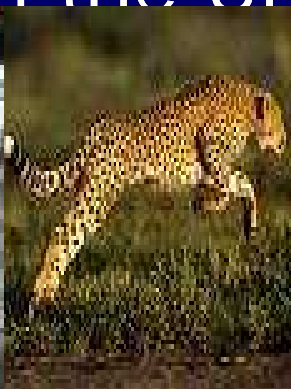
# Transmission from pigs to Human

Swine influenza viruses can be directly transmitted from pigs to people and from people to pigs.



# What animals can be infected with the 2009 H1N1 virus?

- In addition to humans, live swine and turkeys, a small number of ferrets
- Domestic cats and dogs have been infected with 2009 H1N1 virus.
- 2009 H1N1 virus infection was reported in cheetah in the United States





# What should I do if I suspect my pet has 2009 H1N1 influenza virus?

- If members of your household have flu-like symptoms, and your pet exhibits respiratory illness, contact your veterinarian.
- Currently, there is not a licensed and approved 2009 H1N1 vaccine for pets.



# Can I get 2009 H1N1 influenza from my pet?

- Available evidence suggests that transmission has been from ill humans to their companion animals.
- No evidence is available to suggest that animals are infecting humans with 2009 H1N1 virus.



# How does this new H1N1 virus spread?

- The same way that seasonal flu spreads.
- From person to person through coughing or sneezing (exposure to infected droplets) by people with influenza.
- Sometimes people may become infected by touching something with flu viruses on it and then touching their mouth or nose.



# Can I get infected with this new H1N1 virus from eating or preparing pork?

- ~~No.~~ H1N1 viruses are not spread by food. You cannot get this new H1N1 virus from eating pork or pork products. Eating properly handled and cooked pork products is safe.
- The influenza A (H1N1) virus is killed by cooking temperatures of 70°C.



# Can I get 2009 H1N1 more than once?

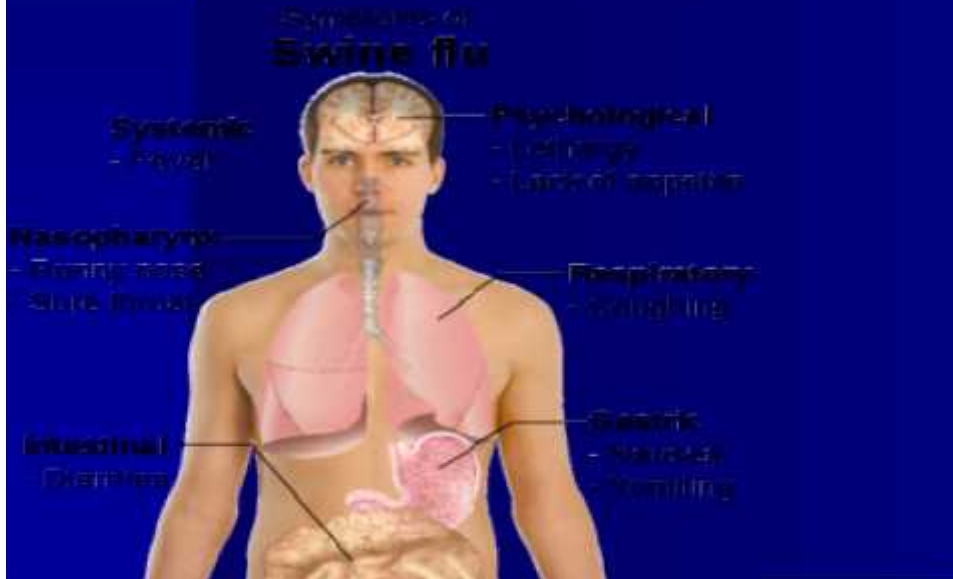
- Getting infected with any influenza virus, including 2009 H1N1, should cause your body to develop immune resistance to that virus so it's not likely that a person would be infected with the identical influenza virus more than once.
- People **with weakened immune systems** might not develop full immunity after infection and might be more likely to get infected with the same influenza virus more than once



# What are the symptoms of swine flu in humans?

**similar to the symptoms of regular human seasonal flu and include:**

Fever (usually high), headache, extreme tiredness, dry cough, sore throat, runny or stuffy nose, body aches, chills and fatigue, stomach symptoms, such vomiting, and diarrhea can occur but are more common in children than adults. Severe illnesses and deaths have occurred as a result of illness associated with this virus.



# Continued

People may be infected with flu, including 2009 H1N1 and have respiratory symptoms without a fever



# How long can an infected person spread this virus to others?

1. It believes that this virus has the same properties in terms of spread as seasonal flu viruses
2. Studies have shown that people may be contagious from one day before they develop symptoms to up to 7 days after they get sick.
3. severely immunocompromised persons and younger children, might potentially be contagious for longer periods.





# How severe is illness associated with 2009 H1N1 flu virus?

- Illness with 2009 H1N1 virus has ranged from mild to severe.
- Most people who have been sick have recovered without needing medical treatment, hospitalizations and deaths from infection with this virus have occurred.



# People at High Risk for Developing Flu-Related Complications

- Adults 65 years of age and older
- Pregnant women
- people of any age with certain chronic medical conditions (include asthma, diabetes, suppressed immune systems, heart disease, kidney disease, neurocognitive and neuromuscular disorders and pregnancy.
- People younger than 19 years of age who are receiving long-term aspirin therapy
- Children younger than 5, but especially children younger than 2 years old



# Influenza Virus Infections

## Cause a Spectrum of Complications

### ■ Common complications

- acute otitis media (children)
- sinusitis
- pneumonia
- exacerbation of underlying diseases
- dehydration (infants)

### ■ Uncommon complications

- encephalopathy
- Reye syndrome (children)
- myositis
- Myocarditis
- febrile seizures



# Does WHO expect the severity of the pandemic to change over time?

- The severity of pandemics can change over time and differ by location or population.
- Close monitoring of the disease during the pandemic period is essential to determine future severity assessments, if needed.
- Future severity assessments would reflect one or a combination of the following factors: **changes in the virus, underlying vulnerabilities or limitations in health system capacities**



# Officially reported cases 8/Jan/2010

worldwide more than 208 countries and overseas territories or communities have reported laboratory confirmed cases of pandemic influenza H1N1 2009, including at least 12799 deaths.



# What do I do now? What actions should I look for in my community?

- Stay informed. Go to reliable sources of information, including your Ministry of Health
- You can also continue to visit the WHO web site for simple prevention practices and general advice.
- WHO is not recommending travel restrictions nor does WHO have evidence of risk from eating cooked pork



# How do I know if I have influenza A(H1N1)?

- You will not be able to tell the difference between seasonal flu and influenza A(H1N1) without medical help.
- Typical symptoms to watch for are similar to seasonal viruses and include fever, cough, headache, body aches, sore throat and runny nose.
- Only your medical practitioner and local health authority can confirm a case of influenza A(H1N1)



# What can I do to protect myself from catching influenza A(H1N1)?

You can prevent getting infected by avoiding close contact with people who show influenza-like symptoms and taking the following measures:





# Continued

1. Avoid touching your eyes, nose or mouth.
2. Clean hands thoroughly with soap and water, or cleanse them with an alcohol-based hand rub on a regular basis (especially if touching the mouth and nose, or surfaces that are potentially contaminated)
3. Try to avoid close contact with sick people.
4. Reduce the time spent in crowded settings if possible
5. improve airflow in your living space by opening windows



# Continued

6. Practice good health habits including adequate sleep, eating nutritious food, and keeping physically active

7. Learn more about how to take care of someone who is ill



# Continued

## How to Protect Yourself and Others



Cover your nose and mouth with a disposable tissue when coughing and sneezing



Dispose of used tissues properly immediately after use



Regularly wash hands with soap and water



If you have flu-like symptoms, seek medical advice immediately



If you have flu-like symptoms, keep a distance of at least 1 meter from other people



If you have flu-like symptoms, stay home from work, school or crowded places



Avoid hugging, kissing and shaking hands when greeting



Avoid touching eyes, nose or mouth with unwashed hands



# What should I do if I get sick?

1. Limit your contact with other people as much as possible.
2. Stay home for 7 days after your symptoms begin or until you have been symptom-free for 24 hours, whichever is longer, keep away from work, school or crowds
3. Cover your mouth and nose with a tissue when coughing or sneezing.
4. Put your used tissue in the waste basket. Then, clean your hands, and do so every time you cough or sneeze.
5. Rest and take plenty of fluids.
6. Use a mask to help you contain the spread of droplets when you are around others, but be sure to do so correctly



# Continued

7. Inform family and friends about your illness and try to avoid contact with other people

8. Treat fever and cough with medicines

9. If you get very sick or are pregnant or have a medical condition that puts you at higher risk of flu complications call your doctor. You might need antiviral medicine to treat flu.



# Continued

Stop the spread of germs that make you and others sick!

## Cover your Cough



Cover your mouth and nose with a tissue when you cough or sneeze or

cough or sneeze into your upper sleeve, not your hands.

Put your used tissue in the waste basket.



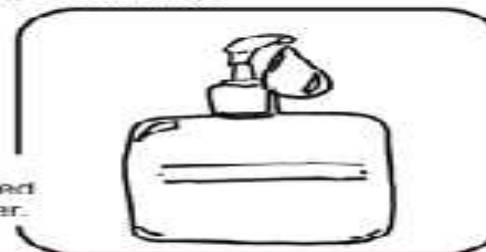
## Clean your Hands

after coughing or sneezing.



Wash hands with soap and warm water for 20 seconds

or clean with alcohol-based hand cleaner.



Minnesota Department of Health  
11700 Cleveland Avenue  
Minneapolis, MN 55424  
1-800-657-3894 or 612-296-6344  
www.health.state.mn.us



**APIC**  
Association for Professionals in Infection Control and Epidemiology, Inc.

# Should I go to work if I have the flu but am feeling OK?

**No.** Whether you have influenza A(H1N1) or a seasonal influenza, you should stay home and away from work through the duration of your symptoms.

This is a precaution that can protect your work colleagues and others.



# Can I travel?

If you are feeling unwell or have symptoms of influenza, you should not travel. If you have any doubts about your health, you should check with your health care provider.





# What is the best technique for washing my hands to avoid getting the flu?

1. Wash with soap and water or clean with alcohol-based hand cleaner.
2. When soap and water are not available, alcohol-based disposable hand wipes or gel sanitizers may be used.
3. If using gel, rub your hands until the gel is dry. The gel doesn't need water to work; the alcohol in it kills the germs on your hands.



# Continue

Wash hands often with soap and water



# Clean hands protect against infection

## Proper Handwashing Procedure



1. Wet hands and wrist. Apply soap.



2. Right palm over left, left over right.



3. Palm to palm, fingers interlaced.



4. Back fingers to opposing fingers interlocked.



5. Rotational rubbing of right thumb clasped in left palm and vice versa.



6. Rotational rubbing backwards with tops of fingers, thumb of right hand in left vice versa.



**MAKE IT A HABIT TO WASH YOUR HANDS WITH SOAP AND WATER.**



# How long can influenza virus remain viable on objects

Studies have shown that influenza virus can survive on environmental surfaces and can infect a person for up to 2-8 hours after being deposited on the surface.



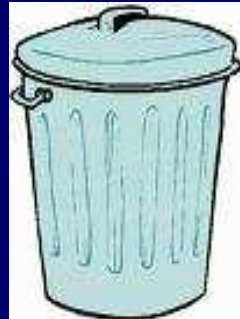
# What household cleaning should be done to prevent the spread of influenza virus?

- To prevent the spread of influenza virus it is important to keep surfaces (especially bedside tables, surfaces in the bathroom, kitchen counters and toys for children)
- clean by wiping them down with a household disinfectant according to directions on the product label.



# How should waste disposal be handled to prevent the spread of influenza virus?

- It is recommended that tissues and other disposable items used by an infected person be thrown in the trash.
- Additionally, persons should wash their hands with soap and water after touching used tissues and similar waste.



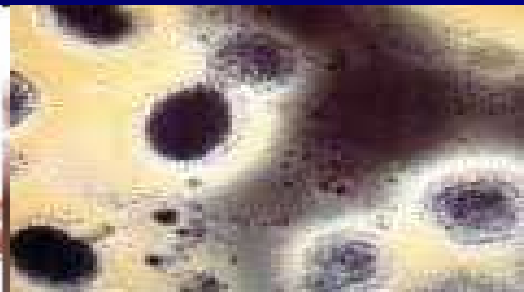
# How should linens, eating utensils and dishes of persons infected with influenza virus be handled?

1. Linens, eating utensils, and dishes belonging to those who are sick do not need to be cleaned separately, but importantly these items should not be shared without washing thoroughly first.
2. Linens (such as bed sheets and towels) should be washed by using household laundry soap and tumbled dry on a hot setting.



# Continued

3. Individuals should avoid “hugging” laundry prior to washing it to prevent contaminating themselves.
4. Individuals should wash their hands with soap and water or alcohol-based hand rub immediately after handling dirty laundry.
5. Eating utensils should be washed either in a dishwasher or by hand with water and soap.





# What kills influenza virus?

1. Influenza virus is destroyed by heat [75-100°C]
2. several chemical germicides, including chlorine, hydrogen peroxide, detergents (soap), iodophors (iodine-based antiseptics), and alcohols are effective against human influenza viruses if used in proper concentration for a sufficient length of time.



## Should I take an antiviral now just in case I catch the new virus?

**No.** You should only take an antiviral, if your health care provider advises you to do so. Individuals should not buy medicines to prevent or fight this new influenza without a prescription.



Seek care if the sick person has  
ANY of the signs below



# **In children emergency warning signs that need urgent medical attention include:**

1. Fast breathing or working hard to breathe
2. Bluish skin color
3. Not drinking enough fluids
4. Severe or persistent vomiting
5. Not waking up or not interacting
6. Being so irritable that the child does not want to be held
7. Flu-like symptoms improve but then return with fever and worse cough



# Continued

8. Fever with a rash

9. Being unable to eat

10. Having no tears when crying



# **In adults, emergency warning signs that need urgent medical attention include:**

1. Difficulty breathing or shortness of breath
2. Pain or pressure in the chest or abdomen
3. Sudden dizziness
4. Confusion
5. Severe or persistent vomiting
6. Flu-like symptoms improve but then return with fever and worse cough



# Are there any special recommendations for pregnant women?

~~Yes~~, they are vulnerable. Like everyone, they should take all the necessary precautions.

- Some pregnant women sick with 2009 H1N1 **have had early labor and severe pneumonia. Some have died.** If you are pregnant and have symptoms of the flu, take it very seriously. Call your doctor right away for advice.



# What can I do to protect my baby?

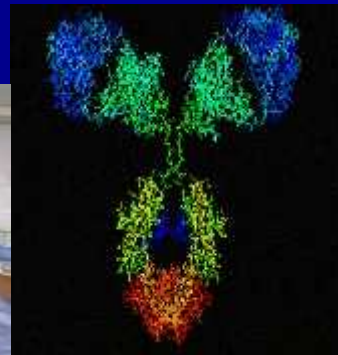
- Take everyday precautions
- In addition, take **extra care to wash your hands** often with soap and **not to cough or sneeze in the baby's face** while feeding your baby, or any other time you and your baby are close.
- If you are ill, or coughing and sneezing, consider **wearing a mask**
- A **flu shot** is the single best way to protect against the flu.





# Does breastfeeding protect babies from this new flu virus?

1. Mothers pass on protective antibodies to their baby during breastfeeding and help fight off infection.
2. Flu can be very serious in young babies. **Babies who are not breastfed get sick from infections like the flu more often and more severely than babies who are breastfed.**
3. **Do not stop breastfeeding if you are ill.** This will help protect your baby from infection.
4. **If you are too sick to breastfeed, pump and have someone give the expressed milk to your baby.**



# What epidemiological investigations are taking place in response to the recent outbreak?

Many epidemiological activities are taking place or planned including:

1. Active surveillance in the countries where infections in humans have been identified.
2. Studies of health care workers who were exposed to patients infected with the virus to see if they became Infected.



# Continued

3. Studies of households and other contacts of people who were confirmed to have been infected to see if they became infected
4. Study of a public high school where there confirmed human cases of H1N1 flu occurred to see if anyone became infected and how much contact they had with a confirmed case; and
5. Study to see how long a person with the virus infection sheds the virus.



# Diagnosis



# How will I know if I have the flu this season?

- 1- You may have the flu if you have one or more of flu symptoms
2. Most people with 2009 H1N1 have had mild illness and have not needed medical care or antiviral drugs, and the same true of seasonal flu.
3. To know for certain, a test specific for flu would need to be performed. But **most people with flu symptoms do not need a test for 2009 H1N1 flu** because the test results usually does not change how you are treated.



# What kinds of flu tests are there?

1. The most common are called “**rapid influenza diagnostic tests**” that can be used in outpatient settings. These tests can provide results in 30 minutes or less.
  2. Unfortunately, the ability of these tests to detect the flu can vary greatly (their ability to detect 2009 H1N1 flu can range from 10% to 70%) (**differ in their sensitivity and specificity for detecting influenza viruses** )
  3. There are several more accurate and sensitive flu tests available that must be performed in specialized laboratories and hospitals
  4. All of these tests are performed by a health care provider using a swab to swipe the inside of your nose or the back of your throat.
- These tests do not require a blood sample.



# Will my health care provider test me for flu if I have flu-like symptoms?

**Not necessarily.** Depending on their clinical judgment and your symptoms, your healthcare provider will decide whether testing is needed and what type of test to perform. Most testing will be done in people who are seriously ill (hospitalized patients) and patients where testing may impact treatment decisions. In most cases, if a healthcare provider suspects you have the flu, the test results will not change their treatment decisions.



# How will I know what strain of flu I have or if it's 2009 H1N1 (formerly known as Swine Flu)?

1. Available rapid influenza diagnostic tests cannot distinguish between 2009 H1N1 and seasonal influenza A viruses
2. There are laboratory tests available that can tell the difference between 2009 H1N1 and other strains of flu, but these can take one to several days to provide results
3. CDC has recommended that this testing be focused on **A)** people who are hospitalized with suspected flu; **B)** people such as pregnant women or people with weakened immune systems, for whom a diagnosis of flu will help their doctor make decisions about their care.





# Why can't I get a more accurate laboratory test to find out if I had flu or what kind of flu I had?

A respiratory specimen (nasopharyngeal) would generally need to be collected within the first 4 to 5 days of illness

1. Rapid Antigen Tests: not as sensitive as other available tests
2. Antibodies used in immunoassays may also give false negative results

## The most accurate laboratory tests

3. Detection and confirmation cases of swine influenza A (H1N1) virus infection by one or more of the following tests
  - a. real-time RT-PCR
  - b. viral culture (Viral isolation)
  - c. Virus Genome Sequencing, will provide definitive identification of the new strain



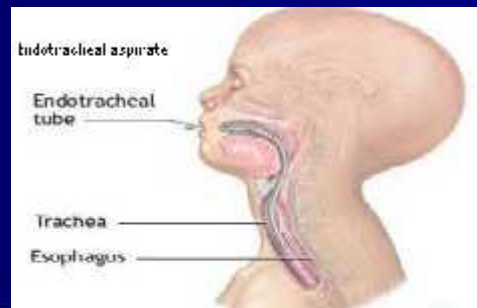
# Comparison of Available Influenza Diagnostic Tests

Influenza Diagnostic Tests	Method	Availability	Typical Processing Time	Sensitivity for 2009 H1N1 influenza	Distinguishes 2009 H1N1 influenza from other influenza A viruses?
Rapid influenza diagnostic tests (RIDT)	Antigen detection	Wide	0.5 hour	10 – 70%	No
Direct and indirect immunofluorescence assays (DFA and IFA)	Antigen detection	Wide	2 – 4 hours	47–93%	No
Viral isolation in tissue cell culture	Virus isolation	Limited	2 -10 days	-	Yes
Nucleic acid amplification tests (including rRT-PCR)	RNA detection	Limited	48 – 96 hours [6-8 hours to perform test]	86 – 100%	Yes



# Preferred respiratory specimens

1. Nasopharyngeal swab
2. Nasal aspirate, wash or swab
3. Endotracheal aspirate
4. Bronchoalveolar lavage (BAL)
5. Combined nasopharyngeal or nasal swab with oropharyngeal swab.
6. In patients with severe lower respiratory disease who are intubated or undergoing bronchoscopy, lower respiratory tract specimens should be collected and tested to improve diagnostic yield



# 2009 H1N1 Flu Vaccine

1. vaccine is the best way to protect against the 2009 H1N1 pandemic virus
2. virtually everyone is susceptible to infection from 2009 H1N1 pandemic virus
3. CDC continues to encourage those at highest risk from flu complications to seek seasonal flu vaccine and receive 2009 H1N1 vaccine, as recommended.
4. This season, vaccines to protect against the 2009 H1N1 virus (sometimes called “swine flu”) have been produced
5. there are two kinds of 2009 H1N1 vaccines: a “flu shot” that is given with a needle, usually in the arm; and a nasal spray flu vaccine



# Are pandemic vaccines safe?

Outcomes of studies completed to date suggest that **pandemic vaccines are as safe** as seasonal influenza vaccines. **Side effects seen** so far are **similar to those observed with seasonal influenza vaccines**.



# What about safety for pregnant women?

1. To date, studies do not show harmful effects from the pandemic influenza vaccine with respect to pregnancy, fertility, a developing embryo or fetus, birthing or post-natal development.
2. Recent studies show that infected pregnant women have a 10 times higher chance to require hospitalization in intensive care units than infected persons in the general population, and 7% to 10% of hospitalized cases are women in their second or third trimester of pregnancy.



# What about my child's safety from a reaction?

1. The most frequent vaccine reactions in children following influenza immunization are **similar to those seen after other childhood immunizations** (such as **soreness** at the injection site, or **fever**)
2. A child may suffer from a condition not related to immunization, which coincidentally developed after vaccination.



# What kind of testing is being done to ensure safety?

1. Because the pandemic virus is new, both non-clinical and clinical testing is being done to gain essential information on immune response and safety.
2. The results of studies reported to date suggest the vaccines are as safe as seasonal influenza vaccines
3. WHO advises all countries administering pandemic vaccines to conduct intensive monitoring for safety and report Serious adverse events.





# Who approves pandemic vaccines for use?

1. National authorities for medicines approve (or license) pandemic influenza vaccines for use
2. These authorities carefully examine the known and suspected risks and benefits of any vaccine prior to its licensing.
3. The testing and manufacturing processes for the new vaccines are similar to seasonal influenza vaccines to ensure quality and safety.



# What are the expected side effects of the new vaccines?

- 1. Inactivated vaccines:** administered by injection, commonly cause local reactions such as **soreness**, **swelling** and **redness** at the injection site, and less often can cause **fever**, **muscle-** or **joint-aches** or **headache**. These symptoms are generally mild, do not need medical attention, and last 1 to 2 days. **Fever**, **aches** and **headaches** can occur more frequently in **children** compared to elderly people.
- 2. Rarely**, such influenza vaccines can cause **allergic reactions** such as **hives**, **rapid swelling** of deeper skin layers and tissues, **asthma** or a severe multisystem allergic reaction due to hypersensitivity to certain vaccine components.



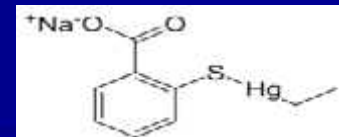
# Continued

2. **Live vaccines:** given via a nasal spray, **cause runny nose, nasal congestion, cough,** and can less frequently cause **sore throat, low grade fever, irritability and head- and muscle- aches. Wheezing and vomiting** episodes have been described in children receiving live influenza vaccines.



# Will pandemic vaccines contain thiomersal, which some believe is a risk to health?

1. Thiomersal is vaccine preservative to prevent vaccine contamination by bacteria during use
2. Inactivated vaccines will contain thiomersal if they are supplied in multi-dose vials
3. Thiomersal does not contain **methyl mercury**, whose toxic effects on humans have been well studied.
4. Thiomersal contains a different form of mercury (i.e. **ethyl mercury**, which does not accumulate, is metabolized and removed from the body much faster than methyl mercury).
5. There is no evidence of toxicity in infants, children or adults, including pregnant women, exposed to thiomersal in vaccines.



# Initial Target Groups

(order of target groups does not indicate priority)

1. pregnant women,
2. persons who live with or provide care for infants aged <6 months (e.g., parents, siblings, and daycare providers),
3. health-care and emergency medical services personnel,
4. persons aged 6 months-24 years, and
5. persons aged 25-64 years who have medical conditions that put them at higher risk for influenza-related complications



# What is meant by at-risk groups?

Individuals that have been identified as “at-risk” of more complicated or severe illness associated with infection by influenza virus include:

1. pregnant women (particularly in the later stages of pregnancy);

Infants and children

2. Patients with chronic health conditions such as cardiovascular, respiratory or liver disease, or diabetes;

3. Patients with immunosuppression related to treatment for transplant surgery, cancer or due to other diseases.

4. The elderly (>65) appear less susceptible to infection by pandemic H1N1 influenza virus, but are assumed to be at higher risk of more severe or complicated illness if infected.



# Influenza A (H1N1) 2009 monovalent vaccines approved for use in the United States, October 6, 2009

Vaccine type	Manufacturer	Presentation	Mercury content ( $\mu\text{g}$ Hg/0.5 mL dose)	Age group	No. of doses	Route
Inactivated	Sanofi Pasteur	0.25 mL prefilled syringe	0	6--35 mos	2	Intramuscular
		0.5 mL prefilled syringe	0	36 mos	1 or 2	Intramuscular
		5.0 mL multidose vial	25.0	6 mos	1 or 2	Intramuscular
Inactivated	Novartis Vaccines and Diagnostics Limited	5.0 mL multidose vial	25.0	4 yrs	1 or 2	Intramuscular
		0.5 mL pre-filled syringe	<1.0	4 yrs	1 or 2	Intramuscular
Inactivated	CSL Limited	0.5 mL prefilled syringe	0	18 yrs	1	Intramuscular
		5.0 mL multidose vial	24.5	18 yrs	1	Intramuscular

# Antiviral drugs

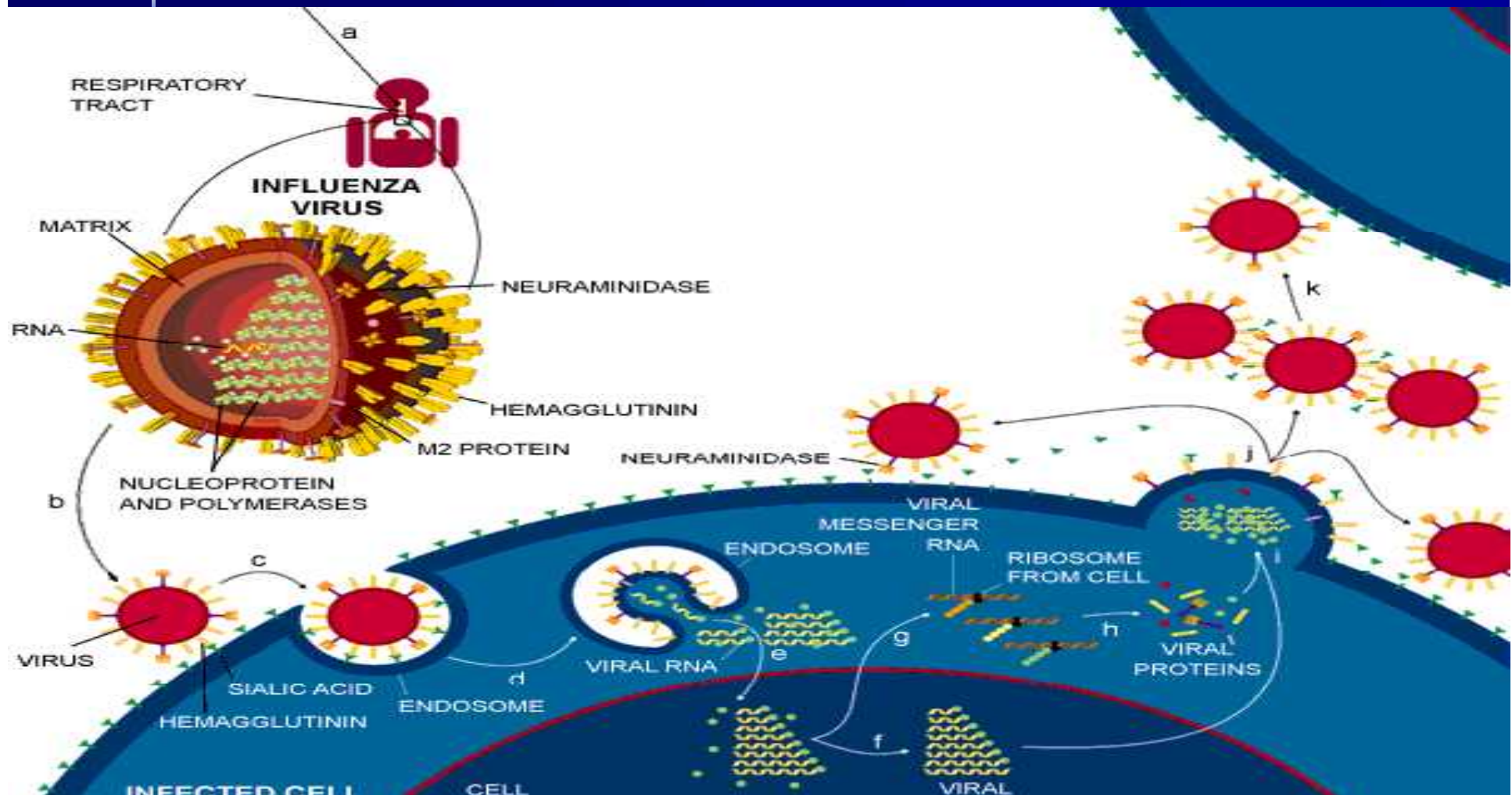
## What are antiviral drugs?

**Antiviral drugs:** are medicines that act directly on viruses to stop them from multiplying.





# Antivirals: Adamantanes and Neuraminidase Inhibitors



# For the treatment of pandemic (H1N1) 2009, how many antiviral drugs are there?

1. Two approved antiviral drugs for influenza that are available for treatment of pandemic influenza. These are the **neuraminidase inhibitors oseltamivir and zanamivir**, more commonly known by their trade names **Tamiflu and Relenza**.
2. These antiviral drugs have been shown to **reduce the symptoms and duration of illness**
3. Reports suggest that these treatments **contribute to preventing severe disease and death related to pandemic influenza (H1N1) 2009 infections**



## Continued

4. M2 inhibitors (**amantadine** and **rimantadine**) can be effective for treating seasonal influenza.
5. the pandemic (H1N1) 2009 virus has been shown to be resistant to these M2 inhibitors .



# What is WHO's guidance on the use of antiviral drugs?

1. Patients with symptoms of severe illness that are probably due to pandemic influenza, WHO recommends that treatment with oseltamivir should start immediately, no matter when the illness started and without waiting for laboratory results to confirm infection.
2. Patients at higher risk for serious disease from pandemic influenza, including pregnant women, children under age 5 and those with certain underlying medical conditions, WHO recommends treatment with either oseltamivir or zanamivir as soon as possible after the onset of symptoms, and without waiting for the results of laboratory tests.



# Continued

3. Not from a higher risk group but who have persistent or rapidly worsening symptoms should be treated with antivirals. These symptoms include difficulty breathing or a high fever that lasts beyond three days.
4. In all cases, where oseltamivir is unavailable or cannot be used for any reason, zanamivir may be given.



# Is it necessary to wait for a laboratory result before starting antiviral drug treatment?

1. **No**, if antiviral drug treatment is indicated by the clinical presentation, then treatment should start as soon as possible.
2. If there is a delay, treatment may be less effective.



# Do antiviral drugs cause resistance

1. Development of resistance to antimicrobial agents (including antiviral drugs) is often seen when antiviral drugs are used in substantial quantities.
2. The speed with which such resistance develops, the percentage of viruses developing resistance and the ability of the new virus to spread will be influenced by several factors, including how the antiviral drug is used and whether the new (mutated) drug resistant virus can compete well enough to spread.



# How many cases of antiviral drug resistance have been reported to WHO?

1. Up to 8 December 2009, 109 oseltamivir-resistant H1N1 viruses have been detected worldwide, characterized and reported to WHO.
2. Although the majority of reported cases are associated with oseltamivir treatment, cases of resistance have occurred in patients taking oseltamivir to prevent against pandemic influenza infection.
3. Although all incidents of oseltamivir resistance merit investigation, and are fully investigated, no evidence suggests that events to date constitute a public health threat.





# Continued

4. WHO expects more cases of oseltamivir-resistant virus to be reported as people continue to use oseltamivir over the coming months.

4. WHO will continue to monitor pandemic influenza (H1N1) 2009 viruses for signs that the number of antiviral drug resistant viruses is increasing enough to pose a public health risk.



# Should individuals keep a personal stockpile of antiviral drugs?

1. WHO does not recommend that individuals stockpile antiviral drugs such as oseltamivir or zanamivir, unless recommended by a health care provider or other national health authority
2. In some instances, such authorities may provide antiviral drugs in advance to individuals at particular risk, or to those who may not have rapid access to medicines in the event of illness.



# Should individuals take antiviral drugs for the prevention of pandemic (H1N1) 2009 infections?

1. Most people recover from the pandemic influenza without the need for medical care.
2. In general, WHO does not recommend the use of antiviral drugs for prevention of pandemic influenza.
3. For people who have had exposure to an infected person and are at a higher risk of developing severe or complicated illness, an alternative option is close monitoring for symptoms, followed by prompt early antiviral treatment should symptoms develop.
4. People who are not from a higher risk group and experience mild symptoms need not take antivirals.
5. Antivirals should only be used when prescribed by a qualified health care provider



# Antiviral medication dosing recommendations for treatment or chemoprophylaxis of novel influenza A (H1N1) infection

Agent, group	Treatment	Chemoprophylaxis
<b>Oseltamivir/Adult</b>	75-mg capsule twice per day for 5 days	75-mg capsule once per day
<b>Children 12 months</b>		
15 kg or less	60 mg per day divided into 2 doses	30 mg once/day
15-23 kg	90 mg per day divided into 2 doses	45 mg once/day
24-40 kg	120 mg per day divided into 2 doses	60 mg once/ day
>40 kg	150 mg per day divided into 2 doses	75 mg once/day
<b>Zanamivir/Adult</b>	Two 5-mg inhalations (10 mg total) twice/ day	Two 5-mg inhalations (10 mg total) once/ day
<b>Children</b>	Two 5-mg inhalations (10 mg total) twice/ day (age, 7 years or older)	Two 5-mg inhalations (10 mg total) twice/day (age, 5 years or older)



# Dosing recommendations for antiviral treatment of children younger than 1 year using oseltamivir.

<b>Age</b>	<b>Recommended treatment dose for 5 days</b>
<3 months	12 mg twice daily
3-5 months	20 mg twice daily
6-11 months	25 mg twice daily

