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A OVERVIEW ON: COMPARITIVE STUDY OF EBOLA VIRUS & H1N1 (SWINE FLUE) VIRUS

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ABSRACT

Ebola virus is transmitted to people as a result of direct contact with body fluids containing virus of an infected patient. The incubation period usually lasts 5 to 7 d and approximately 95% of the patients appear signs within 21 d after exposure. Typical features include fever, profound weakness, diarrhea, abdominal pain, cramping, nausea and vomiting for 3-5 days and maybe persisting for up to a week. Laboratory complications including elevated aminotransferase levels, marked lymphocytopenia and thrombocytopenia may have occurred. Hemorrhagic fever occurs in less than half of patients and it takes place most commonly in the gastrointestinal tract. The symptoms progress over the time and patients suffer from dehydration, stupor, confusion, hypotension, multi-organ failure, leading to fulminant shock and eventually death. The most general assays used for antibody detection are direct IgG and IgM ELISAs and IgM capture ELISA. An IgM or rising IgG titer (four-fold) contributes to strong presumptive diagnosis. Duration of viral shedding following infection is an important determinant of disease transmission, informing both control policies and disease modelling. We undertook a systematic literature review of the duration of influenza A(H1N1)pdm09 virus shedding to examine the effects of age, severity of illness and receipt of antiviral treatment. Studies were identified by searching the PubMed database using the keywords ‘H1N1’, ‘pandemic’, ‘pandemics’, ‘shed’ and ‘shedding’. Any study of humans with an outcome measure of viral shedding was eligible for inclusion in the review. Comparisons by age, degree of severity and antiviral treatment were made with forest plots. The search returned 214 articles of which 22 were eligible for the review. Significant statistical heterogeneity between studies precluded

meta-analysis. The mean duration of viral shedding generally increased with severity of clinical presentation, but we found no evidence of longer shedding duration of influenza A(H1N1)pdm09 among children compared with adults.

KEYWORDS: H1N1 virus, Ebola virus, Swine flue, Treatment, Prevention.

INTRODUCTION of H1N1

The novel influenza A (H1N1) virus firstly detected in April 2009 is now rapidly spreading from human to human throughout the world. As the World Health Organization (WHO) announced on May 29, 2009, there were more than 15,000 of confirmed cases in 54 countries and regions including 99 deaths across the globe More cases, more hospitalizations and more deaths related to this novel virus are expected to occur in the coming days, weeks and months. Early epidemic findings indicated that the transmissibility of the novel H1N1 virus is higher than that of the seasonal H1N1 and the ratio of infected children with clinical symptom is twice higher than that of the adults Apparently, the novel H1N1 virus is antigenically distinct from human seasonal H1N1 and although vaccine against this virus has been developed, it takes time to realize the goal of global vaccination Thus, early detection and separation of suspected patients are the most effective measures to prevent virus transmission. A protocol of real-time RT-PCR for influenza A (H1N1) detection was recommended by WHO A conventional 1-step RT-PCR assay and a 1-step quantitative real-time RT-PCR assay have also been established for rapid detection of the novel H1N1 virus Here we reported multi-fluorescent real-time RT-PCR assay with proprietar primers and probes that seems more specific and sensitive than the recommended or conventional method under a “rapid-assay” condition. We also showed that, in combining with DNA sequencing, a confirmation assay could be established based on this technology.

Introduction of Ebola Virus

Ebola virus disease (EVD), formerly known as Ebola haemorrhagic fever), is a severe, often fatal illness, with a case fatality rate of up to 90%. There are no licensed specific treatments or vaccine available for use in people or animals. Genus Ebola virus is 1 of 3 members of the Filoviridae family (filovirus), along with genus Marburgvirus and genus Cuevavirus. Genus Ebola virus comprises 5 distinct species: Bundibugyo ebolavirus (BDBV), Zaire ebolavirus (EBOV), Reston ebolavirus (RESTV), Sudan ebolavirus (SUDV) and Tail Forest ebolavirus (TAFV).

The incubation period of Ebola virus disease (EVD) varies from 2 to 21 days, with an observed average of 8 to 10 days. Following the introduction of Ebola virus in the human population through animal-to-human transmission, person-to-person transmission by direct contact body fluids/secretions of infected persons is considered the principal mode of transmission. Indirect contact with environment and fomites soiled with contaminated bodily fluids (e.g. needles) may also occur. Airborne transmission has not been documented during previous EVD outbreaks. There is no risk of transmission during the incubation period. The most common symptoms experienced by persons infected with the virus are the sudden onset of fever, intense weakness, muscle pain, headache and sore throat. This is followed by vomiting, diarrhea, rash, impaired kidney and liver function, and at advanced stage, both internal and external bleeding. Laboratory findings include low white blood cells and platelet counts and elevated liver enzymes.

1. EBOLA VIRUS

1.1 HISTORY

The 2014 Ebola outbreak across Guinea, northern Liberia and now eastern Sierra Leone is fuelling concern worldwide. According to the World Health Organization, with over 1,500 laboratory confirmed cases of Ebola virus this year alone and around 887 deaths from the epidemic, this is the worst outbreak ever. Medical News Today examines the effects of Ebola on the human body and the current concerns people may have about the virus.

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WHO have launched a new $100 million response plan as part of an intensified international, regional and national campaign, to combat the outbreak of Ebola in West Africa?.

“The scale of the Ebola outbreak and the persistent threat it poses, requires WHO and Guinea, Liberia and Sierra Leone to take the response to a new level and this will require increased resources, in-country medical expertise, regional preparedness and coordination,” says Dr Margaret Chan, Director-General of the World Health Organization.

"The countries have identified what they need and WHO is reaching out to the international community to drive the response plan forward. Ebola virus disease (EVD), previous known as Ebola hemorrhagic fever (Ebola HF), is a serious, often fatal condition in humans and nonhuman primates such as monkeys, gorillas and chimpanzees. Ebola is one of several viral hemorrhagic fevers (VHF), caused by infection with a virus of the Filoviridae family, genus Ebolavirus.1-3. Ebola has a case fatality rate of up to 90% and is currently one of the world's most infectious diseases. The infection is transmitted by direct contact with the blood, body fluids and tissues of infected animals or people. Severely ill patients require intensive supportive care.4.

This Medical News Today information page will give you the essential details about Ebola, describe what it is, what causes it, which gets the problem and the symptoms they have, the risk factors, how it is diagnosed and offer an overview of treatment options and prevention measures for Ebola. You will also see introductions at the end of some sections to any recent developments that have been covered by MNT's news stories. Also look out for links to information about related conditions.

1.2. What is Ebola?

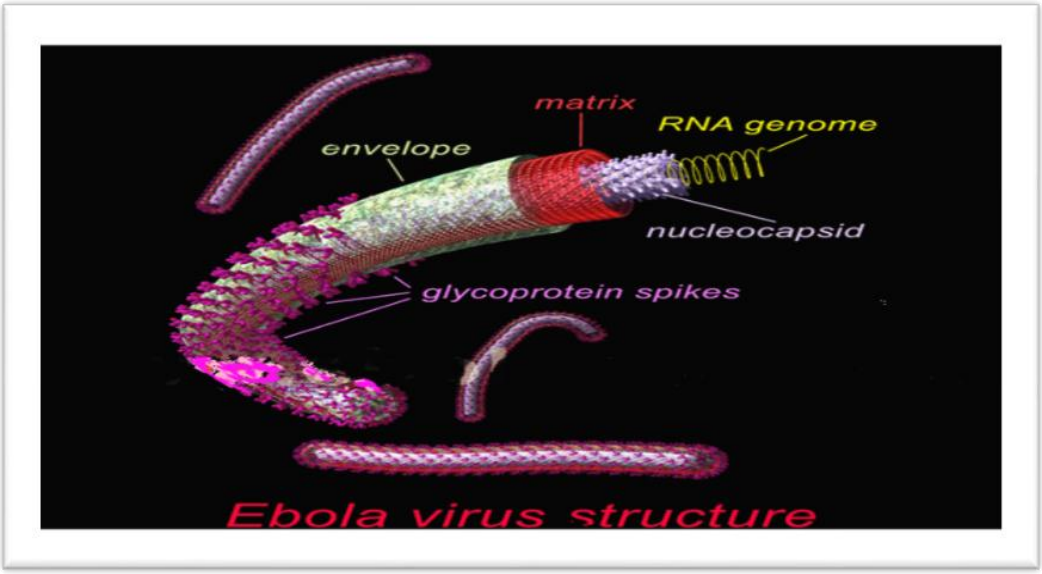

FIG. 1. EBOLA VIRUS STRUCTURE.

The first cases of Ebola were reported simultaneously in 1976 in Yambuku and the surrounding area, near the Ebola River in Zaire, which is now the Democratic Republic of the Congo and in Nzara, Sudan. Since then, eruptions or asymptomatic cases of Ebola viruses in

humans and animals have surfaced intermittently in the following locations due to outbreaks or laboratory contamination and accidents.

The first cases of Ebola were reported in 1976 in Yambuku and the surrounding area, near the Ebola River in Zaire, which is now the Democratic Republic of the Congo.

• Zaire (Democratic Republic of the Congo – DRC)
• Sudan (South Sudan)
• England
• US
• Philippines
• Italy • Gabon
• Ivory Coast
• South Africa
• Russia
• Uganda
• Guinea
• Liberia
• Sierra Leone.

Genus Ebola virus is one of three members of the Filoviridae family (filovirus), along with genus Marburgvirus and genus Cuevavirus. Genus Ebola virus comprises five distinct subspecies: 1,2.

• Bundibugyo Ebola virus (BDBV)
• Zaire Ebola virus (EBOV)
• Reston Ebola virus (RESTV)
• Sudan Ebola virus (SUDV)
• Taï Forest Ebola virus (TAFV).

BDBV, EBOV and SUDV have been connected with considerable EVD outbreaks in Africa, however RESTV and TAFV have not. The RESTV subspecies found in Philippines and the People's Republic of China, can infect humans, but no illness or death in humans from this species has been reported to date.2 among Workers in contact with monkeys or pigs infected With RESTV, several infections have been documented in people who were clinically asymptomatic. Hence, RESTV appears less able to cause disease in humans than other Ebola species.

1.3. What causes Ebola?

Ebola is caused by the five viruses detailed above classified in the genus Ebola virus, family Filoviridae. The natural reservoir of Ebola virus has not yet been proven, for that reason, how the virus first appears in a human at the onset of an outbreak is unknown. It has been hypothesized by researchers that the virus is zoonotic (animal-borne), with the first patient developing the infection through contact with an infected animal.

Ebola is caused by the five viruses above classified in the genus Ebolavirus, family Filoviridae.

The theorized potential natural reservoirs of the Ebola virus are Fruit bats of the Pteropodidae family. 2 In Africa, infection has been documented through the handling of the following infected animals found ill or dead or in the rainforest:

- Chimpanzees
- Gorilla
- Fruit bats
- Monkeys
- Forest antelope
- Porcupines.

In an outbreak or isolated case among humans, the manner in which the virus is transmitted from the natural reservoir to a human is unclear. Person-to-person transmission is a method by which further infections occur after a human is infected.

1.4. Transmission of Ebola between humans can occur in several ways

- Direct contact through broken skin and mucus membranes with the blood, secretions, organs or other bodily fluids of infected people.
- Indirect contact with environments contaminated with such fluids
- Exposure to objects (such as needles) that have been contaminated with infected Secretions
- Burial ceremonies in which mourners have direct contact with the body of the deceased Person can also play a role in the transmission of Ebola
- Men who have recovered from the disease can still transmit the virus through their semen for up to 7 weeks after recovery from illness
- Health care workers have frequently been infected while treating patients with suspected or confirmed EVD.

Ebola tends to spread quickly through families and friends as they are exposed to infectious secretions when caring for an ill individual. The virus can also spread quickly within health care settings for the same reason, highlighting the importance of wearing appropriate protective equipment, such as masks, gowns and gloves. 7 Sterilization and disposal of needles and syringes thoroughly in hospitals is an important factor to prevent virus transmission continuing and amplifying an outbreak.

1.5. Signs and symptoms of Ebola

The time interval from infection with Ebola to the onset of symptoms is 2 to 21 days, although 8 to 10 days is most common. Signs and symptoms may include: EVD is often characterized by the abrupt onset of fever, intense weakness, muscle pain, headache and sore throat.

- Fever
- Headache
- Joint and muscle aches
- Weakness
- Diarrhea
- Vomiting
- Stomach pain
- Lack of appetite.

Some patients may experience

- A rash
- Red eyes
- Hiccups
- Cough
- Sore throat
- Chest pain
- Difficulty breathing
- Difficulty swallowing
- Bleeding inside and outside of the body.

EVD is often characterized by the abrupt onset of fever, intense weakness, muscle pain, headache and sore throat. These signs are usually followed by vomiting, diarrhea, rash,

impaired kidney and liver function, and in some severe cases, both internal and external bleeding.

Laboratory outcomes include low white blood cell and platelet counts and elevated liver enzymes. As long as the patient's blood and secretions contain the virus, they are infectious. Ebola virus was isolated from semen 61 days after onset of illness in a man who was infected in a laboratory.

1.6. Risk factors

Risk of contracting Ebola is low. There is a higher risk of becoming infected when: 10

• Traveling to Africa – where most confirmed cases of Ebola have been reported

• Conducting animal research with monkeys imported from Africa or the Philippines

• Providing medical or personal care – protective gear such as surgical masks and gloves should be worn

• Preparing people for burial.

1.7. EVD in West Africa Situation – Summary sheet

Table No: 1 Cases and deaths from EVD in Guinea, Liberia, Nigeria and Sierra Leone as of 31 July 2014.

Country	Cases	Deaths	Case Fatality Rate (%)	Health care workers affected (Cases/Deaths)
Guinea	472	346	73	(33/20)
Liberia	360	181	50	(47/28)
Nigeria	1	1	100	0
Sierra Leone	574	215	37	(44/23)
Total	1407	743	53	(124/71)

1.8. Tests and diagnosis of Ebola

Before Ebola can be diagnosed, other diseases should be ruled out such as:2

• Malaria

• Typhoid fever

• Shigellosis

• Cholera

• Leptospirosis

• Plague

• Rickettsiosis

• Relapsing fever

• Meningitis
• Hepatitis
• Other viral hemorrhagic fevers.

If Ebola is suspected, the patient should be isolated, and public health professionals notified. Ebola virus infections can be diagnosed definitively in a laboratory through several types of tests. 11.

Within a few days after symptoms begin, the virus can be diagnosed with:
• Antigen-capture enzyme-linked immunosorbent assay (ELISA) testing
• IgM ELISA
• Polymerase chain reaction (PCR)
• Virus isolation.

In the more advanced stages of the disease or after recovery, the diagnostic test available is:
• IgM and IgG antibodies.

Retrospectively Ebola can be diagnosed in deceased patients by:
• Immunohistochemistry testing
• PCR
• Virus isolation.

According to the World Health Organization, samples from patients with Ebola are an extreme biohazard risk. Testing should be conducted under maximum biological containment conditions.

1.9. How is Ebola treated?

There is currently no licensed vaccine available for Ebola. Several vaccines are being tested, but at this time none are available for clinical use Diagnosing Ebola in an individual who has been infected for only a few days is difficult because the early symptoms, such as fever, are nonspecific to Ebola virus infection and are seen often in patients with more common diseases, such as malaria and typhoid fever. However, if a person has the early symptoms of Ebola and there is reason to believe that Ebola should be considered, the patient should be isolated and public health professionals notified. Samples from the patient can then be collected and tested to confirm infection. Ebola virus is detected in blood only after onset of symptoms, most notably fever, which accompany the rise in circulating virus within the

patient's body. It may take up to three days after symptoms start for the virus to reach delectable levels.

Table No: 2 Laboratory tests used in diagnosis include.

Timeline of Infection	Diagnostic tests available
Within a few days after symptoms begin	-Antigen-capture enzyme-linked immunosorbent assay (ELISA) testing - IgM ELISA - Polymerase chain reaction (PCR) - Virus isolation
Later in disease course or after recovery	- IgM and IgG antibodies
Retrospectively in deceased patients	- Immuno histochemistry testing - PCR - Virus isolation

Treatment for Ebola is limited to intensive supportive care and often includes: 12

• Balancing the patient's fluids and electrolytes

• Maintaining their oxygen status and blood pressure

• Treating a patient for any complicating infections.

Experimental treatments have been tested and proven effective in animal models but as yet have not been used in humans.

1.10. How is Ebola prevented?

As it is still unknown how individuals are infected with Ebola, the prevention of the infection presents a challenge. However, there are primary prevention measures that can assist with the challenge, such as: Wearing of protective clothing (such as masks, gloves, gowns and goggles) for health care professionals.

- The use of infection-control measures (such as complete equipment sterilization and Routine use of disinfectant)
- Isolation of Ebola patients from contact with unprotected persons.

Together with the World Health Organization, CDC has developed a set of guidelines to help prevent and control the spread of Ebola - Infection Control for Viral Hemorrhagic Fevers In the African Health Care Setting. India has the second highest number of Hepatitis B infected Ebola toll hits 932 in West Africa First H1NI Death Reported in Kerala 6 Ways to Prevent Mosquito Bites Social media Share this article.

1.11. Ways to prevent infection and transmission

While initial cases of Ebola virus disease are contracted by handling infected animals or carcasses, secondary cases occur by direct contact with the bodily fluids of an ill person, either through unsafe case management or unsafe burial practices. During this outbreak, most of the disease has spread through human-to-human transmission. Several steps can be taken to help in preventing infection and limiting or stopping transmission.

• Understand the nature of the disease, how it is transmitted and how to prevent it from Spreading further. (For additional information, please see the previous questions about Ebola Virus disease in this FAQ.)
• Listen to and follow directives issued by your country's respective Ministry of Health.
• If you suspect someone close to you or in your community of having Ebola virus disease, Immediately encourage and support them in seeking appropriate medical treatment in a healthcare facility.
• If you choose to care for an ill person in your home, notify public health officials of your intentions so they can train you and provide appropriate personal protective equipment (PPE) (gloves, impermeable gown, boots/closed shoes with overshoes, mask and eye protection for splashes), as well as instructions as a reminder on how to properly care for the patient, protect Yourself and your family and properly dispose of the PPE after use. N.B. WHO does not recommend home care and strongly advises individuals and their family members to seek professional care in a treatment centre.
• When visiting patients in the hospital or caring for someone at home, hand washing with soap and water is recommended after touching a patient, being in contact with their bodily fluids, or touching his/her surroundings.
• People who have died from Ebola should only be handled using appropriate protective equipment and should be buried immediately by public health professionals who are trained in safe burial procedures. Additionally, individuals should reduce contact with high-risk infected animals (i.e. fruit bats, monkeys, or apes) in the affected rainforest areas. If you suspect an animal is infected, do not handle it. Animal products (blood and meat) should be thoroughly cooked before eating.

CONCLUSIONS

EVD has a tendency to create public panic locally, nationally, regionally and globally, disproportionate to the actual risk of infection. Since research into the role pigs play in

maintaining and transmitting *Ebola virus* is limited, and there is no need for rash decisions like the Reuters article (Mogato 2009) detailing the slaughter of pigs in the Philippines after the discovery of *Reston ebola virus*, general risk factors favouring *Ebola virus* infection in pigs in Uganda will be outlined.

1. Pig production in Uganda has significantly increased over the last 30 years. A higher density of pigs may favour *Ebola virus* transmission between pigs and from pigs to humans due to increased direct contact.
2. These higher pig populations raised under tethering or free-range systems create overlap of fruit bat habitats (and their dropped fruit, excrement, saliva and urine) where these pigs scavenge for food.
3. The risk to commercial pig farming is poorly understood. It may be possible that fruit bats roost in pig structures and direct contact with their excrement and urine are the biggest risk factors.

The website of the International Union for Conservation of Nature notes that *M. torquata* is adaptable and has been found in city gardens. Also, given that many farmers in Uganda engage in mixed farming, it is possible that pig operations are more at risk from having fruit trees within a certain geographic distance and pigs scavenging fruits. Perhaps the cultivation of fruit trees in addition to pig keeping creates suitable habitats for fruit bats to forage and structures to roost in, fostering direct contact.

4. The human population is experiencing dramatic growth in Uganda. In addition to the increasing contact between humans and wildlife, livestock follow these people as walking bank accounts. As humans encroach into new habitats, so will their livestock. Some of these new environments will include bat and nonhuman primate habitats. This may cause the incidence of EVD outbreaks to increase as infected hosts and their body fluids come in direct contact with suitable hosts at a higher frequency. It should also be noted that as more humans infringe into Nonhuman primate and bat habitats, the human need for protein may drive an increase in hunting and bush meat consumption. Pigs may become infected from scavenging the waste products of bush meat hunting.
5. At present, the risk to pork products is very poorly understood. It is based on anecdotal evidence at best.

Given the link between hunting and consumption of bushmeat with *Ebolavirus* infection, there is a chance that slaughtering pigs and certain methods of handling raw pork may pose a greater risk of *Ebolavirus* infection and pork contamination.

6. The disease course and outcome of different strains of *Ebolavirus* infection in pigs is also in its research infancy. To date, there is no research into natural or experimental infection in pigs with *Bundibugyo ebolavirus* or *Sudan Ebola virus*.

Even the *Zaire Ebola virus* study was done under experimental conditions, where the pigs were kept in conditions dissimilar to those in Uganda.

7. The role pigs may play in *Ebola virus* transmission is poorly understood. The present data suggest they may be amplifying hosts, but likely not reservoir hosts. This suggests the conditions under which pigs become infected with *Ebola virus* and the role they play in transmission may have many variables that will have to be elucidated. Likewise, perhaps the increasing pig densities, coupled with higher human densities and both pigs and humans in contact with nonhuman primates and fruit bats, will create highly favourable conditions for *Ebolavirus* amplification and maintenance, increasing both the frequency and incidence of *Ebolavirus* outbreaks.

8. While the 31 pig samples taken as part of an ecological study after the Kibaale outbreak were all negative by serology (IgG ELISA), the number of samples was very small and not representative enough to draw any conclusions.

Additionally, the pigs sampled were all healthy. Dr Jonathan Towner of CDC Atlanta noted in his presentation (Towner 2013) that in fruit bats, virus isolation was more successful from liver and spleen tissue samples than from blood.

This is something to consider if a field survey of pigs is undertaken in future.

2. HIN1 SWINEE FLUE

❖ **2.1. HISTORY:- H1NI (SWINE FLU)**

Flu pandemic in India (2009) is the outbreak of swine flu in various parts of India. Soon after the outbreak of H1N1 virus in the United States and Mexico in March, the Government of India started screening people coming from the affected countries at airports for swine flu symptoms. The first case of the flu in India was found on the Hyderabad airport on 13 May, when a man traveling from US to India was found H1N1 positive. Subsequently, more

confirmed cases were reported and as the rate of transmission of the flu increased in the beginning of August, with the first death due to swine flu in India in Pune, [1]panic began to spread. As of 24 May 2010, 10193 cases of swine flu have been confirmed with 1035 deaths. The only known drug to work against H1N1(Tamiflu) was not sold in general medical stores, to prevent the virus from developing antibiotic resistance due to excessive use. The government feared that people would pop in pills for no reason, thereby making the virus resistant to its only known cure. The problem facing the state machinery was the fact that flu infected cases were coming from across the country. Generic version of Tamiflu (Oseltamivir) was made available in Indian market, after several months of swine flu attack. Natco Pharma and Strides Arcolabs have launched their generic version of Oseltamivir, Natflu and Starflu. These drugs were made available to the customers directly under prescription. On August 8, 2010 the Indian government reported there had been 1833 deaths from swine flu in the country. Bharat Biotech, a biotechnology firm, on Monday announced the launch of India's first indigenously developed cell culture H1N1 Swine Flu Vaccine under the brand name HNVAC. HNVAC, is manufactured using cell culture technology, a complex process by which cells are grown under controlled conditions, the company said **H1N1Flu ("Swine Flu "Why the 2009 H1N1 virus is sometimes called "swine flu"?.**

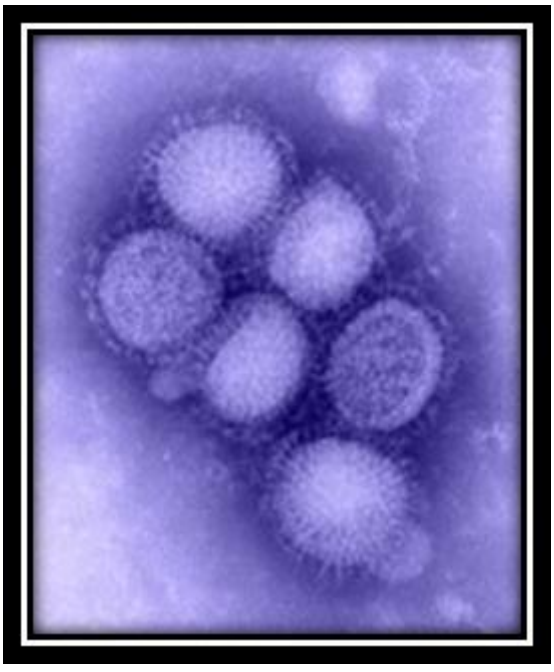

Fig.2 H1N1 Influenza virus.

This virus was originally referred to as "swine flu" because laboratory testing showed that many of the genes in the virus were very similar to influenza viruses that normally occur in

pigs swine) in North America. But further study has shown that the 2009 H1N1 is very different from what normally circulates in North American pigs. It has two genes from flu viruses that normally circulate in pigs in Europe and Asia and bird (avian) genes and human genes. Scientists call this a "quadruple reassort virus.

❖ **How does the 2009 H1N1 virus spread?**

Spread of the 2009 H1N1 virus is thought to occur in the same way that seasonal flu spreads. Flu viruses are spread mainly from person to person through coughing, sneezing or talking by people with influenza. Sometimes people may become infected by touching something – such as a surface or object – with flu viruses on it and then touching their mouth or nose.

❖ **What surfaces are most likely to be sources of contamination?**

Germs can be spread when a person touches something that is contaminated with germs and then touches his or her eyes, nose, or mouth. Droplets from a cough or sneeze of an infected person move through the air. Germs can be spread when a person touches respiratory droplets from another person on a surface like a desk, for example, and then touches their own eyes, mouth or nose before washing their hands.

❖ **What kills influenza virus?**

Influenza virus is destroyed by heat (167-212°F [75-100°C]). In addition, 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.

Table: 3 Consolidated Status of Influenza A H1N1 : 8 August 2009

SR.	State	Lab confirmed cases reported during the week	Lab confirmed cases cumulative	Death of Lab confirmed cases during the week	Death of Lab confirmed cases cumulative
1.	Delhi	106	11156	0	149
2.	Andhra Pradesh	105	1506	6	102
3.	Karnataka	200	4409	12	251
4.	Tamil Nadu	36	3143	0	14
5.	Maharashtra	400	9943	51	937
6.	Kerala	17	2850	2911	121
7.	Punjab	1	205	0	47
8.	Haryana	2	2070	0	51
9.	Chandigarh	0	331	0	8
10.	Goa	15	129	1	6
11.	West Bengal	23	256	1	4
12.	Uttarakhand	0	152	0	17

13.	Himachal Pradesh	0	24	0	10
14.	**Jammu & Kashmir**	**0**	**112**	**0**	**4**
15.	Gujarat	21	2243	7	488
16.	Manipur	0	2	0	0
17.	Meghalaya	0	8	0	0
18.	Mizoram	0	4	0	1
19.	Assam	0	52	0	2
20.	Jharkhand	0	2	0	0
21.	Rajasthan	2	3932	0	296
22.	Bihar	0	7	0	0
23.	Uttar Pradesh	5	1601	1	43
24.	Puducherry	0	132	0	12
25.	Chhattisgarh	0	96	0	14
26.	Madhya Pradesh	3	410	1	118
27.	Daman & Diu	0	1	0	0
28.	Orissa	4	118	2	32
29.	Nagaland	0	2	0	0
30.	Andaman & Nicobar Islands	0	27	0	1
31.	Dadra and Nagar Haveli	2	3	0	1
Total		942	44987	83	2728

❖ What is swine flu?

Swine flu is a respiratory disease caused by a new strain of influenza virus. The seasonal flu vaccines that are already available don't protect against swine flu, so a new flu vaccine has been developed.

❖ What is an Influenza Pandemic?

About Influenza

Influenza (the "flu") is a seasonal respiratory illness caused by flu viruses. The viruses can cause mild to severe illness sometimes resulting in death. It is important to note that the flu is different from a common cold or seasonal allergies. Generally, the onset of the flu is sudden and symptoms include fever (usually high), headache, chills, sore throat, runny or stuffy nose, dry cough, severe exhaustion, muscle aches and stomach symptoms, such as nausea, vomiting and diarrhea.

The flu season typically starts in late November and lasts through early spring. The flu affects about 30-50 million Americans each year. The flu differs from the common cold in that it lasts longer (about two weeks) and can be temporarily debilitating even in healthy individuals. There are three types of Influenza viruses – A, B and C. Influenza A is further

categorized into subtypes based on the type of two surface proteins – hem-agglutinin (H) and neuraminidase (N).

Source

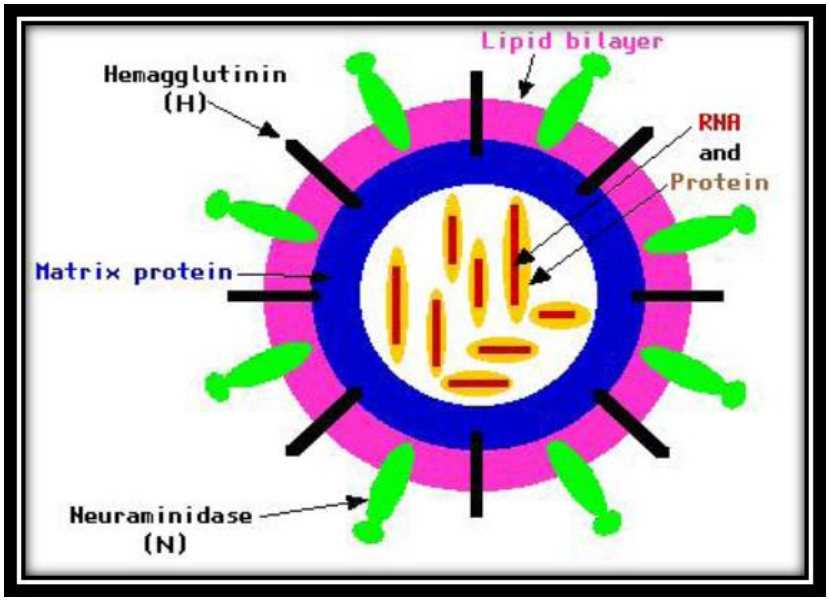

FIG. NO: 3 H1N1 VIRUSES.

❖ **About Influenza Epidemic and Pandemic**

Epidemic refers to the onset of a disease that occurs in an unusually high number of individuals in a community at the same time and is clearly in excess of normal expectancy in a defined community, geographical area or season. The U.S. Centers for Disease Control (CDC) says "that to epidemiologists the terms 'epidemic' and 'outbreak' basically mean the same thing." *Pandemic* refers to a widespread, usually global spread of a disease, while an *epidemic* is localized to a geographic region. According to the World Health Organization, "an influenza pandemic occurs when a new influenza virus appears against which the human population has no immunity, resulting in epidemics worldwide with enormous numbers of deaths and illness." The World Health Organization (WHO) is coordinating the global response to human cases of swine influenza A (H1N1) and monitoring the corresponding threat of an influenza pandemic. WHO revised the phase descriptions in 2009 and has retained the use of six phases in regards to pandemics to allow for the incorporation of new recommendations and approaches into existing national preparedness and response plans. Currently the pandemic threat is at Phase 5, which means that a pandemic is imminent. One way for a new pandemic flu strain to arise is through the mixing of different types of influenza viruses. For instance, the influenza viruses that caused the Avian Flu and the Hong

Kong Flu pandemics are believed to have come from the mixing of Human influenza and avian (bird) influenza viruses in another animal such as a pig. The new strain was then able to cause a much more severe illness in humans. The Spanish Flu pandemic, on the other hand, is thought to have started from an avian flu that directly infected humans; the mixing of the avian influenza with the human influenza within a human led to the new deadly strain of influenza a virus. The current influenza outbreak of swine flu is a result of an influenza virus species that infected pigs, then reassort (swap genes) and the new virus emerging. Currently there are four main influenza Type A virus subtypes, but the most recent influenza virus from pigs causing the outbreak have been H1N1 viruses. This new virus that has emerged is a mixture of swine, human and avian influenza viruses.

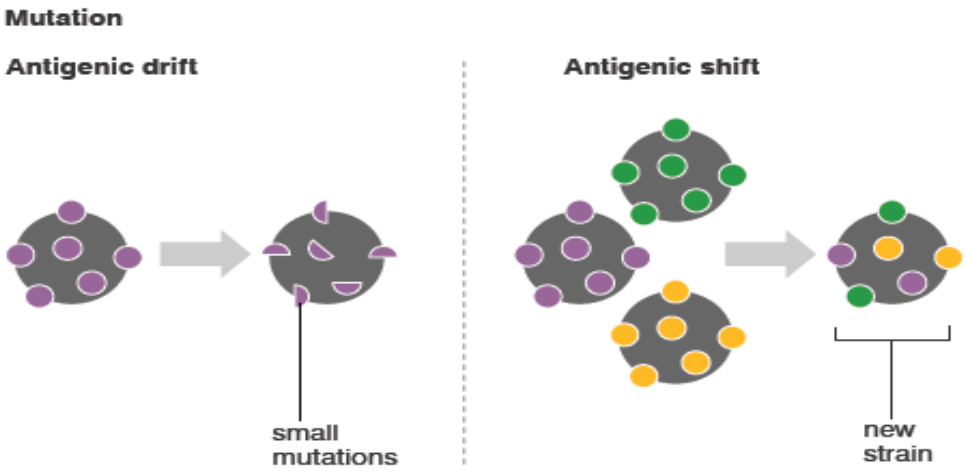

FIG: 4 MUTATION OF VIRUS.

The influenza A virus can mutate in two different ways; antigenic drift, in which existing antigens are subtly altered, and antigenic shift, in which two or more strains combine. Antigenic drift causes slight flu mutations year on year, from which humans have partial, but not complete, immunity. By contrast, the new strain of H1N1 appears to have originated via antigenic shift in Mexican pigs During the 20th century, new strains of Influenza A viruses resulted in three influenza pandemics:

- **Spanish Flu (1918-1919) –** Influenza H1N1 caused an estimated 20-50 million deaths worldwide and accounted for 675,000 deaths in the United States. The most striking characteristics of the 1918 pandemic were the unusually high death rate among the otherwise healthy age group of 15-34 year olds. Healthy people, as well as those in frail condition, were equally affected, and many died within the first few days after infection.

- **Asian flu (1957-58)** –Influenza H2N2 started in China in February 1957; by June 1957 it spread to United States, causing 70,000 deaths. The initial outbreak occurred during the summer of 1957 and again during January/February 1958. This is an example of a second wave of infections that can develop during a pandemic.

- **Hong Kong Flu (1968-1969) –** Influenza H3N2 started in Hong Kong in early 1968. Later in the year, it spread to the United States and caused 34,000 deaths. The Hong Kong Flu was the mildest pandemic of the 20th century.

❖ **Tests for Influenza (Diagnosis)**

The most common method for diagnosing influenza is the Rapid Flu Test. Depending on the type of test used, it can identify influenza A and B Proper sample collection is critical for testing. Because the tests rely on detecting the virus shed in the respiratory secretions of the infected person, the test must be done during the first few days of illness when there is viral shedding. The best sample is a nasal aspirate, but nasopharyngeal swabs are most frequently used. With the patient's head tilted back, a Dacron swab (like a very long Q-tip) is inserted into a nostril until there's resistance (1-2 inches) and then rotated several times.

The major advantages of the Rapid Flu Test are that it can be done in an outpatient setting and the results return within 30 minutes to two hours. The major disadvantages are that true influenza cases will be missed up to 30 percent of the time (false negative result) and some without influenza will be misdiagnosed as having influenza (false positive result). The gold standard for diagnosing influenza is a viral culture.

The virus from the nasal secretion is grown and identified in the laboratory. The advantage of a viral culture is that the specific viral strain and type can be identified. Such detailed information is critical in detecting influenza outbreaks (including surveillance for the pandemic strain) and for developing vaccines.

The major disadvantages are that the results take about three to ten days and not all labs are equipped to perform a viral culture. In response to the current outbreak of swine influenza, the U.S. Food and Drug Administration (FDA) have issued Emergency Use Authorizations (EUAs) at the request of the CDC. The FDA will make available to public health and medical personnel important diagnostic and therapeutic tools to identify and respond to the swine flu virus under certain circumstances. The EUAs are for the use with certain Relenza and

Tamiflu antiviral products and for the rRT-PCR Swine Flu Panel diagnostic test. In authorizing an EUA for the rRT-PCR Swine Flu Panel diagnostic test, the FDA has determined that it may be effective in testing samples from individuals diagnosed with influenza A infections and whose virus subtypes cannot be identified by test that are currently available. This EUA will allow the CDC to distribute the swine flu test to public health and other qualified laboratories that have personnel and equipment trained to perform and interpret the results.

❖ **Transmission**

Influenza is spread from person-to-person by contact with respiratory secretions from an infected person. When an infected person coughs or sneezes, the viruses are carried in large droplets which settle on the surfaces of the upper respiratory tracts of persons who are nearby (i.e. within three feet of the infected person). The viruses can also spread by direct or indirect contact with respiratory secretions –

1. Touching contaminated surfaces and then touching the eyes, nose or mouth.
2. Influenza is more infectious than SARS. Infected adults can spread the virus from the day before exhibiting symptoms to five days after symptoms start (two days on average);
3. The transmission timeline for SARS is six to eight days. Infected children can spread the virus for 10 days or longer.
4. Due to the highly contagious nature of influenza virus, first responders who may be exposed to or are taking care of persons suspected of influenza should wear appropriate protection (discussed later in this article).
5. The swine influenza A (H1N1) virus is likely to be transmitted in the same manner as the seasonal flu spreads.
6. The main transmission of flu viruses from person to person is through coughing or sneezing.
7. Transmission can also occur by touching something with flu viruses on it and then touching the mouth or nose.
8. Persons with swine flu should be considered potentially contagious as long as they are Symptomatic and possibly for up to seven days

➢ **Following illness onset**

1. Children, especially younger children, can potentially be contagious for a longer period.

2. People infected with the swine flu may be able to infect others on day one before symptoms develop and up to seven or more days after becoming sick. This means that you may be able to pass on the flu to someone else before you know you are sick.
3. Viruses and bacteria can live up to two hours or longer on surfaces such as cafeteria tables, doorknobs and desks. Washing hands frequently will help reduce the chance of getting contamination from common surfaces.
4. One concern with this recent strain of swine influenza A (H1N1) virus is that there is a real threat to persons with seemingly healthy immune systems.
5. The danger is that healthy people have no defense built up to this influenza virus and causing a healthy immune system to overreact and attack the body's healthy organs and systems – this makes a healthy 15-60 year old individual more likely to succumb to this new virus.

❖ **Treatment and Prevention**

Treatment

Four antiviral medications are approved by the U.S. Food and Drug Administration (FDA) for treatment and prevention of influenza Tami flu (oseltamivir), Relenza (zanamivir), Symmetrel (amantadine) and Flumadine (rimantadine). While antivirals taken at the onset of the illness may decrease the severity and duration of the illness, there is no definitive treatment for influenza. If antiviral treatment is given within 48 hours, it may reduce the severity of symptoms and the duration of illness. Treatment of infected persons does not prevent further spread of infection, but it may reduce the viral shedding and thus the degree of contagion.

Antiviral do not help if given beyond 48 hours of onset and will not work against other viruses or against bacterial infections that may occur as a complication of influenza. A patient may develop resistance to one or all antiviral. The bird flu (Influenza A H5N1) identified in humans in Asia in 2004 to 2005 is already resistant to amantadine and rimantadine, and higher doses of oseltamivir must be given for a longer period to be effective. Observational studies indicate that early intervention and an extended regime of oseltamivir may help increase the chance of survival, but results are inconclusive due to limited data.

For the swine flu specifically, the CDC recommends the use of Tamiflu (oseltamivir) or Relenza (zanamirvir) to treat and prevent infection.

Prevention

An effective vaccine could potentially thwart an epidemic before it becomes a pandemic. However, once the potential pandemic strain is identified, it takes several months for the vaccine to be developed and mass produced for wide distribution. For the current outbreak and imminent pandemic, fire fighters must continue to practice preventive measures. such as respiratory hygiene, cough etiquette and annual flu vaccination. As with all biological hazards, universal precautions should be practiced. Influenza epidemics result in about 35,000 deaths each year in the United States. Contributing to the high death rate is the inadequate level of vaccination among health care workers who unknowingly transmit the virus to persons susceptible for a serious illness from influenza. Data from several studies indicate that vaccination of health care workers significantly reduces the influenza death rate among the patients for whom they provide care.

Currently there is no vaccine available for this strain of the swine flu. However, there are actions people can take every day to help prevent the spread of germs that cause respiratory illnesses such as influenza.

❖ **These steps can protect your health**

• Cover your nose and mouth with a tissue when you cough or sneeze. Throw the tissue in the trash.

• Wash your hands often with soap and water, especially after a cough or sneeze. Alcohol-based hand sanitizers are also effective.

• Avoid touching your eyes, nose or mouth.

• Try to avoid close contact with sick people.

• If you get sick with influenza, the CDC recommends that you stay home from work or school and limit contact with others to keep from infecting others.

❖ **Vaccines**

Vaccines for pandemic flu strains are made using the same technology as for seasonal flu vaccines. The genes that code for the molecules on the surface of the pandemic flu virus are recombined with genes from a harmless laboratory virus. This creates a hybrid strain that is grown in large quantities and then inactivated. It can be given as a vaccine as it fools the body into producing antibodies against it by simulating infection without causing flu. If a person is subsequently infected with the real virus, the antibodies will destroy it before it causes illness. Although some people experience a few aches or a mild temperature after

vaccination, these symptoms pass very quickly and are an indication that their immune system is responding to the vaccine. Some vaccines are produced by injecting and growing viruses in eggs, which act as ideal incubation chambers. One of the two vaccines licensed for use in the UK, Celvapa, is produced in cell cultures instead of eggs, so it is suitable for use in people with egg allergies. Two H1N1 vaccines were developed and put into production for the UK, to increase the number of doses available and to reduce the chances of delays in manufacturing and/or licensing.

Following successful clinical trials of the vaccines in adults and children, the first vaccine Pandemrix™ was authorised for use in September and the second vaccine Celvapan™ shortly after. Both of the vaccines are being used in the national immunisation programme.

The vaccines will continue to be monitored to identify any rare side effects not picked up in routine safety trials.

FIG: 5 VACCINATION.

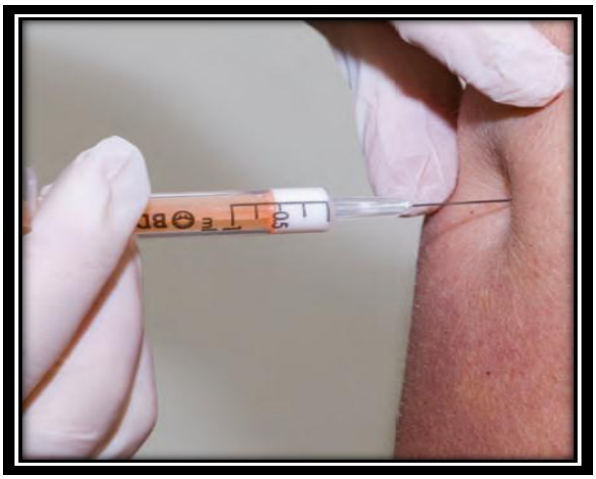

FIG: 6 ROUTE OF ADMINISTRATION.

❖ **Advice to the public**

Since the emergence of the new H1N1 virus in April, the public has been given information about pandemic H1N1 'flu through the media, public health services and government leaflet campaigns. The Health Protection Agency (HPA) advises the following steps to prevent the spread of infection as far as possible:

- sneezing into a tissue
- putting dirty tissues in the bin quickly
- washing hands frequently
- Frequent cleaning of hard surfaces.

REFERENCES

1. Centers for Disease Control and Prevention. http://www.cdc.gov/h1n1flu/, 2009 (accessed 30.05.09.).
2. Poon, L.L., Chan, K.H., Smith, G.J., Leung, C.S., Guan, Y., Yuen, K.Y., Peiris, J.S., 2009. Molecular detection of a novel human influenza (H1N1) of pandemic potential by conventional and real-time quantitative RT-PCR assays. Clin. Chem.doi:10.1373/clinchem.2009.130229 (Epub ahead of print).
3. World Health Organization, 2009a. Epidemic and pandemic alert and response (accessed 30.05.09.) http://www.who.int/csr/don/2009 05 29/en/index.html.
4. World Health Organization, 2009b. CDC protocol of realtime RTPCR for influenza A (H1N1) (accessed 30.05.09.) http://www.who.int/csr/resources/ publications/swineflu/realtimeptpcr/en/index.html.
5. WHO Ebola virus disease: background and summary. Available at: http: // www. who.int/csr/don/2014_04_ebola/en/
6. http://www.cdc.gov/vhf/ebola/index.html.
7. Recommendations for public health authorities and transport sector at http://who.int/ith/updates/20140421/en/.
8. BBC News. "US reports first swine flu death."http://news.bbc.co.uk/2/hi/health/8021958.stm
9. http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/I/Influenza.html
10. http://www.pandemicflu.gov/.
11. Dhar, Aarti (April 28, 2009). "Swine flu: India on alert". The Hindu. Retrieved 2009-08-13.
12. "First case of swine flu confirmed in India". IBN Live. May 16, 2009. Retrieved 2009-08-13.[*dead link*]
13. "First swine flu death confirmed in India". PTI. August 4, 2009. Retrieved 2009-08-13.
14. http://en.wikipedia.org/wiki/2009_flu_pandemic_in_Asia#India"number of deaths"
15. "Anti-swine flu drug Tami flu now available across India". Door Darshan, India. Archived from the original on 25 November 2009. Retrieved 10 November 2009.
16. "Retail sale of Tamiflu from next week". One India. September 15, 2009. Retrieved 10 November 2009.
17. "India allows retail sale of swine flu drugs oselatamivir and zanamivir". Dance With Shadows. September 16, 2009. Retrieved 10 November 2009.