

REMEDIAL APPROACH: SWINE FLU

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ABSTRACT

The swine flu virus was first isolated from a pig in 1930. Swine influenza exploded unusually in the year 1979 at New Jersey. Influenza is caused by RNA viruses. Swine flu is a respiratory disease of pigs caused by type A influenza virus. It was discovered that the vaccine was associated with Guillain-Barre Syndrome. Five types of therapies allopathic, herbal, homeopathic, vaccines and vitamins are used in swine flu. Allopathic remedies are Tamiflu (oseltamivir), Relenza (zanamivir), Aspirin, Hydrogen peroxide, N-acetyl cysteine. Homeopathic remedies are Gelsemium (Gels), Baptisia, Eupatorium perforatum, Sabadilla (Sabad), Arsenicum (Ars), Arsenicum iodide, Dulcamara (Dulc), Bryonia, Phosphorus, Rhus toxicodendron (Rhus-t), Allium cepa (All-c), Sticta, Ipecac, Veratrum album and Chicken soup. Herbal remedies are Fresh Garlic Cloves, Astragalus, Echinacea, Flu-buster tea and Liqorice.

Keywords: Influenza viruses, Allopathic, Homeopathic, Herbal, Vaccines.

INTRODUCTION

Swine flu is a respiratory disease in pigs caused by influenza. Pigs can pass the illness onto humans after contact with them. The latest disease is a new mix of pig viruses with some human and bird viruses¹. Swine flu has been confirmed in a number of countries and it is spreading from human to human, which could lead to what is referred to as a pandemic flu outbreak². Pandemic flu is different from ordinary flu because it's a new flu virus that appears in humans and spreads very quickly from person to person worldwide.

SIGN AND SYMPTOMS

In swine: In pigs influenza infection produces fever, lethargy, sneezing, coughing, difficulty breathing and decreased appetite³. In some cases the infection can cause abortion. Although mortality is usually low (around 1–4%), the virus can produce weight loss and poor growth, causing economic loss to farmers.

In humans: The symptoms of swine flu are similar to other influenzas, and may include a fever, cough (typically a "dry cough"), headache, muscle or joint pain, sore throat, chills, fatigue, and runny nose. Diarrhea, vomiting, and neurological problems have also been reported in some cases.^{4,5}

CAUSE OF SWINE FLU⁶

The two main series of events can lead to swine flu these were:-

1. The influenza viruses (types A, B, C) are enveloped RNA viruses with a segmented genome; this means the viral RNA genetic code is not a single strand of RNA but exists as eight different RNA segments in the influenza viruses. A human (or bird) influenza virus

can infect a pig respiratory cell at the same time as a swine influenza virus; some of the replicating RNA strands from the human virus can get mistakenly enclosed inside the enveloped swine influenza virus. Various combinations of RNA segments can result in a new subtype of virus (known as antigenic shift) that may have the ability to preferentially infect humans but still show characteristics unique to the swine influenza virus (see **Figure 1**). It is even possible to include RNA strands from birds, swine, and human influenza viruses into one virus if a cell becomes infected with all three types of influenza (for example, two bird flu, three swine flu, and three human flu RNA segments to produce a viable eight-segment new type of flu viral genome). Formation of a new viral type is considered to be antigenic shift; small changes in an individual RNA segment in flu viruses are termed antigenic drift and result in minor changes in the virus.

Pigs can play a unique role as an intermediary host to new flu types because pig respiratory cells can be infected directly with bird, human, and other mammalian flu viruses. Consequently, pig respiratory cells are able to be infected with many types of flu and can function as a "mixing pot" for flu RNA segments (see **Figure 1**). Bird flu viruses, which usually infect the gastrointestinal cells of many bird species, are shed in bird feces. Pigs can pick these viruses up from the environment and seem to be the major way that bird flu virus RNA segments enter the mammalian flu virus population.

PREVENTIONS⁷

Prevention of swine influenza has three components: prevention in swine, prevention of transmission to humans, and prevention of its spread among humans.



In swine: Methods of preventing the spread of influenza among swine include facility management, herd management, and vaccination (ATC vet code: QI09AA03). Because much of the illness and death associated with swine flu involves secondary infection by other pathogens, control strategies that rely on vaccination may be insufficient.

- Facility management includes using disinfectants and ambient temperature to control virus in the environment.
- Herd management includes not adding pigs carrying influenza to herds that have not been exposed to the virus
- Control of swine influenza by vaccination has become more difficult in recent decades, as the evolution of the virus has resulted in inconsistent responses to traditional vaccines.

In humans:- Prevention of pig to human transmission

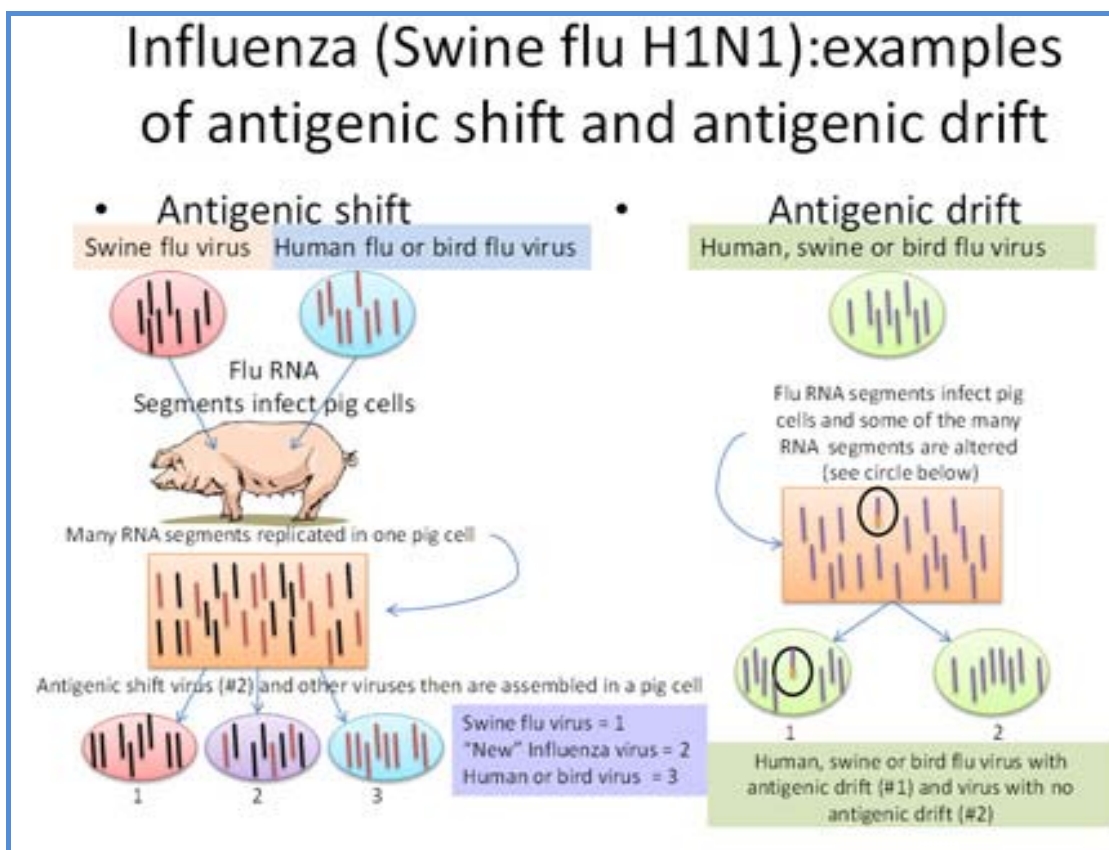
Swine can be infected by both avian and human influenza strains of influenza, and therefore are hosts where the antigenic shifts can occur that create new influenza strains. So following preventions must be taken:

- Farmers and veterinarians are encouraged to use a face mask when dealing with infected animals.
- use of vaccines
- wearing gloves when working with sick animals⁸

Prevention of human to human transmission

Influenza spreads between humans when infected people cough or sneeze, then other people breath in the virus or touch something with the virus on it and then touch their own face.

- frequent washing of hands with soap and water or with alcohol-based hand sanitizers, especially after being out in public.
- Also not touching your eyes, nose or mouth with your hands helps to prevent the flu.
- Social distancing is another tactic
- Cover your nose and mouth with a tissue when you cough or sneeze. Throw the tissue in the trash after you use it



SWINE FLU REMEDIES⁹

Infections cannot be separated from the conditions that invite pathogens to proliferate. This seems to boggle the minds of orthodox medical scientists, who like the blind

men and the elephant, seem to be able to focus on one thing at a time.

We live in a dangerous world and anything that throws us out of balance invites pathogens to take up residence in our bodies. If this is the beginning of the pandemic that

health officials have been warning about it is best to begin preparing your body before the flu strikes. So there are some of the emergency Remedies that addresses both the body's terrain and the potential pathogens quickly. These were:-

- **Allopathic Remedies**
- **Homeopathic Remedies**
- **Herbal Remedies**
- **Vaccination**
- **Vitamins Therapy**

Allopathic Remedies ¹⁰

In Natural Allopathic Medicine we often take doses to exceedingly high levels without the side effects found in pharmaceuticals that are an ever present danger even at very low dosages. In allopathic medicine everything, even water and vitamin C are placed on a scale of toxicity with everything being defined as poisonous. And though it's true, one can drown in water a large person can safely drink a gallon of it a day and one can put pounds of magnesium chloride in one's bath and take very high dosages of iodine safely for infectious disorders without the serious and dangerous downside of antibiotics.

Some of the allopathic remedies which are found to be useful in swine flu treatment were:-

- **Iodine:-** Iodine exhibits activity against bacteria, molds, yeasts, protozoa, and many viruses; indeed, of all antiseptic preparations suitable for direct use on humans and animals and upon tissues, only iodine is capable of killing all classes of pathogens: gram-positive and gram-negative bacteria, mycobacteria, fungi, yeasts, viruses and protozoa. Most bacteria are killed within 15 to 30 seconds of contact.

M.O.A:- Iodine kills single-celled organisms by combining with the amino acids tyrosine or histidine when exposed to the extracellular environment. All single cells (pathogens) showing tyrosine on their outer cell membranes are killed instantly by a simple chemical reaction with iodine that denatures proteins

- **Magnesium :-** Increases in extracellular magnesium concentration cause a decrease in the inflammatory response while reduction in the extracellular magnesium results in inflammation. Magnesium literally puts the chill on inflammation especially when used transdermally. "Magnesium deficiency induces a systemic stress response by activation of neuro endocrinological pathways,"

M.O.A:- Magnesium is central to immunocompetence, and plays a crucial role in natural and adaptive immunity in great part because of its dominance over the inflammatory response.

- **Sodium Bicarbonate:-** Malaria and influenza are often associated with abnormalities of fluid, electrolytes and the acid-base balance. Sodium bicarbonate is very useful. Sodium bicarbonate can be administered orally every two hours and can be put in the baths as well as mixed with mineral water to make a lotion.

M.O.A:- Sodium bicarbonate change the blood and full body pH and going to shift the environment of most pathogens making it more uncomfortable for them to inhibit a host.

- **N-Acetyl Cysteine:-** NAC is a form of the amino acid cysteine and a component of protein. Aside from its importance to the immune system as an antioxidant, NAC is also a mucolytic – meaning that it breaks down lung-clogging mucous in respiratory disorders.

M.O.A:- NAC is a precursor to glutathione, the body's principal antioxidant that neutralizes free radicals and detoxifies harmful substances.

- **Hydrogen peroxide:-** Inactivating pathogens with hydrogen peroxide has been used worldwide since the flu pandemic of 1918. For a sore throat it is good to use hydrogen peroxide mixed in warm water as a gargle.

Homeopathic Remedies ¹¹

Swine flu was successfully treated by homeopathic medication, in the swine flu epidemic of 1918. Homeopathy is a natural form of treatment and has no side effects. Homeopathic medicines are derived from animal, plant and natural sources. These medicines may require some time to show their effect and the symptoms may also aggravate during their use, but the disease gets completely cured and does not relapse, once the homeopathic course is completed. Homeopathic medicines that have been effective for the treatment of swine flu are

Gelsemium. [Gels]:- This remedy corresponds to the commencement of the trouble, when the patient is weak, tired and aches throughout the body. It removes speedily the intense aching and muscular soreness. There is constant chilliness and the patient hugs the fire; the fever is less acute than that of Aconite, and the cough is hard and painful. Aconite will sometimes prove the better remedy for children, but the drug will never be a prominent one in influenza.

Baptisia:- Influenza with marked gastro-intestinal symptoms may need this remedy, especially when there are putrid diarrhoea stools.

Sabadilla. [Sabad]:- Sneezing is the great keynote of this remedy. Sneezing and lachrymation on going into the open air. The throat is swollen and the pain is worse on empty swallowing; the sneezing is excessive, shaking the whole body. Shudderings, with gooseflesh chills creeping



upwards, are also prominent symptoms. Frontal headache, dryness of mouth, without thirst and cough, worse on lying down, are additional symptoms.

Arsenicum. [Ars]:- This remedy covers more phases of flu than perhaps any other remedy. Hughes believes that it will cut short an attack, especially when there is a copious flow, prostration and paroxysmal coryza. Its periodicity makes it suitable to epidemics, and it suits the early symptoms when the affection is in the upper portion of the respiratory tract. The burning dryness and copious watery excoriating secretion and the involvement of the conjunctiva are unmistakable indications. Langour and prostration are prominent symptoms.

Arsenicum iodide:- Chills, flushes of heat and severe fluent coryza, discharge irritating and corrosive, sneezing and prostration. Sanguinaria nitrate is especially valuable when the trachea and larynx are affected. Phytolacca is specific when the throat is inflamed and spotty, with great hardness and tenderness of the glands.

Dulcamara. [Dulc]:- This is one of our best remedies in the acute form; the eyes are suffused, the throat is sore and the cough hurts because of the muscular soreness. If brought on by damp, cold changes in the weather, so much the surer is Dulcamara indicated.

Bryonia. :- When a person is very grumpy and feels miserable with the flu, wanting only to lie still and be left alone, this remedy is likely to be useful. Headache, muscle aches, and cough or stomach pain may be the major symptoms.

Phosphorus may be indicated, especially when the trouble moves towards the chest. It is a very useful remedy for the debility following la grippe, as it is usually of the pure nervous type. It is the great post-influenza "tonic."

Rhus toxicodendron. [Rhus-t]:-Influenza, with severe aching in all the bones, sneezing and coughing. The cough is worse evenings and is caused by a tickling behind the upper part of the sternum. Especially is it useful in cases brought on by exposure to dampness. There is much prostration and depression, and the patient may have some symptoms which are suspicious as pointing towards typhoid fever, such as burning tongue, stupor and delirium. Aching pains and nightly restlessness are keynotes symptoms.

Allium cepa. [All-c]:- Profuse catarrhal coryza; the nose runs freely, there is sneezing, irritability cough, the face is swollen and looks inflamed. Camphora. This remedy is often sufficient at the outset to cut short an attack, or at least modify the severity.

Sticta. [Stict]:- Nasal catarrh; headache, thirst, nightly expectoration, great watering of eyes, running at nose, hoarseness of voice, frontal headache and depression of whole system.

HERBAL REMEDIES ¹²

Most popular treatment adopted by those suffering from swine flu is allopathic medication, though it does not cure swine flu, it merely controls or reduces the symptoms. Swine flu natural remedies and swine flu herbal remedies are better treatment options, and they are also free of side effects that are generally caused by allopathic medicines. Herbs that are useful in the treatment of swine flu include, adaptogens, olive leaves, oregano oil and traditional Chinese medicinal herbs like eleutherococcus, shisandra and codonopsis. Adaptogens are very effective antiviral herbs, that are resistant to biological and chemical stressors. Shisandra is used to treat viral flu and codonopsis strengthens the immune system by increasing the white blood cell and the red blood cell counts. Consuming dietary and vitamin supplements like vitamin C, vitamin D, etc. and certain probiotics can be useful in the treatment and prevention of swine flu. Some of the Antiviral herbs are also there which are very effective in swine flu these are:-

Goldenseal (*Hydrastis canadensis*)

Golden seal contains a high content of isoquinoline alkaloids, of which berberine interfere with intracellular events after virus penetration into the host cells and before viral DNA synthesis. Antimicrobial activity increases with pH therefore alkalisation improves clinical efficacy particularly in the treatment of urinary tract infections. Berberine has also been shown to activate macrophages. Usual dose is 250-500 mg/day (8-12% alkaloid content). It is non-toxic at recommended doses, but it is not recommended for use during pregnancy, and it can decrease B vitamin absorption. It may interfere with H-2 antagonists, proton pump inhibitors, antihypertensives, barbiturates and sedatives, and heparin.

Echinacea (*Echinacea angustifolia or purpurea*)

Echinacea may boost the immune defenses in various ways. It contains three compounds with specific antiviral activity: caffeic acid, chicoric acid, and echinacin which strengthens the body's local defences. However, echinacin, deactivates germs' tissue-dissolving enzyme which prevents germs from spreading and infecting other body tissues. It stimulates production of white blood cells and phagocytes, and increased macrophage germ-killing activity. It also boosted production of infection-fighting T-lymphocytes up to 30% more than standard immune-supportive drugs. Echinacea is used to treat flu, colds, bronchitis, tonsillitis, ear infections and whooping cough. Root extracts of echinacea are believed to boost interferon levels, vital to the body's defences. Its main effect appears to be immunostimulatory; activating the alternative complement pathway, promoting chemotaxis of neutrophils, monocytes, and eosinophils, enhancing macrophage phagocytosis and stimulation of production of TNF, interferon, and interleukin-1. The herb also possesses antiviral activity due to inhibition of hyaluronidases. It has been shown to decrease symptoms



and length of sickness in patients experiencing the common cold. Echinacea has also been shown to accentuate the topical antimycotic agent (econazol nitrate) decreasing recurrence of *C. albicans* from 60.5% to 5-16.7%. The usual dose is 900 mg/day of 3.5% echinacoside. Caution is indicated in patients with HIV because of potential stimulation of viral replication.

St. John's Wort (*Hypericum perforatum*)

St John's wort is most effective as an anti-viral and anti-bacterial. In vitro studies have shown that the two major compounds (hypericin and pseudohypericin) exhibit strong antiviral activity against HSV I and II as well as influenza types A and B, vesicular stomatitis virus and remarkable antiviral activity against Epstein-Barr virus.

St. John's Wort also have broad spectrum antimicrobial activity against both Gram-positive and Gram-negative bacteria including *Staphylococcus aureus*, *Streptococcus mutans*, *Proteus vulgaris*, *E. coli*, and *Pseudomonas aeruginosa*. *Hypericum* is a useful adjunctive treatment for herpes simplex, mononucleosis, and influenza, and because of its antidepressant and anti-EBV activity, a promising treatment for fibromyalgia and chronic fatigue. St. John's Wort used as an topical aid to wound healing. The usual oral dose of *Hypericum* standardized to 0.3% hypericin is 300 mg three times a day. Many potential drug interactions, includes sedative-hypnotics, 5-HT antagonists, cyclosporine, digoxin, nefazodone, NNRTI's, tricyclic antidepressants, photosensitizing drugs, protease inhibitors, theophylline, and coumadin.

Liquorice root (*Glycyrrhiza glabra*)

Liquorice has its major active component a triterpenoid saponin, glycyrrhizic acid. Intestinal flora hydrolyzes glycyrrhizin yielding the aglycone molecule (glycyrrhentic acid) and a sugar moiety, resulting in absorption of both. Both glycyrrhizin and glycyrrhentic acid have been shown to induce interferon, a natural antiviral. It directly inhibits the growth of several DNA and RNA viruses in cell cultures (vaccinia, herpes simplex, Newcastle disease, vesicular stomatitis virus) and to irreversibly inactivate HSV I. The herb shows antimicrobial activity in vitro against *Staphylococcus aureus*, *Streptococcus mutans*, *Mycobacterium*, and *Candida albicans*. Licorice compounds are showing promise in the treatment of HIV related diseases and chronic Hepatitis B (40% of patients will have complete resolution). Topical preparations have been shown to reduce the healing time and pain associated with cold sores, aphthous ulcers, and genital herpes. Caution is recommended when used with drugs that can deplete potassium, stimulant laxatives, and herbs with anticoagulant/antiplatelet properties, including: aspirin and other NSAID's, corticosteroids, cardiac glycosides, loop diuretics, hormones (estrogen-like), insulin, MAOI's and interferon. Usual dose of standardized 4% extract is 250-500 mg/day.

Garlic (*Alium sativa*)

Garlic considered as a natural remedy against a range of human illnesses, including various bacterial, viral and fungal infections. This kind of antibiotic activity of garlic has mostly been associated with the thiosulfinate allicin. Allicin is one of the active principles of freshly crushed garlic homogenates that has a variety of antimicrobial activities. The main antimicrobial effect of allicin is due to its chemical reaction with thiol groups of various enzymes, e.g. alcohol dehydrogenase, thioredoxin reductase, and RNA polymerase, which can affect essential metabolism of cysteine proteinase activity involved in the virulence of *E. histolytica*. Allicin in its pure form was found to exhibit i) antibacterial activity against a wide range of Gram-negative and Gram-positive bacteria, including multidrug-resistant enterotoxigenic strains of *Escherichia coli*; ii) antifungal activity, particularly against *Candida albicans*; iii) antiparasitic activity, including some major human intestinal protozoan parasites such as *Entamoeba histolytica* and *Giardia lamblia*; and iv) antiviral activity.

Astragalus

Astragalus is an extremely versatile herb which may act as an immune strengthener. The IL-2 inducing activity of the triterpene saponins found in astragalus is the mechanism involved in the immunomodulatory and anticancer effects of astragalus species. It is a commonly used herb in traditional Chinese medicine and is used as a component of many immune-supporting formulas, whether prepared as a sliced and boiled herb in food preparations, in extracts, or in capsules.

Elderberry

Elderberry has been used as a remedy for flu, cough, colds, and upper respiratory infections for over 2500 years. Recent studies demonstrate black elderberry's effectiveness against all strains of influenza virus. A constituent present in black elderberry (with actions similar to neuraminidase inhibitors oseltamivir and zanamivir) prevents the spread of virions from infected cells to new cells.

Grape seed extract (GSE)

GSE is a general antimicrobial agent with specific antiviral properties. It is best known for its application against *Candida albicans*, an organism responsible for fungal infections. Flavonoids and related polyphenols, in addition to their cardioprotective, anti-tumor, anti-inflammatory, anti-carcinogenic and anti-allergic activities, also possess promising anti-HIV effects. These compounds elicit anti-HIV effects such as inhibition of HIV-1 expression and virus replication by blocking beta-chemokine receptors, CCR2b, CCR3 and CCR5, and the alpha-chemokine receptors, CXCR1, CXCR2 and CXCR4 which serves as a entry coreceptors for HIV-1. GSE may be used in liquid concentrate form or in capsules. GSE may be taken internally, in minute doses such as 2 to 4 drops



twice daily diluted in at least 4 ounces of carrot, orange, pineapple or grapefruit juice.

Green tea

Certain constituents called catechins found in green tea have been studied for their ability to inhibit influenza virus replication and their direct virucidal effects. One study evaluated polyphenolic compound catechins ((-)-epigallocatechin gallate (EGCG), (-)-epicatechin gallate (ECG) and (-)-epigallocatechin (EGC)) from green tea for their ability to inhibit influenza virus replication in cell culture and for potential direct virucidal effect. Among the test compounds, the EGCG and ECG were found to be potent inhibitors of influenza virus replication. It has been suggested that the antiviral effect of catechins on influenza virus is mediated not only by specific interaction with HA, but via alteration of the physical properties of the viral membrane.

VACCINATION

Antiviral drugs are prescription medicines (pills, liquid or an inhaler) with activity against influenza viruses, including swine influenza viruses. Antiviral drugs can be used to treat swine flu or to prevent infection with swine flu viruses. These medications must be prescribed by a health care professional.

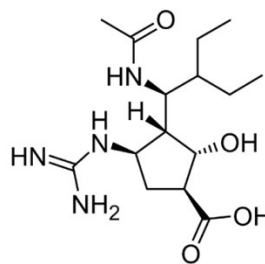
Influenza antiviral drugs only work against influenza viruses - they will not help treat or prevent symptoms caused by infection from other viruses that can cause symptoms similar to the flu. Some drugs which are under clinical trials and effective against swine influenza A (H1N1) viruses were:

Pandemrix

Pandemrix is an influenza vaccine for influenza pandemics, such as the H1N1 2009 flu pandemic colloquially called the swine flu. The vaccine was developed by GlaxoSmithKline¹³ and patented in September 2006. The vaccine contains an immunologic adjuvant AS03 which consists of DL- α -tocopherol (vitamin E), squalene and polysorbate 80. Thiomersal (thimerosal) is added as a preservative. Being manufactured in chicken eggs, it contains trace amounts of egg proteins. Additional important non-medicinal ingredients are formaldehyde, sodium deoxycholate, and sucrose.¹⁴ It claimed to boost the potency of the body's immune response, meaning that only a quarter of the inactivated virus is needed. The vaccine is supplied in separate vials, one containing the adjuvant, and the other the inactivated virus,¹⁵ which require mixing before intramuscular injection. Originally it was thought that two doses given 21 days apart would be required for full efficacy.

GlaxoSmithKline reported results from the second clinical trial, from the pediatric clinical trial, and the response from the elderly population.

Peramivir¹⁶



Peramivir is a neuraminidase inhibitor discovered and being developed by BioCryst Pharmaceuticals for the treatment of the influenza virus. The drug is in clinical trials for treating patients with life-threatening strains of the influenza A viruses H1N1 (swine flu) and H5N1 (bird flu). Peramivir is also used for inhibiting influenza B viruses. With the drug, sites of infection are delivered with plasma concentrations, to prevent the spread of neuraminidase enzymes within the host. The drug is cleared by renal filtration and its half life in patients with normal renal function is 7.7 to 20.8 hours. Peramivir can be used only in cases where alternatives such as oral or inhaled antiviral therapies are ineffective; or if the antiviral drug delivery by other means such as inhalation or enteral is not feasible in patients; or for adults where the IV is considered appropriate ensuring the right dosage is administered by clinical judges. "Peramivir showed positive results for the two Phase III studies on patients suffering from seasonal influenza." The Phase II study of IV Peramivir with single dose of 300mg and 600mg in outpatients with acute, uncomplicated influenza was also effective and well tolerated.

Panflu.1

Panflu.1 is a single-shot vaccine. The vaccine, developed in response to the worldwide outbreak of the H1N1 virus.

"Available as two doses in one vial, Panflu.1 is suitable for people aged three to 60." Panflu.1 contains a killed or weakened part of the germ that is responsible for infection. Since the germ has been killed or weakened prior to being used for making the vaccine, it cannot infect a person. When a person receives a shot of Panflu.1, the body reacts by creating antibodies. Acting as body defenders, the antibodies destroy the germs. "Over 10,000 clinical specimens of the H1N1 virus have been tested and declared to be oseltamivir sensitive." During the trial, three different types of vaccine – split viron vaccine, split viron vaccine with adjuvant and whole viron vaccine with adjuvant – were tested. Results from the clinical trial indicated that the vaccine provided protection from the H1N1 virus after only one shot. To develop the expected levels of immunity, the other existing swine flu vaccines are required to be administered in two doses.

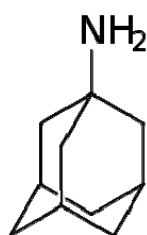
Influenza A (H1N1) Monovalent Vaccine by Sanofi Pasteur

Sanofi Pasteur's Influenza A (H1N1) 2009 Monovalent Vaccine for 2009 Influenza A (H1N1) or swine flu is one of the four vaccines approved by the US Food and Drug Administration (FDA). The Influenza A (H1N1) 2009 Monovalent Vaccine contains an inactivated influenza virus. The vaccine is formulated to comprise 15mcg haemagglutinin (HA) of influenza A/California/07/2009 (H1N1) v-like virus. Based on initial clinical trials data indicated that a single 15mg dose of the vaccine generated a robust immune response in 96% of the adults aged between 18 and 64 and 56% of the adults aged 65 and above. The trial will assess the safety of the vaccine in pregnant women and the immune response after the initial dose and the second dose. It will also evaluate maternal antibodies transmitted to the infants through the placenta. Sanofi Pasteur's vaccine against Influenza (H1N1) was approved in September 2009 by the FDA.

Fluarix (influenza virus vaccine) suspension

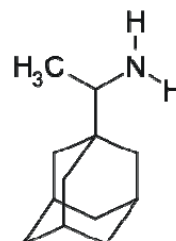
FLUARIX®, Influenza Virus Vaccine for intramuscular use, is a sterile suspension prepared from influenza viruses propagated in embryonated chicken eggs. Each of the influenza viruses is produced and purified separately. After harvesting the virus-containing fluids, each influenza virus is concentrated and purified by zonal centrifugation using a linear sucrose density gradient solution containing detergent to disrupt the viruses. Following dilution, the vaccine is further purified by diafiltration. Each influenza virus solution is inactivated by the consecutive effects of sodium deoxycholate and formaldehyde leading to the production of a "split virus." Each split inactivated virus is then suspended in sodium phosphate-buffered isotonic sodium chloride solution. The vaccine is formulated from the 3 split inactivated virus solutions. FLUARIX is formulated without preservatives. FLUARIX does not contain thimerosal. Each 0.5-mL dose also contains octoxynol-10 (TRITON® X-100) ≤0.120 mg, α-tocopheryl hydrogen succinate ≤0.1 mg, and polysorbate 80 (Tween 80) ≤0.380 mg. Each dose may also contain residual amounts of hydrocortisone ≤0.0016 mcg, gentamicin sulfate ≤0.15 mcg, ovalbumin ≤1 mcg, formaldehyde ≤50 mcg, and sodium deoxycholate ≤50 mcg from the manufacturing process. FLUARIX is supplied as a 0.5-mL single-dose prefilled syringe. FLUARIX, after shaking well, is colorless to slightly opalescent. Four influenza antiviral drugs approved for use in the United States were Amantadine, Rimantadine, Zanamivir, Oseltamivir¹⁷

Amantadine :⁽¹⁷⁾



Amantadine hydrochloride in capsule Dosage Form. Amantadine is the organic compound known formally as 1-aminoadamantane. The molecule consists of adamantane backbone that is substituted at one of the four methyne positions with an amino group. This compound is sold under the name "Symmetrel" for use both as an antiviral and an antiparkinsonian drug. Amantadine's antiviral activity involves interference with a viral protein, M2 (an ion channel), which is required for the viral particle to become "uncoated" once taken inside a cell by endocytosis. Amantadine inhibits the replication of influenza A viruses by interfering with the uncoating of the virus inside the cell. It is an M2 inhibitor which blocks the ion channel formed by the M2 protein that spans the viral membrane. The influenza virus enters its host cell by receptor-mediated endocytosis. Thereafter, acidification of the endocytotic vesicles is required for the dissociation of the M1 protein from the ribonucleoprotein complexes. Only then is the ribonucleoprotein particles imported into the nucleus via the nuclear pores. The hydrogen ions needed for acidification pass through the M2 channel. Amantadine blocks the channel. Amantadine is effective against all influenza A subtypes that have previously caused disease in humans (H1N1, H2N2 and H3N2), but not against influenza B virus, because the protein M2 is unique to influenza. Amantadine is not active against the avian influenza subtype H5N1 strains which have recently caused disease in humans. CNS side effects include nervousness, anxiety, agitation, insomnia, difficulty in concentrating, and exacerbations of pre-existing seizure disorders and psychiatric symptoms in patients with schizophrenia or Parkinson's disease. Another potential side effect is livedo reticularis, a dermatological reaction that results in skin mottling and purpurish mesh network of blood vessels. 200 mg qd both for treatment and prophylaxis. For prophylaxis, amantadine should be started as soon as possible after exposure and continued for at least 10 days. persons with reduced kidney function and elderly persons may need lower doses (or less frequent doses).

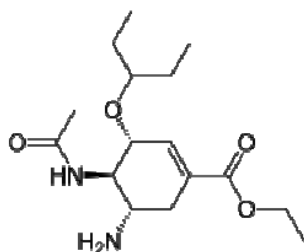
Rimantadine:



Rimantadine (Flumadine) is an orally administered antiviral drug used to treat, and in rare cases prevent, Influenza virus A infection. When taken within one to two days of developing symptoms, rimantadine can shorten the duration and moderate the severity of influenza. Rimantadine is an M2 ion channel inhibitor which specifically inhibits the replication of influenza A viruses by interfering with the uncoating process of the virus. M2

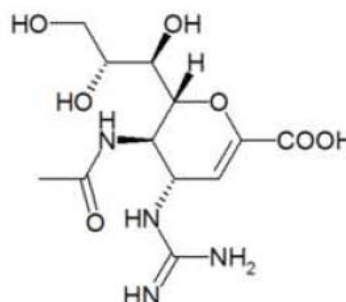
inhibitors block the ion channel formed by the M2 protein that spans the viral membrane. The influenza virus enters its host cell by receptor-mediated endocytosis. Thereafter, acidification of the endocytotic vesicles is required for the dissociation of the M1 protein from the ribonucleoprotein complexes. Only then is the ribonucleoprotein particles imported into the nucleus via the nuclear pores. The hydrogen ions needed for acidification pass through the M2 channel. Rimantadine blocks the channel. Rimantadine can produce gastrointestinal and central nervous system adverse effects. Studies have shown it produces fewer side effects than other anti-viral influenza treatments. Common side effects include: nausea, upset stomach, nervousness, tiredness, lightheadedness, trouble sleeping, difficulty concentrating.

Oseltamivir:



Oseltamivir (Tamiflu) is an antiviral drug that slows the spread of non-resistant strains of the influenza virus between cells in the body. It is used in the treatment and prophylaxis of Influenza virus A and Influenza virus B infection. Oseltamivir is a neuraminidase inhibitor. It acts as a transition-state analogue inhibitor of influenza neuraminidase, preventing progeny virions from detaching from infected cells. Oseltamivir was the first orally active neuraminidase inhibitor commercially developed. It is a prodrug, which is hydrolysed hepatically to the active metabolite, the free carboxylate of oseltamivir. The influenza virus can be prevented from spreading in the body by neuraminidase inhibitors such as Tamiflu. Tamiflu must be started within two days of the onset of symptoms or exposure to the flu. If you have flu, continue taking it twice a day for five days, even if your symptoms might have improved. The medication will be most effective if you take each dose at the same time each day. To prevent influenza, take Tamiflu once a day for at least ten days (or as directed by your doctor). Protection lasts as long as you take the drug. If you miss a dose, take it as soon as possible. Store Tamiflu at room temperature and keep the blister package dry. Try to take Tamiflu with food in order to prevent an upset stomach. Do not use the drug when you are pregnant or nursing unless you have discussed this with your doctor. If you are suffering from any of the following disorders, inform your doctor before starting a treatment with Tamiflu: Heart problems, Viral infections (besides influenza), Liver disease, Kidney problems, Respiratory disease and Other serious medical issues.

Zanamivir :(Relenza)



Zanamivir is a neuraminidase inhibitor used in the treatment and prophylaxis of Influenza virus A and Influenza virus B. Zanamivir works by binding to the active site of the neuraminidase protein, rendering the influenza virus unable to escape its host cell and infect others. It is also an inhibitor of influenza virus replication in vitro and in vivo. In clinical trials it was found that zanamivir was able to reduce the time to symptom resolution by 1.5 days if therapy was started within 48 hours of the onset of symptoms. Zanamivir has a good safety profile and the overall risk for any respiratory event is low. The following adverse reactions have been identified during post-marketing use of zanamivir, but it is not possible to reliably estimate their frequency or establish a cause relationship to zanamivir exposure: Allergic or allergic-like reaction, including oropharyngeal oedema, Arrhythmias, syncope, Seizures, Bronchospasm, dyspnoea.

Vitamins Therapy:

Vitamin A

Vitamin A stimulates several immune system activities, possibly by promoting the growth, and preventing the stress-induced shrinkage, of the thymus gland. Vitamin A is known to enhance the function of white blood cells, increase the response of antibodies to antigens, and to have anti-viral activity. As retinoic acid is needed to maintain the normal structure and function of epithelial and mucosal tissues, which are found in the lungs, trachea, skin, oral cavity, and gastrointestinal tract. These tissues, when healthy and intact, serve as the first line of defense for the immune system, providing a protective barrier that disease-causing microorganisms cannot penetrate.

Vitamin C

The immune system relies on a wide variety of mechanisms to help protect the body from infection, including white blood cells, complement proteins, interferons; and vitamin C is especially important in the function of these immune components.

- *Leucocytes require Vitamin C for Effective Function*
- *Modulates Antibody Level*
- *Modulates Synthesis of Complement*
- *Modulates Interferon Synthesis*
- *Vitamin C Modulates Prostaglandin Synthesis*

Vitamin E

Vitamin E, or tocopherol, has been shown to exert a number of beneficial effects on influenza infection. Vitamin E has beneficial effects on cytokine levels during influenza infections. Vitamin E increased levels of interferon and IL-2 while decreasing levels of TNF and IL-1. The researchers suggested that vitamin E did so by reducing levels of prostaglandin E₂.⁸¹ Other research on vitamin E and influenza showed that this vitamin can improve age related declines in NK killer cells in the immune system, and that there was a significant improvement in resisting influenza in older mice and a modest improvement in younger mice given supplemental vitamin E.

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