

## INFLUENZA! THE NEXT GREAT PLAGUE?

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### Introducing - INFLUENZA!

Radio 4, January 2000 – “the UK is being gripped by the latest outbreak of influenza. The chief medical officer is calling it an epidemic”.

Commonly called the "flu", influenza is one of the deadliest diseases known. First described by Hippocrates in 412 BC, 31 possible influenza pandemics have been documented. This includes three in the last century: 1918, 1957 & 1968.

Its fatality arises because the virus can mutate quickly, producing new strains against which human beings have no immune defence. The "Spanish Flu" pandemic of 1918-20, killed over 20 million people in year one.

#### **Odd Origins...**

You caught the flu from someone, and they were generously given it by someone else. Where did it all start?

Possibly a duck! Fowl harbour many flu viruses without being particularly bothered by them. Until recently, it was thought that humans would not be directly bothered either.

Unfortunately pigs are vulnerable. They can pass it on to humans too! A pig has cell receptors (allowing viral attachment and infection) for avian, human and pig flu viruses. Thus avian flu might travel via the pig to humans, and mutate along the way.

Influenza is an RNA virus, which means that when it directs a cell to copy it there are more errors inherent and thus greater genetic variation. It consists of 8 exchangeable gene segments. If avian and human viruses infect the same pig, each would direct the pig cells to replicate the viral genes. Should the new gene copies get mixed up, a new strain of virus is born! Two viruses infecting the same cell can produce 256 possible new viruses.

Genes determine the cell surface proteins (antigens). So new genes mean a new disguise for the virus, one the immune system may not recognise. The blended virus may not infect us, but if it did it might be more virulent.

#### **Common Flu: a global killer?**

Since the virus is constantly changing, we cannot eradicate it like smallpox. Its ever-changing surface proteins are known as hemagglutinin (h) and neuraminidase (n): there are 15 varieties of h and 9 of n known!

The strains of the 3 known flu types are named according to their structure and origin. Strain A/Wuhan/359/95 (h3n2) is a virus in the A family with No. 3 hemagglutinin, No. 2 neuraminidase, was the 359<sup>th</sup> sample isolated from Wuhan, China in 1995.

#### **WHO is watching Flu.**

When flu antigen changes significantly, no one is immune, and the virus might cross species barriers. A pandemic is a possibility.

In the event of a new and virulent strain turning up, mass vaccinations are on the agenda. Alas this still takes months and a lot of people might be dead by then.

The World Health Organisation operates a global surveillance network where medical workers isolate viral samples and send them to the Centre for Disease Control for analysis. Each year, the results of this used to create the next season's flu vaccine.

**Jennerating a Vaccine...**

Vaccines have short-term benefits and they are not guaranteed. However by getting vaccinated regularly one might develop a partial immunity to some of the strains.

The flu vaccine is typically a mix of three virus strains that have been deactivated. The mix of strains is varied for different parts of the world because the flu mutates as it travels and attacks seasonally. A vaccine injection stimulates the immune system but is unlikely to cause any serious side effects. Alas people allergic to eggs may not be so easily vaccinated.

The vaccine is made by injecting a droplet of the flu virus into the air sack of a chicken egg. In a few days the droplet will multiply into a tablespoon full and be harvested. Up to 150,000 eggs are used at once to create 250 gallons of pure virus! This is repeated to create enough vaccine to be purified, tested, and distributed. This takes 6 months, which is why production (hopefully) starts well ahead of demand.

Alas vaccination reduces infection from one strain, but then the way is clear for other strains to spread with less competition!

**Are you Bugged by the Flu?**

Is it flu? How do you know it is not a bad cold? Whilst colds are irritating, flu can be dangerous, leaving the body weakened and vulnerable to opportunistic infections. Flu cannot be easily distinguished from other respiratory diseases.

**What ails thee?**

Symptoms	Cold	Flu
fever	Rare	Often lasts several days
headache	Rare	Painful
general aches & pains	Slight	Usual
fatigue & weakness	quite mild	Can last 2-3 weeks
extreme exhaustion	Never	Sometimes
stuffy nose	Common	Sometimes
Sneezing	Usual	Sometimes
sore throat	Usual	Common
chest discomfort, cough	mild - medium, hacking	Common & often severe

**Who is at risk?**

- Those aged 65 and older
- The chronically diseased (especially heart, lungs, kidneys)
- Diabetics, the immuno-suppressed, or anaemic
- care workers, i.e. doctors, nurses, & nursing-home staff

### **Why do we suffer anyway?**

Flu symptoms are unpleasant but not totally without their useful points. By coughing and sneezing we move mucus up and out of our respiratory tract.

Mucus is unpleasant but very useful. It helps to trap flu virus which may then be expelled or swallowed. Ingested viruses are deactivated by stomach acid (denatures the virus), pepsin (breaks virus structural protein bonds), or bile (breaks down the fatty lipid membrane) in the gut.

Fever raises our temperature, which speeds metabolic activity, leukocyte multiplication, and hinders infectious organisms like bacteria. Bacterial (and viral) pneumonia cause many of the deaths associated with flu epidemics.

### **What to do, when you've the flu?**

1. Taking antiviral drugs (i.e. amantadine and rimantadine) are an option for the elderly and those allergic to eggs. They can reduce likelihood, severity and duration of influenza when taken soon after symptoms first appear.
2. Drink much more water to counteract dehydration. When dehydrated, mucus viscosity increases and airways are more congested. When we get rid of mucus we also rid ourselves of virus. Eating spicy foods can increase mucus production too.
3. Maintain vitamin C levels to ensure optimal immune functioning. There is still debate as to whether increased vitamin C intake is beneficial but it is certain that if it drops too low, immune responses will be compromised.

### **Previous Pandemics**

The 1918 Spanish Flu pandemic: some estimates put the death toll at > 40 million over 2 years. It is thought that genetic rearrangement (reassortment) &/or antigenic shift created a virulent new virus, to which no one was immune. The first victims were the weak and immuno-compromised.

By comparison, bubonic plague killed around 137 million over 6<sup>th</sup>, 7<sup>th</sup> and 14<sup>th</sup> centuries. At most perhaps 2 million people died each year. Influenza is the greater killer.

The pandemics in 1957 ("Asian flu") and 1968 ("Hong Kong flu") together killed more than 1.5 million people and caused an estimated \$32 billion in economic damages world-wide.

These pandemics may have originated in animals (1918 = swine, 1957 & 1968 = avian strains). In 1976, a new flu virus (swine) infected humans, while in 1997-8, an outbreak of (avian) flu occurred in Hong Kong.

### **An Alternative Theory?**

Influenza strains appear in cycles. The variant appearing in 1978-79 was identical to the virus present during the 1950s. Evidence exists that pandemics 60-70 years apart are caused by the same virus. On this theory, in 1976 the same virus that caused the 1918 pandemic was expected. A vaccine was prepared and mass inoculations carried out. No outbreak of that form occurred.

Attempts have been made to link flu outbreaks with patterns of solar activity and their associated electromagnetic effects. Theories vary but often involve cells being stimulated to express more cell receptors and thus being more vulnerable to infection. Others suggest immune responses are reduced.

Whilst major pandemics have all occurred at times of increased sun spot activity, no mechanism linking the two has been confirmed. The path of infection does follow the sun, but this is probably due to population movements.

2000 is likely to be a year of increased solar activity and a candidate for a pandemic. Perhaps only time will tell if influenza is the real Y2K bug that everyone dreads...

**Influenza: It, lit., influence, fr. ML *influentia*; fr. the belief that epidemics were due to the influence of the stars (1743)**

*An acute highly contagious virus disease caused by various strains of a myxovirus (family Orthomyxoviridae) and characterized by sudden onset, fever, prostration, severe aches and pains, and progressive inflammation of the respiratory mucous membrane; broadly: a human respiratory infection of undetermined cause.*

**Influence [ME, fr. MF, fr. ML *influentia*, fr. L *influent-*, *influens*, prp. of *influere* to flow in, fr. *in-* + *fluere* to flow] (14c)**

*a* : an ethereal fluid held to flow from the stars and to affect the actions of humans

*b* : an emanation of occult power held to derive from stars

*c* : the act or power of producing an effect without apparent exertion of force or direct exercise of command (i.e. in indirect or intangible ways)

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