

Seasonal flu and the influenza vaccine

November 2015

The Influenza Virus

What is influenza?

Influenza (flu) is an acute contagious infection of the respiratory tract caused by the constantly mutating and changing influenza virus. Infection is spread by virus-containing droplets that are dispersed by an infected individual breathing out, or can be projected into the air through coughing or sneezing. The virus is then inhaled by another individual where it infects and replicates inside their cells.

The disease is usually characterised by mild to severe symptoms of high fever, coughing, sore throat, fatigue, headaches and aching muscles. The serious implications of an influenza infection can result in hospitalisation, or even death.

Types of influenza

The influenza virus can be sub-divided into 3 types: influenza types A, B and C. While all influenza types can cause the illness, it is the influenza types A and B in particular that cause the seasonal epidemics of the disease seen each year.

Influenza A can be further sub-typed based on the differences in two proteins present on the virus' surface: hemagglutinin (H) and neuraminidase (N). The influenza A sub-types are then named based on these surface proteins, with H1N1 and H3N2 being attributable for current seasonal influenza outbreaks.

Who is at risk?

Whilst people of all age groups are susceptible to infection from the influenza virus there is a higher prevalence of infection, and higher risk for developing flu-related complications amongst children under the age of 5, adults aged 65 or over, pregnant women and those with specific underlying health conditions.

Of these increased risk groups it is of particular importance to highlight the serious risk of flu in pregnancy. It has been reported that 1 in 11 maternal deaths in the UK were the result of flu, with more than half of these deaths being preventable if the flu vaccination had been received during pregnancy¹.

Effective measures against influenza

The primary measures currently in place to prevent the influenza infection include the use of vaccines or select antiviral drugs. In particular the influenza vaccine can offer high-levels of protection against the flu, with the vaccine having been shown to be over 80% effectiveness in preventing influenza infection amongst 18-75 year olds².

But, over time the influenza virus is capable of changing through mutations which cause the parts of the virus that the vaccine trains the immune system to recognise to change, and so become less identifiable by the immune system for destroying. The implications of this are that in order to keep a person's immune system 'up-to-date' to enable it to potentially recognise the latest virus type circulating then an annual re-vaccination is strongly recommended.

Seasonal influenza vaccines

The seasonal influenza vaccine

In the UK there are two different forms of the influenza vaccine that are used: via injection or nasal spray. As the injection involves the use of different inactivated forms of the virus this vaccine is recommended for pregnant women, healthcare workers, those with certain underlying health conditions and those aged 65 or over.

In contrast the nasal spray vaccine being offered is composed of weakened forms of the live virus that cannot cause disease, but is able to replicate. This vaccine is primarily of use among those who have not had the flu previously as it can provide a broader immunity than the inactivated, injectable, and so is recommended for those aged 2-17 years.

The impact of the seasonal influenza vaccine in the UK

The implications of an influenza vaccine should not be undervalued; studies have shown that a seasonal vaccination programme against influenza can avert as many as 1.2 million cases of the disease each year³. Whilst it has also been estimated that a correctly matched influenza vaccine could save the UK economy over £70 billion in gross domestic product⁴, highlighting the significant economic advantages of a flu vaccine in addition to its health merits.

Due to the potential impact of the seasonal flu each year Public Health England spends over £1 million each year to provide a seasonal flu vaccination information campaign across the country. It is hoped that through this programme an awareness is raised among the public on the risks of catching flu and the benefits of having a flu vaccination.

The reasons for a seasonal influenza vaccine

Each year there can be seasonal outbreak of influenza that usually occurs during the winter months as a direct result of the lower temperatures being the most ideal conditions for the survival and transmission of the influenza virus. Therefore it is necessary to try and protect from this increased incidence of flu by proactively immunising the population with a vaccine targeted against the influenza virus.

However, due to the influenza virus' capabilities of rapid reproduction and mutation, each seasonal outbreak will be being caused by a different version of the flu virus. Thus rendering the previous season's vaccine inadequately effective. This necessitates the need for a new vaccine each year.

Vaccine-virus selection

In the UK the new seasonal influenza vaccine is developed every year through the work of the World Health Organisation (WHO) and the European Medicines Agency (EMA) in consultation with influenza experts. Collectively they work to try and predict what the new virus type will be and what different parts of the virus would be capable of stimulating an immune response for use in a vaccine.

Whilst the predictive-models used are more often successful; there may be certain times when the influenza virus mutates so significantly that any new vaccine made against it is unable to provide high levels of protection to the population. Though it must be noted that even in these situations the vaccine will still be providing protection against other strains of the influenza virus, and so should still be seen as necessary to be immunised with.

Seasonal flu and the influenza vaccine

November 2015

Bibliography

¹National Childbirth Trust (NCT). 2014. *Flu and Pregnancy*. [ONLINE] Available at: <https://www.nct.org.uk/pregnancy/flu-and-pregnancy>. [Accessed 02 November 15].

²Syrjänen, R.K., Jokinen, J., Ziegler, T., Sundman, J., Lahdenkari, M., Julkunen, I. and Kilpi, T.M. 'Effectiveness Of Pandemic And Seasonal Influenza Vaccines In Preventing Laboratory-Confirmed Influenza In Adults: A Clinical Cohort Study During Epidemic Seasons 2009–2010 And 2010–2011 In Finland'. *PLOS ONE* 9(9) (2014)

³Baguelin, Marc *et al.* 'Health And Economic Impact Of The Seasonal Influenza Vaccination Programme In England'. *Vaccine* 30(23) (2012)

⁴Smith, R. D., Keogh-Brown, M.R., Barnett, T., Tait, J. 'The Economy-Wide Impact Of Pandemic Influenza On The UK: A Computable General Equilibrium Modelling Experiment' *BMJ* 339 (2009)

Further Resources

| Resource Title | Access to Resource |
|--|---|
| NHS UK: Flu | http://www.nhs.uk/conditions/Flu/Pages/Introduction.aspx |
| NHS UK: Flu and the Flu Vaccine | http://www.nhs.uk/Livewell/winterhealth/Pages/Fluandthefluvaccine.aspx |