Will we ever have a universal flu vaccine?

Influenza is an infectious disease that is spread by a virus. It has an effect on three to five million individuals and causes around five hundred thousand deaths a year (WHO). Influenza is considered a serious health problem because it can be deadly for people with existing conditions and as well as on its own. Along with ill health, the flu virus has an economic toll and affects work force productiveness. Therefore, it is important to closely analyse its prevention because of its wide spread impact. The most effective prevention method of the flu is a flu vaccination which is more commonly referred to as a flu jab. It makes the immune system more able and ready to fight the flu virus by introducing inactivated virus. Even though this preventative method seems fairly simply, it is very taxing since it is specific for a single type of flu virus which is not economical and approximately one billion pounds were spent on flu jab last year (Nhs). Manufacturing a flu jab ever year and administrating it every single year heightens the need to pursue research into developing a universal flu vaccine. DNA based flu vaccines have been tested in the past but they aren't consistent as the inoculated inactivated virus. During the course of this article we will looking into how DNA based vaccinations, the structure and possible targeting of the hemagglutinin protein in the flu virus, chemical stimulants and M2 protein regulation techniques (Neirynck, 1999) can create a universal flu vaccine. A universal flu vaccine would

provide immunity against all types of flu strains (seasonal and pandemic) for many years making the need for a yearly flu jab unnecessary.

The idea of a universal flu vaccine has been around for many years, however the reason that it has not been able to substantiate is the constant drift and change of the flu virus proteins that alert the immune system. To be able to work past this, the flu virus proteins that change the least M2 and nucleoprotein need to be targeted (Ledford, 2008). These two proteins change very little from year to year and can be considered to use since there is very little variation. However on their own they are difficult to be recognized by the human immune system and therefore cannot be considered for the analysis of a universal flu jab. Researchers are looking into how the protein is recognized by the immune system. By close analysis of the linkage of the M2 protein to the hepatitis B protein, the hepatitis B proteins cluster together to form particles that display the M2 protein on their surface. This shows us how the M2 protein would be presented during a normal infection[1], and provokes a stronger immune response than the M2 protein alone when tested in the lab. But this just shows us a way to decrease the flu chances and not nullify them universally so we can not consider it as an ongoing research for a universal flu vaccine.

Moreover, unlike current flu vaccines, which consist of inactivated inoculated virus and take months to

manufacture, a new vaccine for flu currently in the manufacturing pipe, uses small snippets of viral DNA and can be made in only days or weeks. Researching the increase in effectiveness of its DNA vaccine by adding tucaresol to the vaccination. In mice, the results were comparable to those that inactivated virus jabs had produced in prior studies (Smb, Patel, 2009). A tucaresol-DNA combination should provide long-lasting protection against the flu because it targets the flu recognition protein site.

Another promising aspect is the prevention is detailed in the recognition by the immune system of the flu virus protein called hemagglutinin. This protein is like a flower with a head and a stem. The flu virus binds to human cells via the tip of the hemagglutinin and current flu vaccines target the tip of the hemagglutinin to prevent infections, but because the flu virus drifts fast and the tip changes being unable to be recognized. Hence there is a need for different jabs for every flu virus. Vaccines contain bits of weak or dead germs that trigger the immune system to produce antibodies that circulate in the blood to kill those specific germs. However, the research team found that the 2009 pandemic H1N1 vaccine induced broadly protective antibodies capable of fighting different variants of the flu virus. This is because, rather than attacking the variable head of the HA, the antibodies attacked the main body the HA, neutralizing the flu virus. The stem plays such an integral role in penetrating the cell that it cannot change between different variants of

the flu virus. The different recognition sites of the immune system make it difficult for flu vaccines to induce broadly protective antibodies against the hemagglutinin stem. The pandemic H1N1 swine flu was different, because humans had not been exposed to a similar virus (Raffaele, 2010).

On the contrary due to the contentment behaviour of humans, it remains doubtful that even if a universal flu vaccine was introduced, it would eradicate levels of the influenza virus. This is because even though the vaccine will be present after a few years of the vaccine some people will opt out from receiving the vaccine since they would not get the flu because the overall population would be void of the virus. These people will be considered free riders because even though they do not receive the flu jabs they still will receive the disease as the levels of heard immunity will be comparatively much larger then. When the amount of these free riders increase by large, then the vaccination coverage will fall to a select few and a severe epidemic will occur (Breban, Vardavas , Blower, 2007) This is the free rider effect and this is why a universal flu vaccination can never be implemented practically in a naturalistic world view. This will be a constant chain as after a severe epidemic, herd immunity will increase again as people will start taking their vaccinations and then the free rider effect will pave through after a length of time.

For my part it is plausible to accept that universal influenza vaccines may turn out to be imperfect no matter what technique is used for them to be able to be recognised by the human immune system. The flu virus can always mutate and it undergoes fast drift so no matter what vaccination is made, it will always mutate. Also, they may not protect from all influenza types since a broad spectrum antibiotic will only be in effect till the virus mutates. They could also induce influenza strains to mutate in unexpected ways and thus demanding frequent updates and even costlier research. A universal vaccine may not be very immunogenic, allowing for increased protection but not to the extent of preventing influenza epidemics. Keeping in mind the free rider affect, flu will occur even with perfect vaccines as long as the vaccination of some individuals benefits the others. Moreover, the duration of the lasting of vaccination and the vaccination memory of individual immune system are critical time-scale parameters that govern the dynamics of the vaccination coverage.

In conclusion, based on the different undergoing process' of developing a universal vaccine and the pratical impossibility of flu to be wiped out due to the free rider effect, I think that a universal flu vaccine is not probable but a long term one that is eight to twelve years is possible however it should include an epidemic risk awareness program in order to reduce content with vaccination and undermine the risk of influenza epidemics. On the other hand I feel that public

health intervention using universal vaccines that offer short-term protection that is three to four years may not need this precaution. Current influenza awareness programs do stress the importance of vaccination as well as personal hygiene practices to help prevent transmission (Bentley, Ormerod, 2009). Here we argue both for the cases of emerging and non-emerging strains that, especially when using a universal vaccine offering long-term protection, more attention should be given to the fact that individuals may become complacent with influenza vaccination and act as free riders.

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