

## Will a Universal Flu Vaccine Stop Future Pandemics?

The only real hope to stop future influenza pandemics such as we're now facing from bird flu, is to develop a "universal" flu vaccine that inoculates us against all influenza viruses.

This would also eliminate the habit of giving people a new flu shot every Fall.

The European Union is funding a cooperative project called Universal Vaccine, to produce a vaccine capable of inoculating people permanently against all Type A and B strains of influenza.

They plan to focus on the M2e, the extracellular domain of the ion channel protein M2 which is maintained in all A type influenza viruses. This ectodomain that protrudes from M2 is made up of 23 amino acids. Walter Fiers, co-inventor of the process said, "The structure of M2e is almost identical in all known flu viruses that can be transmitted between people."

Previous vaccines focus on the hemagglutinin (H) protein and the neuraminidase (N) protein which are spikes that stick out from the fatty sheath surrounding the 8 compartments of the influenza virus. However, tests have shown that the M2 protein has remained relatively constant since the influenza virus was first isolated in 1933.

They plan to manufacture the vaccine using recombinant bacterial fermentation, which is quicker, cheaper and more effective than traditional egg growing influenza techniques.

They hope to begin human trials in early 2007.

Included in Universal Vaccine are: Arexix AB, Sweden; Pepscan Systems BV, The Netherlands; Proxima Concepts Ltd, England; Eurogentec SA, Belgium; Flanders Interuniversity Institute for Biotechnology VZW (VIB), Belgium; and Göteborg University (UGOT), Sweden.

Merck is also working on a universal vaccine based on targeting M2.

The San Diego-based Vical Incorporated is working on a vaccine for H5N1 and believes it has latched on to the key to a universal flu vaccines. They focussed their vaccine on three bits of DNA: the H5 protein, the nucleoprotein (NP) and matrix protein which is also the M2.

Using the conserved internal protein nucleoprotein (NP) elicits a different kind of immunity. It's based on the type of T cell called a cytotoxic T lymphocyte (CTL), rather than on antibodies. These CTLs kill cells infected with the influenza virus.

Rats and ferrets vaccinated with this vaccine not only survived exposure to H5N1, but to ordinary human flu viruses also.

The Israeli company BiondVax Pharmaceuticals has been working on a universal flu vaccine for two years. Their vaccine will be inhaled, and they expect it to provide protection against 95% of all influenza, including H5N1, and for that protection to last five years.

Their vaccine is based on 15 years of research by Weizmann Institute Professor Ruth Arnon. She worked on finding conserved epitopes, fragments of the outer virus shell that never change despite antigenic shift and drift. She found that the hemagglutinin hid a peptide that remains fixed.

BiondVax expects development time to take three to four years, though shorter if a bird flu pandemic hits.

"Dr. Arnon decided not to chase a specific strain of virus. She said 'let's identify the common components of all flu viruses, use genetic engineering to duplicate those common parts of the virus, and create a vaccine which - no matter what virus will come - will vaccinate you,'" said Devash one of the founders of BiondVax.

One thing we must understand about any universal vaccines based on the M2 protein, however, is that we can still get sick. That's because the M2 antibodies our bodies produce will bind to cells that're already infected and promote their clearance out of the body, but won't stop them from being infected in the first place.

That is, influenza viruses can still get into your body and infect your lungs. However, the infection cannot spread as readily. You can still get sick but probably won't die.

Vaccines targeting the internal NP neuroprotein have the same problem -- they promote the killing of already infected cells but not the prevention of infection.

#### About the Author

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