Universal Influenza Vaccine : Fallacy or a Reality

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The effectiveness of seasonal influenza vaccine ranges between 10% and 60%. The lowest effectiveness occurs when vaccine strains are not well matched to circulating strains. Reliance on egg pass aging for vaccine production may allow for additional mutations during manufacturing and further compromise vaccine effectiveness in a given season. Seasonal influenza vaccines provide virtually no protection against novel pandemic strains. The cornerstone of both seasonal and pandemic influenza prevention and control is strain-specific vaccination.

Seasonal influenza viruses are subject to ongoing antigenic changes referred to as "drifts". For influenza A virus, these drifts can be pronounced each season; they are much more gradual for influenza B virus. Strains used in annual vaccines are selected twice annually following the influenza seasons in the northern and southern hemispheres. Similarly, the emergence of a novel influenza virus with pandemic potential requires the development of a strain-specific vaccine to protect humans from an epidemic that might never occur. The current strategy for seasonal influenza vaccination keeps us at least 1 year behind this ever-evolving virus. The strategy for pandemic influenza leads to making, testing and stockpiling vaccines that may never be used.

To limit the public health consequences of both seasonal and pandemic influenza, vaccines that are more broadly and durably protective are needed. Advances in influenza virology, immunology, and vaccinology make the development of a "universal" influenza vaccine more feasible than a decade ago. For example, broad availability of deep-gene-sequencing techniques allows better and more-efficient characterization of viruses and enables tracking of genetic changes in influenza viruses over time. In addition, advances in structural biology allow researchers to relate how seemingly minor changes in the structure and conformation of the hemagglutinin (HA) protein affect function, antigenicity, and immunogenicity.

A universal influenza vaccine should:

- Be at least 75% effective against symptomatic influenza virus infection;
- Protect against group I and group II influenza A viruses (influenza B virus would be a secondary target)
- Have durable protection that lasts at least 1 year and preferably through multiple seasons
- Be suitable for all age groups

Developing an influenza vaccine that improves the breadth and durability of protection against seasonal influenza and provides protection from pandemic strains;
There is an accelerated effort for developing a universal influenza vaccine by supporting a consortium of scientists focused on addressing obstacles that have limited progress toward this goal. There is a need for expansion of research resources by establishing longitudinal cohorts, supporting improved animal models of influenza virus infections and expanding capacity for conducting human challenge studies.