

## On the trail of a universal influenza vaccine

Richard Béliveau

*Translated from Le Journal de Montréal, November 14, 2016*

*The effectiveness of vaccines against influenza varies between one year and another due to the incredible ability of the influenza virus to defeat the immune defenses. Some promising results show, however, that the virus possesses a weakness that could be exploited to develop a vaccine that is effective against all of the strains of influenza.*

Each year **influenza** affects between 5 and 15% of the world population and can cause up to 500,000 deaths, particularly amongst young infants, the elderly and patients affected with chronic diseases. Unlike the common cold, which is quite disagreeable but lacks any danger, influenza is truly not just an annoying infection!

The battle against influenza is complicated by the exceptional ability of the influenza virus to modify its structure, thus creating new forms which are capable of escaping the immune system. This versatility of the virus has two important consequences.

### MUTATIONS AND NEW STRAINS

First of all, the mutations which spontaneously arise in the virus can generate new forms which are particularly virulent and infectious, capable of unleashing an epidemic with the potential to be very dangerous (such as the Spanish flu of 1918, for example).

As well, the arrival of new strains of influenza virus each year ensures that no vaccine can be effective over the long term. Unlike vaccines developed against several other viruses (e.g. poliomyelitis, measles and HPV), which protect for life against these infections, influenza requires the production of a new vaccine and a new immunization for each season of influenza activity.

### INCOMPLETE PROTECTION

Vaccination of at-risk individuals has been performed since the 1960s to reduce the risk of death associated with complications arising from influenza. Despite their usefulness, the vaccines used remain, however, incapable of completely eliminating the risk of infection: it is estimated that the average vaccine decreases the risk of contracting the flu by 50%, but this protection can be considerably less in certain years (20-30%). The worst example of this is undoubtedly the 2014-2015 flu season: while the World



Health Organization had predicted that the flu would be associated with the strains B and H1N1, it was actually the strain H3N2 which went into circulation and the available vaccine was, consequently, totally ineffective. There is thus clearly room for improvement if we wish to reduce the infections associated with influenza virus, particularly in the case of pandemics caused by the highly virulent strains which can put large number of lives at risk.

### POLYVALENT ANTIBODIES

A major step towards this goal has been made by scientists at the American National Institutes of Health<sup>1</sup>. By analyzing the immune response provoked by immunization with a vaccine against influenza (H5N1), the researchers noted the presence of three types of antibodies capable of neutralizing several different strains of the virus. A more detailed analysis revealed that the antibodies were all directed against a protein named HA2, which plays an essential role in binding of the virus to cells and consequently is present in all subtypes of influenza. According to the authors, creating a vaccine capable of specifically increasing the production of these antibodies could thus allow us to produce a universal vaccine, capable of neutralizing all of the influenza virus strains.

While we await this, the experts continue to recommend that individuals at higher risk should be vaccinated against the influenza virus. These vaccines are very safe, do not provoke significant secondary effects and, while they are not perfect, they do significantly reduce the risk of contracting the influenza virus. But, whether or not you are vaccinated, it should also be borne in mind that regular washing of the hands as well as of frequently used objects (computer keyboard, telephones) and sleeping well remain unbeatable ways of guarding against the flu and against infections in general.

<sup>(1)</sup> Joyce MG et al. Vaccine-induced antibodies that neutralize Group 1 and Group 2 influenza A viruses. *Cell* 2016;166:609-623.