

## These vaccines that save lives

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*Translated from Le Journal de Montréal, January 25th, 2021*

*Newly developed COVID-19 vaccines finally give us the chance to end the current pandemic in the near future. A good opportunity to explain how these vaccines work and to recall how vaccination has played a crucial role in increasing our life expectancy.*

Vaccines are arguably one of the most important scientific revolutions in human history. By preventing several very serious infectious diseases (smallpox, polio, tuberculosis and measles, among others), vaccines have contributed to the phenomenal increase in life expectancy in the 20th century, which rose from 55 years in 1900 to more than 80 years now. They led to the complete eradication of smallpox and the virtual disappearance of polio, two of the worst infections to affect humans.

Even today, vaccines can reduce the incidence of several serious diseases, such as pneumococcal infections, shingles, hepatitis B, cervical cancers caused by HPV or meningitis due to serogroup meningococcus. COVID-19 vaccines are therefore added to a prestigious list of vaccines that have had an enormous positive impact on human health.

### NEUTRALIZE THE VIRUS

When a pathogen, the virus responsible for COVID-19, for example, first infects the body, the immune system recognizes it as a foreign invader based on the pathogen-specific molecular characteristics (antigens).

In response to these antigens, the body then produces antibodies that will neutralize and ultimately eliminate the virus to stop the infection.

The beauty of this adaptation is that the immunity will retain a memory of the antibodies produced against the virus and will therefore be able to neutralize it very quickly in the event of reinfection.

The duration of this immune memory varies greatly from virus to virus, but seems very good for the virus that causes COVID-19. Indeed, a recent study indicates the presence of lymphocytes producing specific antibodies against the virus more than 6 months after infection (1).

### STIMULATE THE IMMUNE MEMORY

The immune response of the body exposed to a pathogen is very effective, but nevertheless requires a certain period of adaptation to allow sufficient production of neutralizing antibodies.

In people who do not have optimal immunity (the elderly, obese, or those affected by certain chronic diseases), this time may be sufficient for the infection to get out of control and cause serious complications.

It is for this reason that severe cases of COVID-19 overwhelmingly affect these more vulnerable people, while younger and healthy people generally have better immunity and are much less affected by the virus.

The importance of vaccines is that they can eliminate this delay in response by activating immunity even before exposure to a pathogen.



The principle is very simple: it is simply a matter of introducing into the body a harmless version of the virus containing the same antigens as the virus itself. In the case of the two COVID-19 vaccines already available, it is a genetic sequence (mRNA) that produces the region of the virus essential for its entry into our cells that is used for immunization.

Following the injection, the presence of this viral protein in our cells is detected by the immune system, which immediately starts the production of neutralizing antibodies against this antigen. When the body is subsequently exposed to the virus, the immunity is already formed and therefore ready to be eliminated before it can cause damage.

### VACCINATE WITHOUT HESITATION

The clinical data collected on COVID-19 vaccines is spectacular, with an infection prevention efficacy exceeding 90%, with no major side effects reported after the vaccination of several million people.

The skepticism displayed by some towards these vaccines is therefore unfounded and we can only strongly encourage the population to be vaccinated as soon as the vaccines are available in their community.

It should be understood that this vaccine is not only used to protect the recipient, but, ultimately, the entire population. The higher the number of individuals who are immunized (75% or more), the better the chances of achieving herd immunity, that is, immunity that protects even those who are not vaccinated.

Herd immunity is very important to protect those who are not eligible for vaccines, such as infants, pregnant women, immunocompromised adults or some patients with autoimmune diseases.

So while vaccination may seem like a personal choice, it is actually a selfless act that benefits everyone and will allow us to finally return to normal life. Let us all be proud that scientific research has succeeded, through the intelligence and the work of its best scientists, in the incredible feat of creating new vaccines against this dangerous coronavirus, in less than a year.

Vaccination is the expression of the human genius to solve, through scientific knowledge, problems that no other species can solve, a symbolic act of our human nature, and to live in communities concerned with the well-being of its members more vulnerable.

(1) Gaebler C et coll. Evolution of antibody immunity to SARS-CoV-2. Nature (published online, January 18<sup>th</sup> 2021).