Coronavirus: Science on the Warpath

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The sudden appearance of a new virus, as is currently the case with the SARS - CoV - 2 coronavirus, is still a worrying event due to the difficulty in effectively treating viral infections. The vaccine race has started.

Unlike bacteria which can reproduce autonomously and which are therefore sensitive to drugs, which block this reproduction (antibiotics), viruses, are compulsory parasites that rather use our own cells as reproduction factories and are therefore in no way affected by antibiotic treatments. This intracellular localization of viruses also makes it extremely difficult to develop drugs that can specifically block viral progression without causing significant toxic effects on our own cells.

The most effective way to fight viral infections is vaccination: by introducing a harmless version of the virus, the vaccine, into the body. The latter allows the immune system to develop antibodies that will neutralize the virus as soon as it enters the body to block the infection at the source, before the virus manages to settle permanently in our cells. This approach is obviously not possible in the case of sudden epidemics caused by a new virus, as is currently the case for SARS - CoV - 2. Scientists must therefore react extremely quickly to contain the spread of the virus as much as possible, and subsequently succeed in producing a vaccine.

THE IMPORTANCE OF EARLY DETECTION

In the absence of drugs or vaccines, the crucial first step is to detect the viral infection as quickly as possible to identify carriers and isolate them from the healthy population. This is particularly true with regard to SARS - CoV - 2, as current data indicate that this virus is highly contagious and that the respiratory disease it causes (called COVID-19) is associated with a mortality rate of 2%, about twenty times more than the seasonal flu. In addition, even if the vast majority of infected people do not develop a serious illness, they nevertheless represent vectors, which can infect more vulnerable people who are particularly at risk of severe complications, in particular the elderly or those affected by diseases (diabetes, cancer, etc.).

Fortunately, the molecular tools of modern biochemistry have made it possible to rapidly develop tests to diagnose the presence of the virus: just weeks after the start of the epidemic in China, scientists had already determined the complete sequence of the genetic material of the virus SARS - CoV - 2 and thus identified certain molecular regions specific to this virus. Using a technique called "reverse transcription polymerase chain reaction" (RT-PCR), these regions of the viral genome can be amplified in samples taken from people suspected of carrying the virus and thus can detect the infection.

The importance of these tests to contain the contagion is well illustrated by the data coming from South Korea, where nearly 20,000 people are tested free every day: although this country presents the highest rate of COVID-19 after China, the number of new cases has decreased substantially in the past few days. Authorities are optimistic: the worst may have passed and the epidemic may gradually subside in the coming weeks.

FIGHT THE VIRUS

Containing the spread of the virus is arguably the key to reducing the number of deaths from COVID-19 pneumonia, as there is currently no specific treatment for this disease. The current therapeutic approach consists essentially in limiting fever, cough and breathing difficulties.

This does not preclude testing certain antivirals developed against other viruses. These drugs save time because they are already available and their side effects are known: promising preliminary therapeutic trials have been carried out with Remdesivir (active against the Ebola virus, among others) and Kaletra (used against HIV) , but the number of patients tested is very limited and their clinical utility remains uncertain.

The best hope remains vaccination, and a race against the clock has already started, with more than 20 vaccines being developed around the world. The availability of one or more of these vaccines is not, however, for tomorrow: the vaccines are first administered to healthy people and several studies are necessary to establish their safety (absence of adverse effects), before using them on the population.

It is estimated that development of a SARS - CoV - 2 vaccine could take 12 to 18 months. In fact, the availability of a vaccine with good therapeutic activity, manufactured on a large scale and available in less than a year would represent a truly remarkable achievement, because no other vaccine has ever been developed so quickly. It is hoped that the mobilization of the scientific community on an international scale will make it possible.

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