Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

The race for treatments

It will take time to develop a coronavirus vaccine, but some existing drugs may help save lives before then, says **Michael Le Page**

THE race to develop vaccines and treatments for the new coronavirus is on. The UK announced this week that it will donate £20 million for vaccine development, while Jack Ma, the billionaire co-founder of Alibaba Group, is giving $14 million to similar efforts.

A vaccine could be essential for controlling the outbreak. There are plans to test an existing experimental vaccine against SARS for use with 2019-nCoV, as well as several efforts to develop new ones, but this will take time. "A vaccine would take at least a year, if not more," says virologist Jonathan Ball at the University of Nottingham, UK.

What can be done in the meantime? The good news is that a few existing drugs might help to save lives before then, and it may be possible to develop other treatments in as little as six months.

There are two main ways of treating viral infections: antibodies or small-molecule drugs. Antibodies are large proteins that bind to viruses and trigger their destruction. It can take our immune systems two weeks after a new infection to produce enough antibodies to fight it off. But this can be accelerated by injecting people with antibodies made by cells grown in a vat. This can keep viruses in check until your immune response kicks in fully.

Antibodies are less likely to cause side effects than other drugs, because they bind more specifically to viruses. This means we should be able to find safe and effective antibodies against the 2019 coronavirus very quickly – the problem will be mass-producing them fast enough.

A team in China that tested antibodies against the coronavirus that caused the SARS outbreak in 2003 has found one that binds to the new coronavirus as well. But team leader Tianlei Ying at Fudan University says it could take one or two months to make enough of the antibody to start testing it in animals and then people.

Antibody search

Two antibodies for treating the MERS coronavirus have already been tested in people. The US biotechnology company that makes them, Regeneron, says they are unlikely to work against the 2019 coronavirus, but it will test them and others.

However, this takes time. While developing antibodies for Ebola, it took Regeneron six months to get to the stage of testing in humans.

A Chinese company called WuXi Biologics announced in a press release last week that it is establishing a 100-strong team dedicated to developing antibody treatments for the 2019 coronavirus. It says it might be able to start mass production in a record four or five months.

By that stage, the outbreak could be over or millions of people might be infected, in which case making enough wouldn't be easy. There aren't many antibody factories, says Ball, and they are all already busy producing antibodies for treating cancer and other diseases.

There might be a shortcut. Instead of making antibodies in a vat, a US company called RenBio injects the genes coding for them into leg muscles. Antibody production in the body continues for weeks or even months, so these injections could be given to people to prevent infections as well as to treat those who are already infected.

"Both are possibilities," says Neal Padte, the head of RenBio. But this has only been tested in other animals, so health authorities may be reluctant to try it in people.

The second way of treating viral infections is to find small molecules that stop viruses replicating by interfering with their proteins.

Antivirals like these are usually simple to manufacture, and can be taken in pill form, both of which are big advantages. But 99 per cent of potential small-molecule drugs fail, says Ball. So developing new antivirals from scratch could take years.

"Given the scale of the outbreak, you'd hope to quickly discover if these interventions work"

TPG/ZUMA PRESS/PA IMAGES

Medical workers in Wuhan, China, on 3 February

However, there are a few existing small-molecule drugs that might help. For instance, an experimental antiviral called galidesivir developed for treating Ebola is active against coronaviruses, says its US maker, BioCryst Pharmaceuticals. It has already passed safety tests in people. A team in China has identified four existing, approved drugs that might also work: prulifloxacin, bictegravir, nelfinavir and tegobuvir (bioRxiv, doi.org/dk2z).

FRANCIS SHEEHAN/SPL

Some drugs used to treat HIV may also target coronaviruses

Most promisingly, doctors in Wuhan, China, have already started two randomised controlled trials. One will test two drugs called lopinavir and ritonavir given together. These are already used to treat HIV, and there is some evidence they work against coronaviruses too. The other trial is of an experimental drug called remdesivir, made by US firm Gilead Sciences.

"Given the scale of the outbreak in China, you would hope to get a reasonably quick answer to whether these interventions work," says Ball. "The manufacturing for these is already in place and they are easily available."

In the meantime, most people with the new virus are being treated for their symptoms, rather than the specific virus. Unfortunately, this isn't always enough for people who are older or have pre-existing conditions, for whom the virus seems to be more deadly. ▮