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WHY TREAT COVID-19 WITH ANTIBIOTICS?

The Mercury · 10 Jan 2022 · 7 · MOSTAFA RATEB The Conversation Rateb is a lecturer in Drug Discovery at the University of the West of Scotland

IF YOU have a cold, don't ask your doctor for antibiotics – that's the golden rule. They're for bacterial infections, not viral ones. We're told not only that they won't work, but that by using antibiotics when they aren't needed, we're helping bacteria become resistant to them.

Yet in a recent study conducted in an Egyptian hospital, we showed that treating moderate-to-severe Covid patients with either one of two antibiotics (ceftazidime or cefepime, in combination with a steroid) resulted in similar recovery times compared to patients given standard treatment. This standard treatment, authorised by the Egyptian government and approved by the World Health Organization, was made up of at least seven different medications, suggesting that treating Covid with antibiotics could be a much simpler way of making people better. Yet by doing this, we went against the established medical convention that antibiotics aren't for viruses. Why did we break this rule?

Necessity the mother of invention

Traditionally, creating new drugs to treat diseases takes a long time. However, this time-consuming process is not viable when there is a high threat posed by an emerging infectious disease, such as Zika, Ebola, Mers and now Covid. Without quick action or effective treatments that are ready to go, emerging diseases can evolve into pandemics that take a lot of lives.

Because of this, when faced with a new threat, drug developers and major pharmaceutical companies look for quicker alternatives. One practical strategy is drug repurposing.

This is where drugs already created and approved for one use are tested to see if they can also help treat the new disease.

As the drugs have already been shown to be safe, and plenty is known about how they work, this is potentially a much less risky and time-consuming way of coming up with a treatment for the new disease. It's a strategy that's been used often in the past – and one my colleagues and I wanted to try to use it during Covid because of the pressing need.

Finding a new purpose

With a viral disease like Covid, a drug considered for repurposing should show one of these three qualities: it should either be able to inhibit one or more stages of the coronavirus's replication cycle; relieve the bad effects of the virus; or manipulate the immune system so that the body can deal with the virus. And surprisingly, antibiotics are often the substances that show potential. Although viruses are different to bacteria, they are sometimes also susceptible to antibiotics.

For example, in response to the Zika crisis five years ago, an American study evaluated more than 2 000 drugs already approved by the US Food and Drug Administration to see if they could potentially be safely used in pregnancy against the virus. The study found that the antibiotic azithromycin could reduce the proliferation of the virus in the brains of unborn children, potentially protecting against microcephaly.

Separately, testing also showed that the antibiotic novobiocin had a strong antiviral effect against the Zika virus. These studies gave us confidence that repurposing antibiotics as Covid treatments was a plausible idea.

Why ceftazidime or cefepime?

Research had already shown that a number of antibiotics were good at stopping the coronavirus reproducing in lab tests – including ceftazidime and others of the same class, which is known as “beta-lactams”. We therefore knew this drug class had potential.

And when we ran computer simulations of how ceftazidime and cefepime (another beta-lactam) would interact with the virus, they were both effective at disrupting its protease, a key enzyme the virus uses to reproduce. Ceftazidime and cefepime are also broad-spectrum antibiotics that are widely used to treat critically ill patients who pick up infections in hospital. As Covid patients often end up with other infections at the same time, we also thought these drugs might help badly ill patients by clearing other infections they might have, helping prevent conditions such as pneumonia.