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Coronavirus Drug and Treatment Tracker

By Jonathan Corum, Katherine J. Wu and Carl Zimmer July 16, 2020

We rated **20 coronavirus treatments** for effectiveness and safety:



The Covid-19 pandemic is one of the greatest challenges modern medicine has ever faced. Doctors and scientists are scrambling to find treatments and drugs that can save the lives of infected people and perhaps even prevent infection.

Below is an updated list of **20 of the most-talked-about treatments for the coronavirus**, including some of the most promising, interesting and potentially harmful. We also included a warning about a few that are just bunk.

The F.D.A. has not fully licensed any treatment specifically for the coronavirus, but it has granted [emergency use authorization](#) to a few. For the current status of vaccine development, see our [Coronavirus Vaccine Tracker](#).

What the Ratings Mean

We rate each treatment based on the scientific evidence for its effectiveness and safety. We'll update and expand the list as more evidence emerges.

STRONG EVIDENCE: The treatment has been demonstrated to be effective and safe, either through a robust clinical trial or widespread use by doctors. The strongest trials are randomized controlled trials, in which some people get a treatment and others get a placebo.

PROMISING EVIDENCE: Early evidence from studies on patients suggests effectiveness, but more research is needed. This category includes treatments that have shown improvements in morbidity, mortality and recovery in retrospective studies, which look at existing datasets rather than starting a new trial.



TENTATIVE OR MIXED EVIDENCE : Some treatments show promising results in cells or animals, which need to be confirmed in people. Other treatments have produced different results in different experiments, raising the need for larger, more rigorously designed studies to clear up the confusion.

NOT PROMISING : These treatments show mixed evidence that suggests that they do not work.

INEFFECTIVE AND POSSIBLY HARMFUL : These treatments were once seriously considered for Covid-19 but have not held up under scientific scrutiny, proving to be ineffective or even harmful.

PSEUDOSCIENCE OR FRAUD : These are not treatments that researchers have ever considered using for Covid-19. Experts have warned against trying them, because they do not help against the disease and can instead be dangerous. Some people have even been arrested for their false promises of a Covid-19 cure.

Filter the list of treatments:

Strong Promising

Tentative or mixed

Not promising

Ineffective

Pseudoscience

Blocking the Virus

Antivirals can stop viruses such as H.I.V. and hepatitis C from hijacking our cells. Scientists are searching for antivirals that work against the new coronavirus.

STRONG EVIDENCE

EMERGENCY USE AUTHORIZATION

Remdesivir [Remdesivir](#), made by Gilead Science, was the first drug to get emergency authorization from the F.D.A. for use on Covid-19. It stops viruses from replicating by inserting itself into new viral genes. Remdesivir was originally tested as an antiviral against Ebola and Hepatitis C, only to deliver lackluster results. But preliminary data from trials that began this spring suggested the drug can reduce the hospital stays of people with severe cases of Covid-19 from [15 to 11 days](#). These early results did not show any effect on mortality, though retrospective data released in July hints that the drug might [reduce death rates](#) among those who are very ill.

TENTATIVE OR MIXED EVIDENCE

Favipiravir Originally designed to beat back influenza, favipiravir blocks a virus's ability to copy its genetic material. A [small study](#) in March indicated the drug might help purge the coronavirus from the airway, but results from larger, well-designed clinical trials are still pending.

TENTATIVE OR MIXED EVIDENCE **EIDD-2801** Another antiviral

originally designed to fight the flu, EIDD-2801 has had promising [results](#) against the new coronavirus in studies in cells and on animals. It is still being tested in humans.

TENTATIVE OR MIXED EVIDENCE **Recombinant ACE-2** To enter

cells, the coronavirus must first [unlock them](#) — a feat it accomplishes by latching onto a human protein called ACE-2. Scientists have created artificial ACE-2 proteins which might be able to act as decoys, luring the coronavirus away from vulnerable cells. Recombinant ACE-2 proteins have shown promising [results](#) in experiments on cells, but not yet in animals or people.

NOT PROMISING **Lopinavir and ritonavir** Twenty years ago, the

F.D.A. approved this combination of drugs to treat H.I.V. Recently, researchers tried them out on the new coronavirus and found that they stopped the virus from replicating. But clinical trials in patients proved [disappointing](#). In early July, the World Health Organization [suspended](#) trials on patients hospitalized for Covid-19. But they didn't rule out studies to see if the drugs could help patients not sick enough to be hospitalized, or to prevent people exposed to the new coronavirus from falling ill. The drug

could also still have a role to play in certain [combination treatments](#).

NOT PROMISING Hydroxychloroquine and chloroquine

German chemists synthesized chloroquine in the 1930s as a drug against malaria. A less toxic version, called hydroxychloroquine, was [invented in 1946](#), and later was approved for other diseases such as lupus and rheumatoid arthritis. At the start of the Covid-19 pandemic, researchers discovered that both drugs could stop the coronavirus from replicating in cells. Since then, they've had a tumultuous ride through the first few months of the pandemic. A few small studies on patients offered some hope that hydroxychloroquine could treat Covid-19. The World Health Organization launched a randomized clinical trial in March to see if it was indeed safe and effective for Covid-19, as did Novartis and a number of universities. Meanwhile, President Trump repeatedly [promoted hydroxychloroquine](#) at press conferences, touting it as a “game changer,” and even [took it himself](#). The F.D.A. temporarily granted hydroxychloroquine emergency authorization for use in Covid-19 patients — which a whistleblower later [claimed](#) was the result of political pressure. In the wake of the drug's newfound publicity, [demand spiked](#), resulting in [shortages](#) for people who rely on hydroxychloroquine as a treatment for other diseases. When data emerged from the randomized clinical trials, the message was clear: hydroxychloroquine [didn't help people with Covid-19 get better](#) or [prevent healthy people from contracting the coronavirus](#). (One large-scale study that concluded the drug was harmful as well was later

[retracted](#).) The [World Health Organization](#), the National Institutes of Health and Novartis have since halted trials investigating hydroxychloroquine as a treatment for Covid-19, and the F.D.A. [revoked its emergency approval](#). The F.D.A. now [warns](#) that the drug can cause a host of serious side effects to the heart and other organs when used to treat Covid-19. In July, researchers at Henry Ford hospital in Detroit published a [study](#) finding that hydroxychloroquine reduced mortality in Covid-19 patients. President Trump [praised the study on Twitter](#), but experts raised doubts about it because it was not a randomized controlled trial. Still, the White House has initiated a push for the F.D.A. to reauthorize hydroxychloroquine as an emergency Covid-19 treatment. Despite negative results, a number of hydroxychloroquine trials have continued. A recent analysis by STAT and Applied XL found more than 180 [ongoing clinical trials](#) testing hydroxychloroquine or chloroquine, for treating or preventing Covid-19. Although it's clear the drugs are no panacea, it's possible they could work in combination with other treatments, or when given in early stages of the disease.

Mimicking the Immune System

Most people who get Covid-19 successfully fight off the virus with a strong immune response. Drugs might help people who can't mount an adequate defense.

PROMISING EVIDENCE

EMERGENCY USE AUTHORIZATION

Convalescent plasma A century ago, doctors filtered plasma from the blood of recovered flu patients. So-called convalescent plasma, rich with antibodies, helped people sick with flu fight their illness. Now researchers are trying out this [strategy](#) on Covid-19. Early trials with convalescent plasma have yielded [promising, if preliminary, results](#), and the F.D.A. has authorized its use on very sick patients infected by the coronavirus.

TENTATIVE OR MIXED EVIDENCE

REGN-COV2 and other monoclonal antibodies

Convalescent plasma contains a mix of different antibodies, some of which can attack the coronavirus, and some of which can't. Researchers have been sifting through the slurry for the most potent antibodies against Covid-19. Synthetic copies of these molecules, known as [monoclonal antibodies](#), can be manufactured in bulk and then injected into patients. Safety trials for this treatment have [only just begun](#), with several more on the way.

TENTATIVE OR MIXED EVIDENCE

Interferons Interferons are molecules our cells naturally produce in response to viruses, rousing the immune system to attack. Injecting synthetic interferons is now a standard

treatment for a number of immune disorders. [Rebif](#), for example, is prescribed for multiple sclerosis. Early studies, including experiments in [mice](#) and [cells](#), hint that injecting interferons may help against Covid-19. There's even some evidence that the molecules could [help prevent healthy people from getting infected](#).

Putting Out Friendly Fire

The most severe symptoms of Covid-19 are the result of the immune system's overreaction to the virus. Scientists are testing drugs that can rein in its attack.

STRONG EVIDENCE **Dexamethasone** This cheap and widely available steroid blunts many types of immune responses. Doctors have long used it to treat allergies, asthma and inflammation. In June, it became the first drug shown to [reduce Covid-19 deaths](#). That [study](#) of more than 6,000 people, which has not yet been published in a scientific journal, found that dexamethasone reduced deaths by one-third in patients on ventilators, and by one-fifth in patients on oxygen. It may be [less likely to help](#) — and may even harm — patients who are at an earlier stage of Covid-19 infections, however. In its Covid-19 treatment guidelines, the National

Institutes of Health [recommends](#) only using dexamethasone in patients with COVID-19 who are on a ventilator or are receiving supplemental oxygen.

PROMISING EVIDENCE

EMERGENCY USE AUTHORIZATION

Cytosorb Cytosorb is a cartridge that [filters immune-signalling molecules](#) called cytokines from the blood. Although cytokines are essential for fighting off diseases, they can sometimes trigger a runaway response. The body produces so much inflammation that it damages itself. By removing excess cytokines, Cytosorb may be able to cool this so-called cytokine storm. The machine can purify a patient's entire blood supply about 70 times in a 24-hour period. It was [granted emergency use authorization](#) by the F.D.A. for Covid-19 after reports in March suggested that it had helped dozens of severely ill Covid-19 patients in Europe and China. [Many clinical trials](#) evaluating the device's effectiveness against Covid-19 are now underway.

TENTATIVE OR MIXED EVIDENCE

Cytokine Inhibitors Researchers have created a number of drugs that can potentially halt cytokine storms, and have proven effective against arthritis and other inflammatory disorders. Some turn off the supply of molecules that launch the production of the cytokines themselves. Others block the receptors on immune cells to which cytokines would normally bind. A few block the

cellular messages they send. Against the coronavirus, several of these drugs, including tocilizumab, sarilumab and [anakinra](#), have [offered modest help](#) in some trials, but faltered in others. The drug company Regeneron recently announced that a branded version of sarilumab, Kevzara, [failed](#) Phase 3 clinical trials.

TENTATIVE OR MIXED EVIDENCE **Stem cells** Certain kinds of stem cells can secrete anti-inflammatory molecules. Over the years, researchers have tried to use them as a [treatment for cytokine storms](#), and now dozens of clinical [trials](#) are under way to see if they can help patients with Covid-19. But these stem cell treatments haven't worked well in the past, and it's not clear yet if they'll work against the coronavirus.

Assisting Our Bodies

Caregivers can physically adjust a patient's body to help weather Covid-19.

STRONG EVIDENCE **Prone positioning** The simple act of flipping Covid-19 patients onto their bellies [opens up the lungs](#). The maneuver has

become commonplace in hospitals around the world since the start of the pandemic. It might help some individuals avoid the need for ventilators entirely. The treatment's benefits continue to be tested in a range of clinical trials.

STRONG EVIDENCE

EMERGENCY USE AUTHORIZATION

Ventilators and other respiratory support devices Devices that help people breathe are an essential tool in the fight against deadly respiratory illnesses. Some patients do well if they get an extra supply of oxygen through the nose or via a mask connected to an oxygen machine. Patients in severe respiratory distress may need to have a [ventilator breathe for them](#) until their lungs heal. Doctors are divided about how long to treat patients with noninvasive oxygen before deciding whether or not they need a ventilator. Not all Covid-19 patients who go on ventilators survive, but the devices are thought to be [lifesaving in many cases](#).

Undoing the Damage

Covid-19 can harm not just the lungs, but other parts of the body. Researchers are searching for ways to block or reverse this devastation.

STRONG EVIDENCE Enoxaparin and other anticoagulants

The coronavirus can invade cells in the lining of blood vessels, leading to tiny clots that can cause strokes and other serious harm. Breaking up these clots with anticoagulants, which have long been used on patients with various heart conditions, improves the prospects of seriously ill patients. Early data has linked the use of anticoagulants to [survival among Covid-19 patients](#), and many clinical trials teasing out this relationship are now underway.

PROMISING EVIDENCE Renal replacement therapy

About one in five people with Covid-19 who are admitted to the ICU suffer from acute kidney injury. It's not clear yet why — possibilities include the coronavirus infecting kidney cells or the immune system attacking the kidneys with a cytokine storm. In its [guidelines](#) for treating Covid-19, the National Institutes recommends filtering toxins from the blood with dialysis or other forms of renal replacement therapy. But they warn that few studies have yet been carried out to determine the best treatment for damaged kidneys.

Pseudoscience and Fraud

False claims about Covid-19 cures abound. The F.D.A. maintains a [list](#) of more than 80 fraudulent Covid-19 products, and the W.H.O. [debunks](#) many myths about the disease.

WARNING: DO NOT DO THIS

Drinking or injecting bleach and disinfectants In April, President Trump [suggested](#) that disinfectants such as alcohol or bleach might be effective against the coronavirus if directly injected into the body. His comments were immediately [refuted](#) by health professionals and researchers around the world — as well as the [makers of Lysol and Clorox](#). Ingesting disinfectant would not only be ineffective against the virus, but also hazardous — possibly even deadly. In July, Federal prosecutors [charged](#) four Florida men with marketing bleach as a cure for COVID-19.

WARNING: NO EVIDENCE

UV light President Trump also speculated about hitting the body with “ultraviolet or just very powerful light.” Researchers have used UV light to sterilize surfaces, including killing viruses, in carefully managed laboratories. But UV light would not be able to purge the virus from within a sick persons’ body. This kind of radiation can also damage the skin. Most skin cancers are a result of exposure to the UV rays naturally present in sunlight.

WARNING: NO EVIDENCE Silver The F.D.A. has threatened legal action against a host of people claiming silver-based products are safe and effective against Covid-19 — including televangelist [Jim Bakker](#) and InfoWars host [Alex Jones](#). Several metals do have [natural antimicrobial properties](#). But products made from them have not been shown to prevent or treat the coronavirus.

Treatment ratings will be updated as new evidence emerges. We cannot list every possible treatment. For more details on evaluating treatments, see the [N.I.H. Covid-19 Treatment Guidelines](#).

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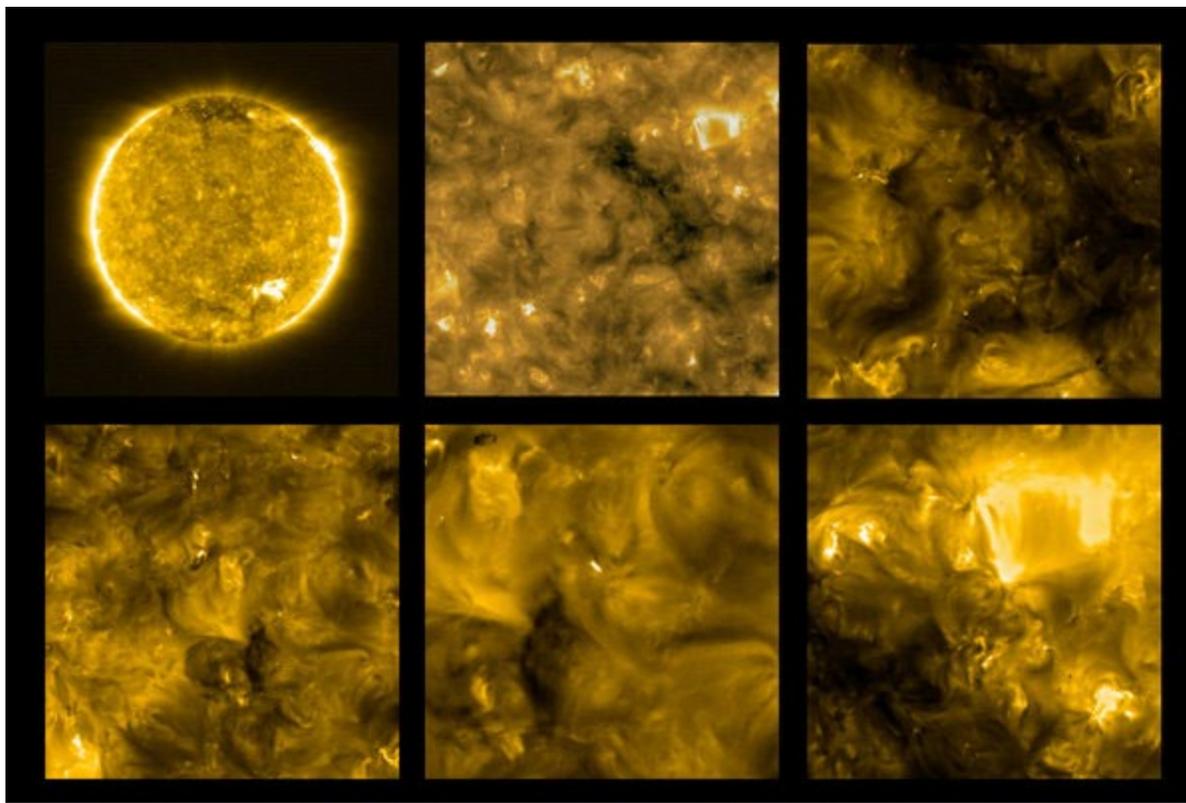
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Note: The tracker rates individual treatments, but doctors are also testing a number of combination treatments. Sources: National Library of Medicine; National Institutes of Health; Paul Knoepfler, University of California, Davis; Phyllis Tien, University of California, San Francisco; John Moore and Douglas Nixon, Weill Cornell Medical College.

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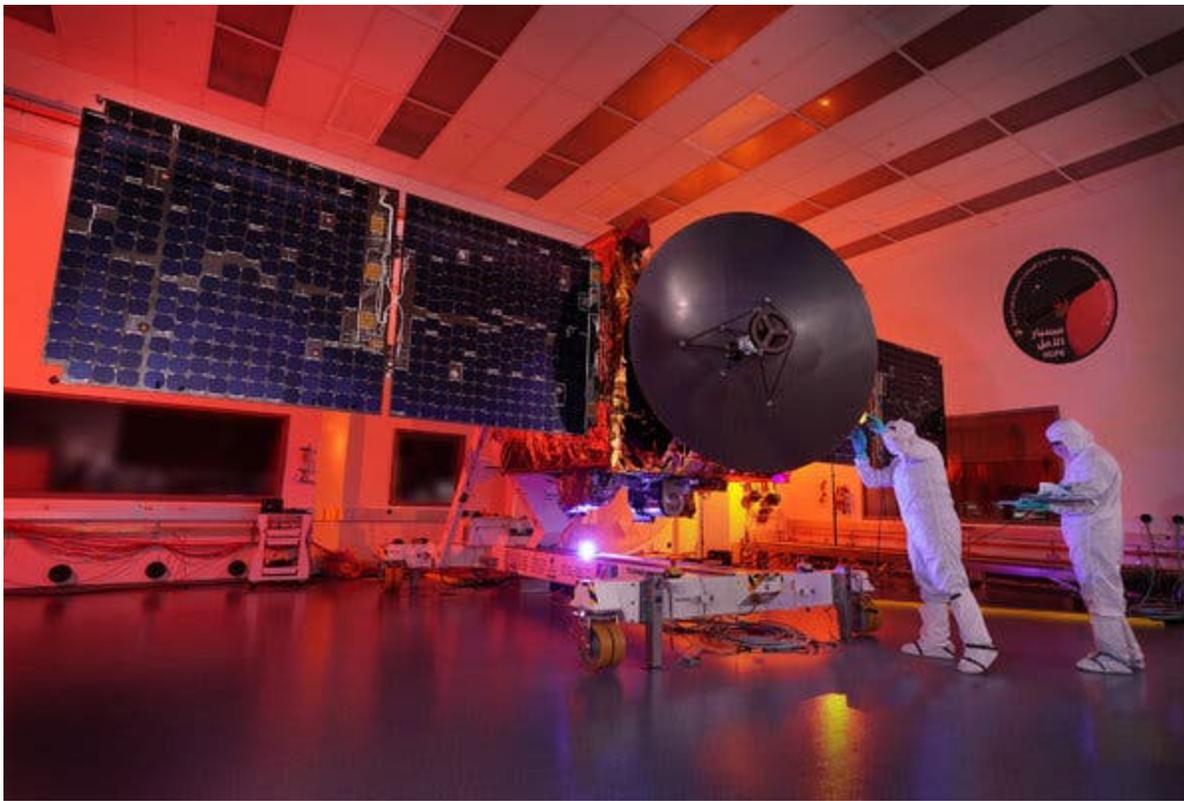
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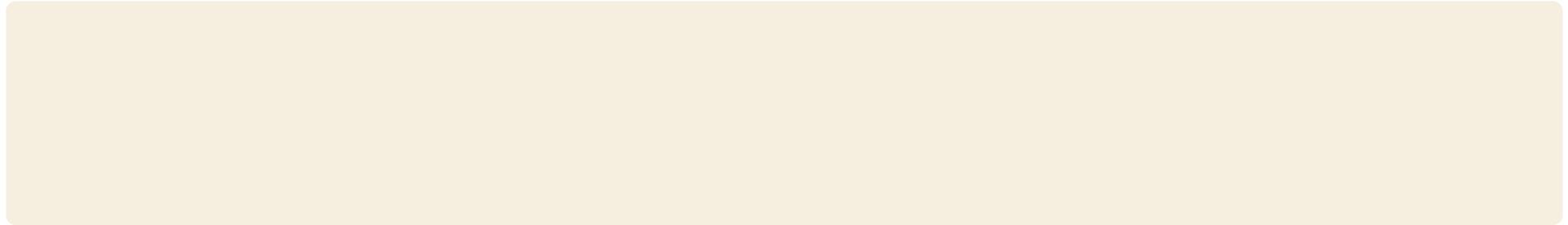
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