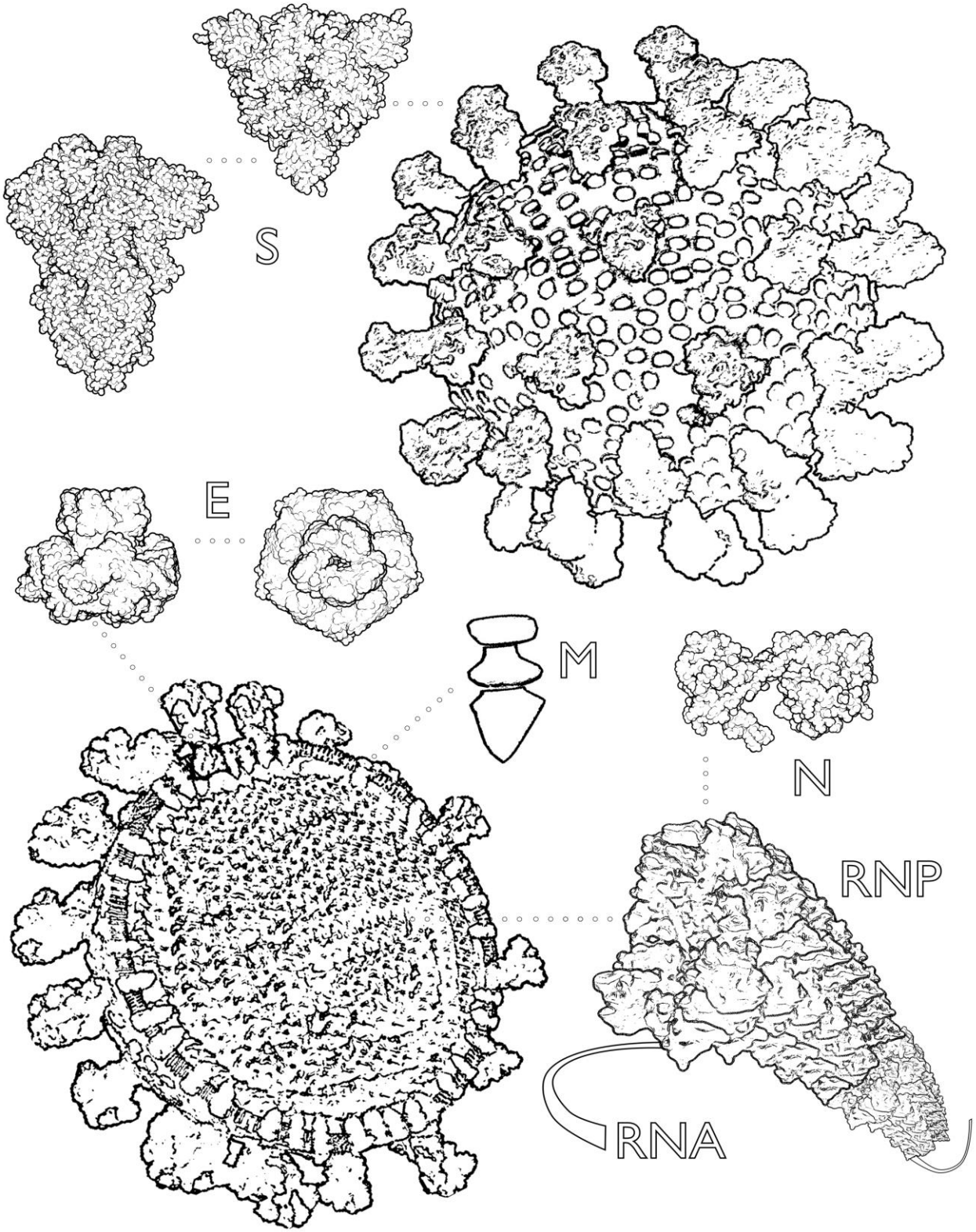
SARS CORONAVIRUS 2



MRC Medical Research Council

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CVR Centre for Virus Research

22. SARS Coronavirus 2

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In December 2019, a number of patients suffering from unusual respiratory symptoms were reported in the city of Wuhan in Hubei province, China. Many of the patients, who were suffering from the disease now known as COVID-19, had connections to a live animal market. This suggested that they had picked up an illness from an animal. Such infections are known as 'zoonoses,' and indeed most novel human infections are zoonoses from wild or domesticated animals. This one would change the world.
Zoonoses are relatively common, but viruses that are used to growing in other animals rarely spread well among humans. Indeed, relatives of SARS-CoV-2 had already caused limited outbreaks (SARS in Hong Kong in 2003 and MERS in the Arabian Peninsula and South Korea from 2012) but they were inefficient at spreading from one person to the next. SARS-CoV-2 had mutated in a way that allowed it to spread efficiently between humans. Within the space of a few months, it had spread to over 200 countries and been declared a pandemic: an epidemic that spread across the world.

One of the problems in containing SARS-CoV-2 is that, although it can cause severe disease, people can also be infectious without realising it. Many infections are mild or even asymptomatic (no symptoms). A large proportion of people who do report COVID-19 experience mild symptoms such as a dry cough, fever, muscle aches and loss of senses of smell and taste, and often recover in the first week. However, current data suggest that around one in five patients develop more serious illness. In the most severe cases, pneumonia and viral damage to the lungs causes breathlessness and low oxygen levels, which can cause long-term damage and can be fatal.

As this is being written scientists around the world are racing to try and understand and control this new pandemic virus. This colouring sheet shows the virus particles that SARS-CoV-2 uses to spread.

The SARS-CoV-2 virus particle is fringed with spikes, each made from three S proteins. The virus particle uses S to bind to and enter cells, and so infection can be blocked by antibodies that bind to S (making S an attractive target for a vaccine). Beneath the spikes is a lipid membrane, which is vulnerable to detergents (such as soap) and alcohols. Embedded in this membrane is the most abundant protein in the virus particle, M (the membrane, or matrix, protein), which gives the particle its shape. Also in the membrane are a few copies of the envelope protein (E), which is thought to have a number of functions within infected cells, including helping the production of new virus particles. Inside the particle is the coronavirus genome, a single strand of RNA, roughly 30,000 'letters' long. This is unusually long for an RNA virus, and if stretched out straight the genome would be around 100 times longer than the virus particle itself. To pack in this long genetic message, it is coiled into tight spirals around multiple copies of the nucleocapsid (N) protein.

Did you know?

The distinctive spike proteins give coronaviruses their name. 'Corona,' the Latin for 'wreath' or 'crown,' refers to the resemblance of images of the virus to a solar corona or a halo.