Coronavirus

One mutation spread covid-19 variant

The JN.1 variant may have been able to escape antibodies because of a small genetic change

Carissa Wong

A SINGLE mutation may have been crucial to the JN.1 covid-19 variant spreading rapidly around the world last year, demonstrating how quickly the virus can adapt.

"A single mutation in JN.1 was key for it to evade the antibody response, and that's why it was able to spread," says Emanuele Andreano at the Toscana Life Sciences Foundation in Italy.

JN.1, a subvariant of the omicron variant, was first identified in Luxembourg in August 2023. At the end of January, it accounted for 88 per cent of the recorded infections in the US, 85 per cent of those in the UK and 77 per cent in Australia. Its predecessor, BA.2.86, never accounted for more than 5 per cent of known global infections.

With JN.1 and its descendants remaining the most reported covid-19 variants globally, Andreano and his colleagues wanted to investigate how it spread so widely. Genetic sequencing previously pointed to an additional mutation compared with BA.2.86 in its spike protein, which the virus uses to infect host cells.

To learn more, the researchers analysed 899 types of antibodies from blood samples previously collected from 14 people, all of whom had received two or three doses of an mRNA covid-19 vaccine and had confirmed infections with prior variants.

The researchers added each of these antibodies, along with BA.2.86 SARS-CoV-2 viruses, to a dish containing monkey cells. This revealed that 66 of the 899 antibodies were able to prevent BA.2.86 from infecting the cells. When they repeated the experiment with JN.1, just 23 of the antibodies prevented infection.

A computer simulation showed that JN.1's spike protein mutation caused a longer amino acid called leucine to be swapped for a shorter one called serine, which then weakened or blocked the body's antibodies from interacting with the spike protein (*Science Immunology*, doi.org/gt6qq3).

"A single mutation in JN.1 was key for it to evade the antibody response and enable it to spread"

The antibodies that prevented JN.1 infections in the monkey cells came from five of the 14 blood sample donors. These individuals had "super hybrid" immunity, says Andreano, brought about from receiving three mRNA vaccine doses, being infected once by the original SARS-CoV-2 variant identified in Wuhan, China, and infected again by an omicron variant. Those antibodies may bind to other parts of the spike protein, away from the site of the mutation, thereby preventing a JN.1 infection, he says.

The study shows how a single mutation may have been key to JN.1's spread. Yet, it still doesn't cause more severe illness than prior variants, says Andreano.

That is probably because there are other prongs of the immune system, such as T-cells, that work to stop the virus from causing severe illness, says Jonathan Ball at the Liverpool School of Tropical Medicine in the UK. "Collectively, people's immunity is holding strong," he says. ▮

Astronomy

Black hole devouring giant star gives clues to a cosmic mystery

A SUPERMASSIVE black hole has been caught eating a huge star in the biggest example of this powerful event ever seen. It could help us understand mysteriously bright cosmic objects in the centres of some galaxies.

When a black hole gobbles up a star, it doesn't happen in one titanic gulp – instead, the star is torn apart in a violent process called a tidal disruption event (TDE). These are some of the brightest events in the sky. Edo Berger at the Harvard-Smithsonian Center for Astrophysics in Massachusetts and his colleagues have now found one that is nearly 10 times as bright as any seen before.

MARK GARLICK/SCIENCE PHOTO LIBRARY/GETTY IMAGES

An illustration of a tidal disruption event in which a black hole shreds a star

This TDE, called AT2023vto, is so bright scientists originally thought it was a supernova. However, when Berger and his colleagues conducted follow-up observations and more analysis of the original data, they found it was a much closer match to a star being ripped limb from limb. "It's much more energetic than any TDEs we've seen before and yet it behaves exactly like all of the other tidal disruption events," says Berger.

The researchers' models showed that AT2023vto was caused by a star about nine times as massive as the sun falling into a black hole about 10 million times as massive as the sun (arXiv, doi.org/ncks). Finding such a huge star so close to a supermassive black hole is rare.

"A star like this one has a lifetime of only about 10 million years or so, so in all likelihood it had to have formed in the vicinity of the supermassive black hole," says Berger. Studying events like this could help us understand the possibility of star formation there.

It could also help us figure out odd phenomena called ambiguous nuclear transients (ANTs), which are bright flashes from the centres of certain galaxies. Some researchers have suggested these may be a new type of TDE involving extremely massive stars. If that is ANTs' true identity, then this cosmic cataclysm could be the missing link between them and the less-extreme TDEs. ▮

Leah Crane