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Dr Wan Yue (above) carried out the study together with Dr Roland Huber, assistant principal investigator at the Bioinformatics Institute, and Professor Wang Linfa of Duke-NUS Medical School's Emerging Infectious Diseases Programme. The study was published in the Nature Communications journal this week. ST FILE PHOTO

Covid-19 virus changes shape for survival: Study

Key discovery by scientists here can help in making more effective drugs to treat disease

Cheryl Tan

Scientists in Singapore have made an important discovery about the shape and structure of the Sars-CoV-2 virus' genetic material – which can help in producing more effective drugs to treat Covid-19.

They found that the virus' ribonucleic acid (RNA) can fold into complex and dynamic shapes for its growth and survival when inside infected cells.

The team, which comprised researchers from Duke-NUS Medical School as well as the Agency for Science, Technology and Research's Genome Institute of Singapore (GIS) and Bioinformatics Institute (BII), also discovered that the virus' RNA can interact with many of the human cell's RNAs to make use of them for its own survival.

Dr Wan Yue, who led the study, which was published in the scientific journal Nature Communications on Wednesday, said: "Aside from helping us understand the shape that the virus takes when inside human cells, recent work has also shown that its shapes are very important for drugs targeting the RNA, which was what prompted us to start this project."

Dr Wan is group leader of the Laboratory of RNA Genomics and Structure and associate director of Epigenetic and Epitranscriptomic Systems at GIS.

The Sars-CoV-2 virus, which causes Covid-19, has a single-strand genome with RNA as its genetic material.

The RNA plays a key role in helping the virus produce its proteins. When the virus infects and enters the human cell, the spike protein on the surface of its cell binds with the human or host cell receptor.

It then releases its genome into the host cell, where the RNA is translated to make viral proteins.

As the virus' genetic material closely resembles that of human cellular RNA, the human cell is therefore "tricked" into helping the virus to create its proteins.

These viral proteins are essential in helping the viral RNA replicate and infect more human cells.

While a lot of research has gone into how antibodies interact with the virus' proteins and genome, little is known about how the virus interacts with human RNAs once it infects a cell.

The Singapore study tackles this gap.

Aside from discovering the shape and structure of the Sars-CoV-2 virus' genetic material, the team also learnt that the virus binds with a small nucleolar RNA, or snoRNA, to steal its modification abilities.

The snoRNA modifies our translation machinery to enable our body to produce protein properly.

In stealing the modification abilities, this helps to stabilise the virus, making it more successful in infecting the host cells.

Dr Wan said the findings can help to inform other researchers on the regions in the virus' RNA that can be targeted for drug development.

Dr Wan carried out the study together with Dr Roland Huber, assistant principal investigator at BII, and Professor Wang Linfa of the Emerging Infectious Diseases Programme at Duke-NUS Medical School.

The team also compared the structures of the original Sars-CoV-2 virus with a variant, and found that the latter has a region of its RNA deleted.

They also found shape differences between the original and the variant.

Studies are under way to determine how the different circulating variants can use their different shapes to replicate themselves, said Dr Wan.

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IMPORTANT DISCOVERIES

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DR WAN YUE, group leader of the Laboratory of RNA Genomics and Structure and associate director of Epigenetic and Epitranscriptomic Systems at GIS, who led the study.