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ASIA EDITION

Israeli researchers develop molecular 'super cork' approach to battle Coronavirus

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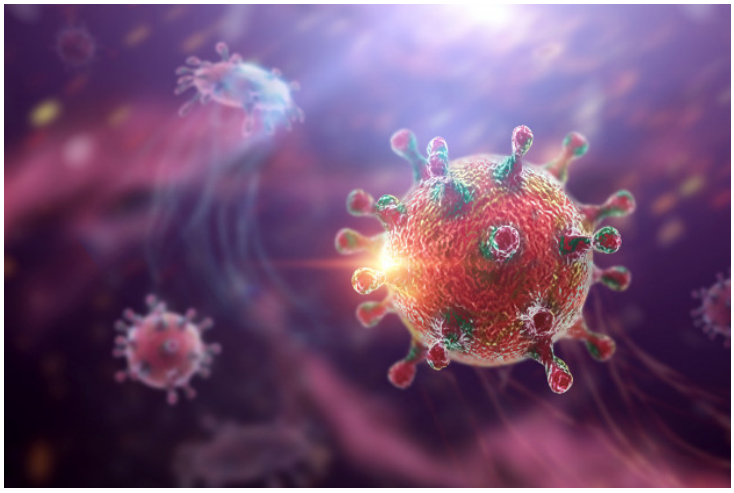
Breakthrough therapy to tackle constantly mutating SARS-CoV-2 by preventing the virus from attaching human cells' membrane



Even though vaccines may be steering the world toward a post-pandemic normal, a constantly mutating SARS-CoV-2 necessitates the development of effective drugs. In a new study published in Nature Microbiology, Weizmann Institute of Science researchers, together with collaborators from the Pasteur Institute, France, and the National Institutes of Health (NIH), USA, offer a novel therapeutic approach to combating the notorious virus.

Rather than targeting the viral protein responsible for the virus entering the cell, the team of researchers addressed the protein on human cells' membrane that enables this entry. Using an in-house advanced artificial evolution method, the researchers generated a molecular "super cork" that physically jams this "entry port," thus preventing the virus from attaching itself to the cell and entering it.

Most potential therapies (and present vaccines) for SARS-CoV-2 target the so-called "spike protein" found on the virus's outer envelope. This protein, however, is prone to mutations that erode the efficacy of these treatments. This approach is not susceptible to new emerging virus variants, which is one of the main challenges in fighting the pandemic.

ACE2, attached to the membrane of lung epithelial cells and other tissues, is an enzyme important for regulating blood pressure. Therefore, as tempting as it may be to simply block this receptor to prevent the entry of SARS-CoV-2, any such strategy must not interfere with ACE2's function. Prof. Gideon Schreiber of Weizmann's Biomolecular Sciences Department, whose lab specializes in studying interactions between proteins, set out to develop a small protein molecule that could bind to ACE2 better than SARS-CoV-2 does but without affecting the receptor's enzymatic activity.

The researchers found that already after the first round of selection, the lab-made variants with tighter binding capabilities to ACE2 mimicked the mutations present in the binding domains of the most contagious SARS-CoV-2 strains, such as the British variant (Alpha), the South African variant (Beta) and the Brazilian variant (Gamma). Surprisingly, the now widespread Indian (Delta) variant relies on a different trick to be more infectious – by partially evading detection by the immune system. So far, the researchers have developed formulations in hamsters infected with SARS-CoV-2. the treatment significantly reduces disease symptoms.

To develop a potential method for administering the molecule as a drug, Schreiber and his team collaborated with Prof. YinonRudich of Weizmann's Earth and Planetary Sciences Department. Together with Dr. Ira Marton and Dr.Chunlin Li, they created an aerosol-based spray that would allow the developed molecule to be administrated by inhalation to patients.