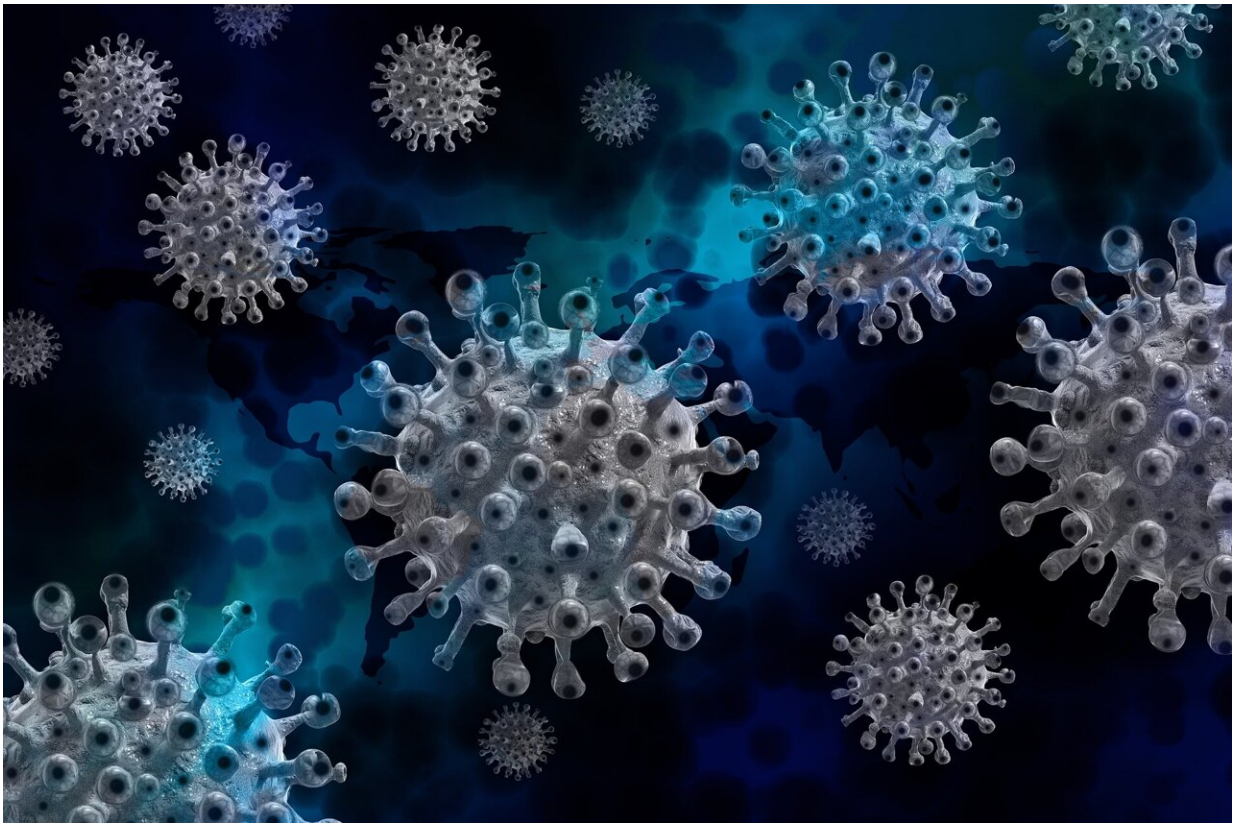
New bioengineered protein design shows promise in fighting COVID-19

March 14 2024



Credit: Pixabay/CC0 Public Domain

In the wake of the COVID-19 pandemic, scientists have been racing to develop effective treatments and preventatives against the virus. A recent scientific breakthrough has emerged from the work of researchers

aiming to combat SARS-CoV-2, the virus responsible for COVID-19.

Led by Jin Kim Montclare and her team, the study, published in the *Biochemical Engineering Journal*, focuses on the design and development of a novel protein capable of binding to the spike proteins found on the surface of the coronavirus. The goal behind this innovative approach is twofold: first, to identify and recognize the virus for diagnostic purposes, and second, to hinder its ability to infect human cells.

The engineered protein, resembling a structure with five arms, exhibits a unique feature—a hydrophobic pore within its coiled-coil configuration. This feature enables the protein not only to bind to the virus but also to capture small molecules, such as the antiviral drug Ritonavir.

Ritonavir, already utilized in the treatment of SARS-CoV-2 infections, serves as a logical choice for integration into this protein-based therapeutic. By incorporating Ritonavir into the protein, the researchers aim to enhance the treatment's efficacy while simultaneously targeting the virus directly.

The study marks a significant advancement in the fight against COVID-19, showcasing a multifaceted approach to combating the virus. Through a combination of protein engineering and computational design, the team has devised a promising strategy that may revolutionize current treatment modalities.

Although the research is still in its early stages, with no human or animal trials conducted as yet, the findings offer a proof of principle for the therapeutic potential of the designed protein. The team has demonstrated its ability to enhance the protein's binding affinity to the virus spike protein, laying the groundwork for future investigations.

The potential applications of this protein-based therapeutic extend

beyond COVID-19. Its versatility opens doors to combating a range of viral infections, offering a dual mode of action—preventing viral entry into human cells and neutralizing virus particles.

Furthermore, the success of this study underscores the importance of computational approaches in protein design. By leveraging computational tools such as Rosetta, the researchers have accelerated the process of protein engineering, enabling rapid iterations and optimization.

The development of this novel protein represents a significant step forward in the ongoing battle against COVID-19. As research progresses, the integration of computational design and protein engineering holds promise for the development of innovative therapeutics with broad-spectrum antiviral capabilities. While challenges remain, this study offers hope for a future where effective treatments against emerging viral threats are within reach.

More information: Dustin Britton et al, Dual coiled-coil protein domain mimic and drug delivery vehicle for SARS-CoV-2, *Biochemical Engineering Journal* (2024). DOI: 10.1016/j.bej.2024.109261

Provided by NYU Tandon School of Engineering