Using origami DNA to trap large viruses

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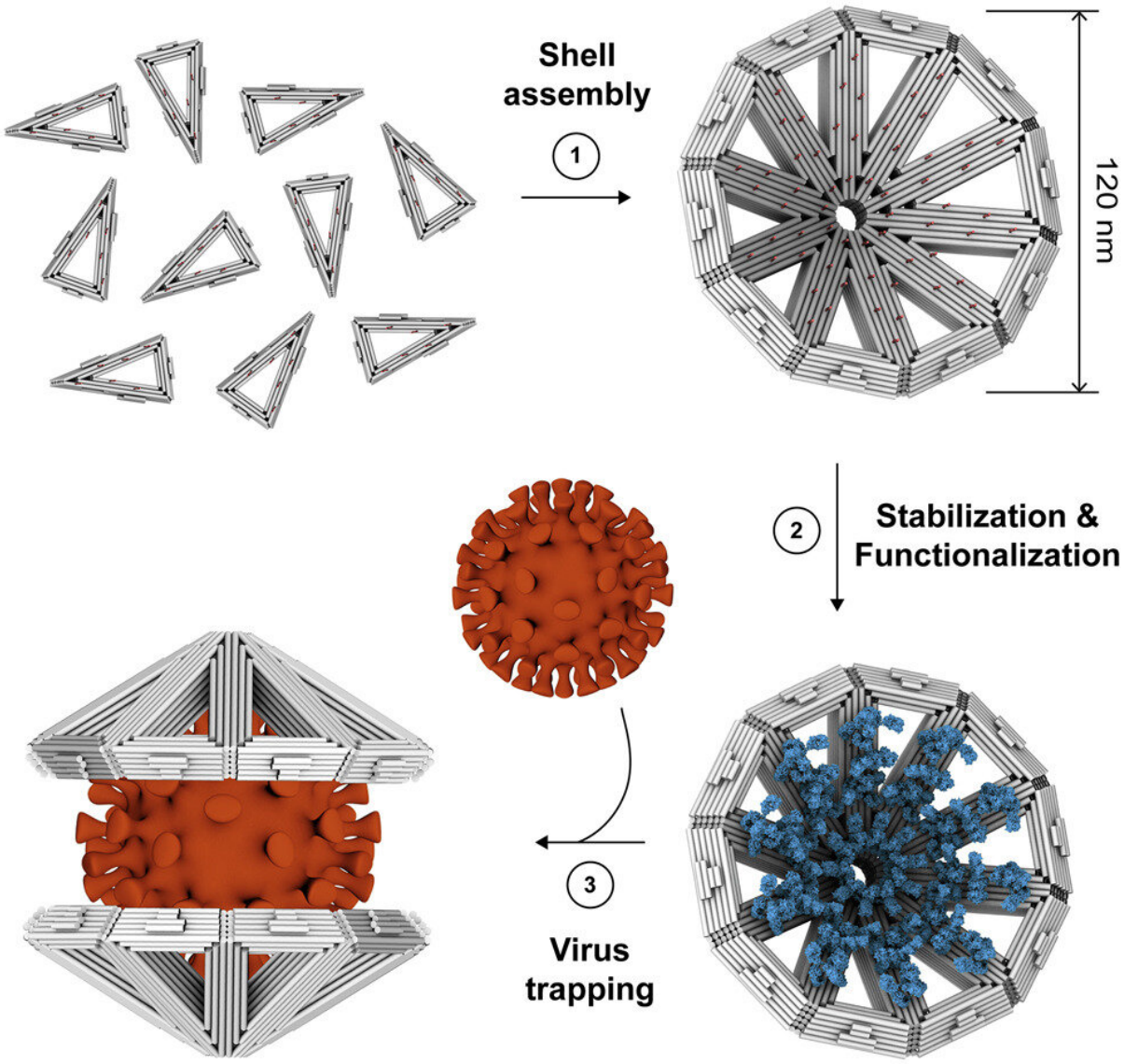

Graphical abstract. Credit: *Cell Reports Physical Science* (2023). DOI:

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A team of researchers from the Technical University of Munich and the University of Regensburg, both in Germany, has found that it is possible to build origami DNA structures that can be used to trap large viruses. In their paper published in the journal *Cell Reports Physical Science*, the group describes how they built their structures and how well they worked when tested.

As the global pandemic continues, albeit in a less deadly phase, the medical science community continues to look for ways to prevent people from becoming infected with not just the SARS-CoV-2 virus, but all viruses. One such approach involves the use of structures designed to attract viruses and when they come close enough, to trap them. In this new effort, the researchers have tested the idea of using origami DNA.

DNA origami involves strands of DNA manipulated to create two or three-dimensional shapes, all at the nanoscale. In this new work, the researchers expanded on prior work done by some of the team members who together had developed a process for using DNA origami to trap very small viral particles.

To create larger traps for larger viruses, the team used both long and short strands of DNA that had been designed to stick together in useful ways. They then used them to create triangular 2D building blocks that when placed near each other would snap together like puzzle pieces. They then set to work creating structures that they believed could serve as virus traps.

After confirming that the structures they had in mind had the desired shapes, they coated the insides of them with chemicals or antibodies that

are known to bind with viruses. They then tested the traps by placing them in the vicinity of live viruses. They found that the traps worked as hoped, capturing viruses as large as 100nm in diameter. When trapped, viruses were unable to bond with other cells, thus preventing infections.

The researchers tested their traps with several types of viruses—from Zika, to influenza to SARS-CoV-2—and found that they worked equally well on all of them. They also found that they could make them more durable by shining a UV light on them and by covering them with an oligosine polymer. They next plan to test their traps in live lab animals.

More information: Alba Monferrer et al, DNA origami traps for large viruses, *Cell Reports Physical Science* (2023). DOI: 10.1016/j.xcrp.2022.101237