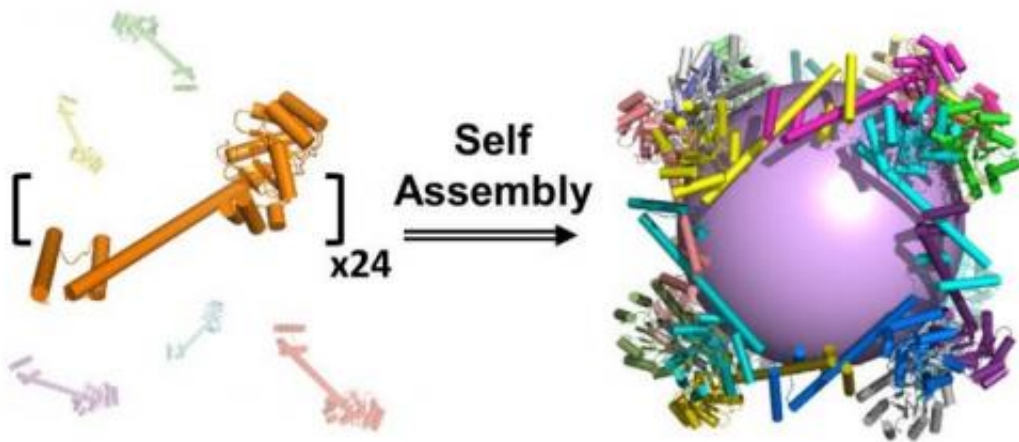


New nanoscale protein container could lead to synthetic vaccines and medicine delivery method

November 19 2014, by Stuart Wolpert



A molecular cage created by designing specialized protein pieces. On the left is one copy of the designed protein molecule. The 24 copies of it on the right, each colored differently, make the molecular cage. The lavender image on the right indicates the openness of the empty space in the middle of the container and is not actually part of the molecular structure. Credit: Yen-Ting Lai, Todd Yeates

UCLA biochemists have created the largest-ever protein that self-assembles into a molecular "cage." The research could lead to synthetic vaccines that protect people from the flu, HIV and other diseases.

At a size hundreds of times smaller than a human cell, it also could lead to new methods of delivering pharmaceuticals inside of cells, or to the

creation of new nanoscale materials.

The [protein assembly](#), which is shaped like a cube, was constructed from 24 copies of a protein designed in the laboratory of Todd Yeates, a UCLA professor of chemistry and biochemistry. It is porous—more so than any other protein assembly ever created—with large openings that would enable other large protein molecules to enter and exit.

The research was recently published online in the journal *Nature Chemistry* and will appear in a future print edition.

Yeates, the study's senior author, has sought to build complex protein structures that self-assemble since he first published research on self-assembling proteins in 2001. In 2012, he and colleagues produced a self-assembling molecular cage made from 12 protein pieces combined perfectly like pieces of a puzzle. Now they have done so with 24 pieces, and they are currently attempting to design a molecular cage with 60 pieces. Building each larger [protein](#) presented new scientific challenges, but the bigger sizes could potentially carry more "cargo."

In principle, these [molecular structures](#) should be able to carry cargo that could then be released inside of cells, said Yeates, who is a member of the UCLA–Department of Energy Institute of Genomics and Proteomics and the California NanoSystems Institute at UCLA.

Yeates' research was funded by the National Science Foundation and the UCLA–DOE Institute of Genomics and Proteomics. The lead author was Yen-Ting Lai, who conducted the research as a UCLA graduate student in Yeates' laboratory and is now a postdoctoral scholar at Arizona State University.

The molecular cube is probably too porous to serve as a container—for medicine, for example—inside a human body. "But the design principles

for making a cage that is more closed would be the same," Yeates said, adding that there are ways to make the cage less stable when it gets into a cell, so that it would release its cargo, such as a toxin that could kill a cancer cell.

Yeates said that his lab's method also could lead to the production of [synthetic vaccines](#) that would mimic what a cell sees when it's infected by a virus. The vaccines would provoke a strong response from the body's immune system and perhaps provide better protection from diseases than traditional vaccines.

Yeates has started a research collaboration with Peter Kwong, chief of the structural biology section at the National Institutes of Health and a national leader in the structural biology of disease viruses. They will conduct research on attaching viral antigens to molecular cages.

More information: "Structure of a designed protein cage that self-assembles into a highly porous cube." *Nature Chemistry* (2014) [DOI: 10.1038/nchem.2107](https://doi.org/10.1038/nchem.2107)

Provided by University of California, Los Angeles

Citation: New nanoscale protein container could lead to synthetic vaccines and medicine delivery method (2014, November 19) retrieved 1 May 2024 from <https://phys.org/news/2014-11-nanoscale-protein-synthetic-vaccines-medicine.html>

<p>This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.</p>
--