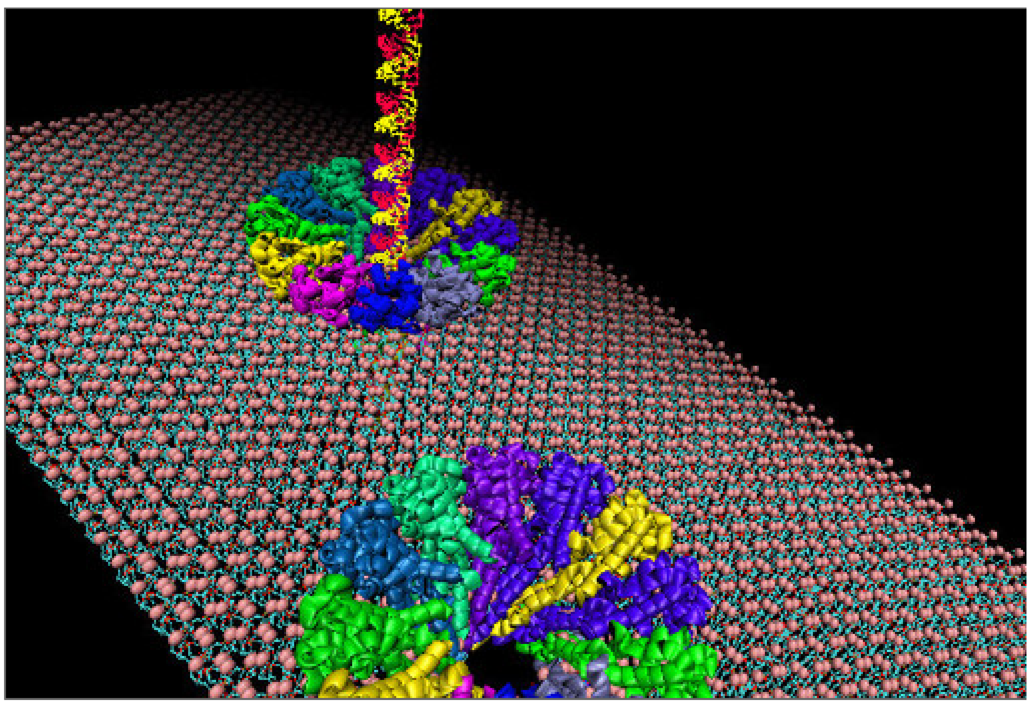

Abstract:
Using an RNA-powered nanomotor, University of Cincinnati (UC) biomedical engineering re developed an artificial pore able to transmit nanoscale material through a membrane.

Nanotech Research Featured in Nature Nanotechnology Journal

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In a study led by UC biomedical engineering professor Peixuan Guo, PhD, members of modified core of a nanomotor, a microscopic biological machine, into a lipid membrane. Th them to move both single- and double-stranded DNA through the membrane.

Their paper, "Translocation of double-stranded DNA through membrane-adapted phi29 mo appear in the journal Nature Nanotechnology, Sept. 27, 2009. The engineered channel coul sensing, gene delivery, drug loading and DNA sequencing," says Guo.

Guo derived the nanomotor used in the study from the biological motor of bacteriophage bacteria. Previously, Guo discovered that the bacteriophage phi29 DNA-packaging motor genetic material RNA to power its DNA genome through its protein core, much like a screw t

"The re-engineered motor core itself has shown to associate with lipid membranes, but we n punch a hole in the lipid membrane," says David Wendell, PhD, co-first author of the pap professor in UC's biomedical engineering department. "That was one of the first challenge enclosure into this engineered environment."

In this study, UC researchers embedded the re-engineered nanomotor core into a lipid she enough to allow the passage of double-stranded DNA through the channel.

Guo says past work with biological channels has been focused on channels large enough to genetic material.

"Since the genomic DNA of human, animals, plants, fungus and bacteria are double stra single pore system that can sequence double-stranded DNA is very important," he says.

By being placed into a lipid sheet, the artificial membrane channel can be used to load dou other therapeutic material into the liposome, other compartments, or potentially into a cell t

Guo also says the process by which the DNA travels through the membrane can have larger

"The idea that a DNA molecule travels through the nanopore, advancing nucleotide by nu development of a single pore DNA sequencing apparatus, an area of strong national interest

Using stochastic sensing, a new analytical technique used in nanopore work, Wendell says r and identify material, like DNA, moving through the membrane.

Co-first author and UC postdoctoral fellow Peng Jing, PhD, says that, compared with traditi successful embedding of the nanomotor into the membrane may also provide researchers w DNA packaging mechanisms of the viral nanomotor.

"Specifically, we are able to investigate the details concerning how double-stranded DN protein channel," he says.

The study is the next step in research on using nanomotors to package and deliver the infected cells. Eventually, the team's work could enable use of nanoscale medical devi diseases.

"This motor is one of the strongest bio motors discovered to date," says Wendell, "If you ca nanoscale rotor or a nanoscale machine … you're converting the force of the motor into something useful."

Funding for this study comes from the National Institutes of Health's Nanomedicine Devel director of one of eight NIH Nanomedicine Development Centers and an endowed chair ir UC.

Coauthors of the study include UC research assistant professor David Wendell, PhD, postdoc graduate students Jia Geng and Tae Jin Lee and former postdoctoral fellow Varuni Subram lab at Purdue University. Carlo Montemagno, dean of the College of Engineering and Colle contributed to the study.

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