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Cell Membrane Proteins

READ RETRIEVE CONNECT & USE

Next Generation Sunshine State Standard
SC.912.L.14.2: Compare and contrast the general structures of plants and animal cells. Explain the role of cell membranes as a highly selective barrier (passive and active transport).

Common Core Scientific Literacy Standard
Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

Chemists Concoct New Agents to Easily Study Critical Cell Proteins

ScienceDaily (Oct. 31, 2010) — They are the portals to the cell, gateways through which critical signals and chemicals are exchanged between living cells and their environments.

But these gateways -- proteins that span the cell membrane and connect the world outside the cell to its vital inner workings -- remain, for the most part, black boxes with little known about their structures and how they work. They are of intense interest to scientists as they are the targets on which many drugs act, but are notoriously difficult to study because extracting these proteins intact from cell membranes is tricky.

Now, however, a team of scientists from the University of Wisconsin-Madison and Stanford University has devised a technology to more easily obtain membrane proteins for study. Writing the week of Oct. 31 in the journal *Nature Methods*, the group reports the development of a class of agents capable of extracting complex membrane proteins without distorting their shape, a key to understanding how they work.

"The proteins are embedded in the membrane to control what gets into the cell and what gets out," explains Samuel Gellman, a UW-Madison professor of chemistry and a senior author of the paper along with Brian Kobilka of Stanford and Bernadette Byrne of Imperial College London. "If we want to understand life at the molecular level, we need to understand the properties and functions of these membrane proteins."

The catch with membrane proteins and unleashing their potential, however, is getting insight into their physical properties, says Gellman.

Like other kinds of proteins, membrane proteins exhibit a complex pattern of folding, and determining the three-dimensional shapes they assume in the membrane provides essential insight into how they do business.

Proteins are workhorse molecules in any organism, and myriad proteins are known. Structures have been solved for many thousands of so-called "soluble" proteins, but only a couple of hundred membrane protein structures are known, Gellman notes. This contrast is important because roughly one-third of the proteins encoded in the human genome appear to be membrane proteins.

To effectively study a protein, scientists must have access to it. A primary obstacle has been simply getting proteins out of the membrane while maintaining their functional shapes. To that end, Gellman's group has developed a family of new chemical agents, known as amphiphiles, that are easily prepared, customizable to specific proteins and cheap.

"These amphiphiles are very simple," says Gellman. "That's one of their charms. The other is that they can be tuned to pull out many different kinds of proteins."

University of Wisconsin-Madison (2010, October 31). Chemists concoct new agents to easily study critical cell proteins. *ScienceDaily*. Retrieved September 22, 2011, from http://www.sciencedaily.com-/releases/2010/10/101031154013.htm

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1. Read the article, "Chemists concoct new agents to easily study critical cell proteins." After reading the article (5-10 minutes), write down everything you can remember in the box below. The process of recalling the information is important, so do not return to the article at this point.

2. Return to the article if necessary and answer the following questions. You may also need to draw from your knowledge of biology and you should feel free to use your text or other resource.

a) What is the primary function of the cell membrane?

b) Explain the role of the proteins discussed in the article in relation to the function of the cell membrane.

c) What happens to the function of a protein if the shape of the protein is changed?

d) Using the article, cite four benefits of amphiphiles.