Mimicking Mother Nature yields promising materials for drug delivery, other applications

March 29 2011

Mimicking Mother Nature's genius as a designer is one of the most promising approaches for developing new medicines, sustainable sources of food and energy, and other products that society needs to meet the great challenges that lie ahead in the 21st century, a noted scientist said here today.

In the inaugural Kavli Foundation Innovations in Chemistry Lecture at the 241st National Meeting & Exposition of the American Chemical Society, Virgil Percec, Ph.D., said the approach — often termed "bioinspired design" — can stake a claim to becoming one of the most innovative fields in science.

"Using Nature as a model and mentor offers great promise for developing new commercial products, launching new industries, and for basic progress in science and technology," Percec said. "Nature already has found simple, elegant, sustainable solutions to some of our most daunting problems. The models are there — the leaf as the perfect solar cell, for instance — waiting for us to fathom and mimic."

Percec's laboratory at the University of Pennsylvania led an international collaboration of scientists to prepare a library of synthetic biomaterials that mimic the cell membrane, the biological films that hold the contents of the 50 trillion cells in the human body. Composed of mainly of proteins and fats, cell membranes have a crucial role in controlling the

flow of nutrients and chemical signals into cells and the exit of substances produced inside cells.

The scientists found that when certain organic substances called Janus dendrimers are added to water, they spontaneously form a menagerie of nano-sized packets shaped like bubbles, tubes, and disks. Percec named them "dendrimersomes," and indications are that the structures are ideally suited to serve as packages for carrying drugs, genes, medical imaging and diagnostic agents, and cosmetics into the body. Their structural similarity to natural cell membranes makes them highly compatible with the body's own cells.

Dendrimersomes show promise of being more stable, targeted, and effective than existing nanomaterials used for drug delivery, Percec said. The packets also tend to be uniform in size, are easily formed, and can be customized for different functions, properties which give them additional advantages in the emerging field of nanomedicine.

Percec's talk will describe dendrimersomes and other bioinspired materials, some of which show promise for improved solar cells, electronics, water purification, and other applications. It takes place on Monday, March 28, from 5:30 to 6:30 p.m., Pacific Time, in the Anaheim Convention Center, Halls D/E.

Sponsored by The Kavli Foundation, a philanthropic organization that supports basic scientific research, the lectures are designed to address the urgent need for vigorous, "outside the box" thinking by scientists as they tackle the world's mounting challenges, including climate change, emerging diseases, and water and energy shortages.

"We are dedicated to advancing science for the benefit of humanity, promoting public understanding of scientific research, and supporting scientists and their work," said Kavli Foundation President Robert W.

Conn in a statement. "The Kavli Foundation Innovations in Chemistry Lecture program at the ACS national meetings fits perfectly with our commitment to support groundbreaking discovery and promote public understanding."

More information: The Kavli lectures debut at the Anaheim meeting during this International Year of Chemistry and will continue through 2013. They will address the urgent need for vigorous, new, "outside-the-box"- thinking, as scientists tackle many of the world's mounting challenges like climate change, emerging diseases, and water and energy shortages. The Kavli Foundation, an internationally recognized philanthropic organization known for its support of basic scientific innovation, agreed to sponsor the lectures in conjunction with ACS in 2010.

Provided by American Chemical Society