Polymers show promise for gene delivery, tissue scaffolds, other biomedical applications

March 27 2007

Virginia Tech polymer scientists have developed a new family of gene vectors – novel polymers that can ferry genetic material across the cell membrane so that it can be incorporated into the machinery of the cell.

Representing Virginia Tech faculty members and students from engineering, chemistry, and veterinary medicine, Chemistry Professor Tim Long will give an invited lecture at the 233rd National Meeting of the American Chemical Society in Chicago March 25-29.

The presentation will be an overview of novel polymers developed by Virginia Tech researchers for biomedical applications, with an emphasis on gene delivery and tissue scaffolds. “Both of these emerging technologies are enabled with fundamental advances in polymer chemistry,” Long said.

“Synthetic macromolecules can be easily modified to contain a variety of functional elements capable of interacting with biological systems,” he said. “Initial studies have found macromolecular topology to be a significant parameter in the delivery of DNA into cells.”

In the cell, the new DNA initiates the manufacture of therapeutic proteins, such as might be needed to treat a genetic disease where an enzyme or protein is not produced naturally. The Virginia Tech vectors presently being tested in cell cultures are proving to be superior to

surfactant benchmarks and offer reduced toxicity to viral vectors, Long said.

Meanwhile, scientists at Virginia Tech have developed a single-step process for creating fibrous mats from a small organic molecule – a new nanoscale, biocompatible material (Jan. 20, 2006, *Science*, "Phospholipid Nonwoven Electrospun Membranes," by Matthew G. McKee, John M. Layman, Matthew P. Cashion, and. Long).

Since last year, they have improved the durability of the phospholipids through novel photochemistry during electrospinning and have begun to impregnate the porous mats with cells that will initiate tissue regeneration.

Source: Virginia Tech