DNA nanotechnology breakthrough offers promising applications in medicine (w/ Video)

March 17 2010

A team of McGill Chemistry Department researchers led by Dr. Hanadi Sleiman has achieved a major breakthrough in the development of nanotubes - tiny "magic bullets" that could one day deliver drugs to specific diseased cells. Sleiman explains that the research involves taking DNA out of its biological context. So rather than being used as the genetic code for life, it becomes a kind of building block for tiny nanometre-scale objects.

Using this method, the team created the first examples of DNA nanotubes that encapsulate and load cargo, and then release it rapidly and completely when a specific external DNA strand is added. One of these DNA structures is only a few nanometres wide but can be extremely long, about 20,000 nanometres.

Until now, DNA nanotubes could only be constructed by rolling a two-dimensional sheet of DNA into a cylinder. Sleiman's method allows nanotubes of any shape to be formed and they can either be closed to hold materials or porous to release them. Materials such as drugs could then be released when a particular molecule is present.

One of the possible future applications for this discovery is cancer treatment. However, Sleiman cautions, "we are still far from being able to treat diseases using this technology; this is only a step in that direction. Researchers need to learn how to take these DNA nanostructures, such

as the nanotubes here, and bring them back to biology to solve problems in nanomedicine, from drug delivery, to tissue engineering to sensors," she said.

The team's discovery was published on March 14, 2010 in *Nature Chemistry*. The research was made possible with funding from the National Science and Engineering Research Council and the Canadian Institute for Advanced Research.

Provided by McGill University