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(April 1, 2009) Carbohydrates are part of our daily vocabulary. We all know they're part of a healthy diet. We know they're in breads and pastas. We know they have something to do with starches and sugars. But, even though carbohydrates are so familiar, there's still a lot for science to learn about them.

"Our knowledge of carbohydrates is still in its infancy," said Nikki Pohl, an Iowa State University associate professor of chemistry. Pohl said there's more to learn about carbohydrates because it's very difficult to synthesize specific carbohydrate molecules for study. To date, that's been a slow, labor-intensive and expensive practice.

But Pohl thinks she's found a solution. She's developed a synthesis technology that's predictable, automated and much more efficient. It can even handle the production of complex carbohydrate molecules with multiple branches and long chains of sugars.

The Iowa State University Research Foundation Inc. has filed for a patent of Pohl's technology.

She says her process can fabricate a custom-order, complex carbohydrate molecule in 24 hours. Current commercial technology requires six to 12 months for the same molecule at a cost that can be 10 times higher than Pohl's technology.

Pohl has launched a startup company called LuCELLa Biosciences Inc. to license the technology and use it to produce and market carbohydrate molecules for researchers at universities, government agencies and private pharmaceutical companies. The company is now located in the Roy J. Carver Co-Laboratory on the Iowa State campus.

Pohl is developing her technology and advancing the startup company with the help of a \$66,477 grant from the Grow Iowa Values Fund, a state economic development program.

Beatrice Collet, the principal scientist for LuCELLa and a former post-doctoral researcher in Pohl's Iowa State lab, said the company plans to develop an online catalog and begin selling carbohydrates by the end of the year.

Collet said there's a need for the company's custom-order carbohydrates.

"A lot of basic research needs to be done on carbohydrates and their interactions with cells," she said. "Carbohydrates are involved in a lot of biological processes and it's still unclear exactly how they work."

And what would a better understanding produce?

Pohl said possible applications include new vaccines, new diagnostic tests for illnesses and better bio-based products.

When she talks about the new technology, Pohl likes to contrast it with studies of DNA. The ability to synthesize custom strands of proteins and nucleic acid for lab research has advanced and accelerated DNA studies.

Researchers predicted similar synthesis technologies would also work for carbohydrates, even though their structures are more complex. But researchers haven't been able to transfer three decades of DNA work into technologies that efficiently synthesize carbohydrates.

"Today biologists can mostly only dream about experiments that explore the structure and function relationships of carbohydrates for vaccine design and other more basic studies," Pohl said. "These are the types of experiments biologists now take for granted with nucleic acids and proteins."

Pohl said there's enough demand for custom-order carbohydrates – and enough potential to apply research findings – to eventually grow LuCELLa's sales to \$20 million and higher.