As more and more people are diagnosed with diabetes, the word “insulin” pops up more frequently in the news and in casual conversations. You might know that insulin is a hormone needed for regulating blood sugar in the body, and you might know that people with type-1 diabetes require insulin injections for survival. But do you know where the insulin for these injections comes from? “Up until the early 1980s, the only way to get insulin was from the pancreas of a pig or other animal,” says Michael Jewett, chemical and biological engineering. “While this worked well for most patients, some developed adverse reactions or allergies.”

This challenge was addressed by the development of recombinant DNA (rDNA) technology. Researchers discovered that they could take the gene that encodes for the insulin protein and then cut and paste that gene into a plasmid vehicle that allows it to express, or be synthesized, in another organism. In the case of insulin, the first biosynthetic human insulin was produced in E. coli bacteria. Now, most insulin used across the globe is recombinant insulin.

rDNA technology is now widely used for biotechnology and medical research and applications. Recombinant proteins are still expressed in bacteria but can also be produced in yeast, insect cells, and mammalian cells, among others. As of the summer of 2011, this research found a new home at Northwestern in the Recombinant Protein Production Core (rPPC), which is located in the basement of Silverman Hall.

“Proteins are these very functionally diverse molecules that participate in just about every biological process within cells,” says Jewett, co-director of the rPPC. “People can drop off DNA samples, and we make proteins as reagents for them to study and understand their functions.”

Co-directed by Andreas Matouschek, molecular biosciences, and Keith Tyo, chemical and biological engineering, the core does protein expression and purification of recombinant or synthetic biologics.

Proteins are responsible for the regulation and functions of virtually all biological systems. However, a large number of proteins are left with no known function. As a production facility, rPPC facilitates the expression of proteins for a broad spectrum of research activities at Northwestern, ranging from producing potential therapeutics to structure and function studies.

For example, the rPPC successfully produced a large quantity of several proteins that are typically difficult to express by using well-controlled fermenters. The protein was then used for a crystallization study for bacterial pathogens in the laboratory of Wayne Anderson, molecular pharmacology and biological chemistry. This work could potentially aid drug discovery for antimicrobials.

Before the rPPC was established, researchers produced the recombinant proteins in his own lab. They would add DNA to a microbial system and put it in a shake flask, which was then shook inside of an incubator to allow the cells to grow.

Not only can the core create large quantities of inexpensive protein reagents but the proteins are also produced in well-controlled fermenters (from 1 to 5 liters) where the pH level and temperatures are stable.

“We’re not just meeting a need of throughput,” Jewett says. “We’re also meeting a need of quality.”

In addition to producing proteins for customers, the facility also trains researchers and students on how to use the instruments in the facility. Students in Keith Tyo’s lab are already using the parallel bioreactor system in the core to run their own experiments.

“This provides a unique opportunity for a lot of students,” Jewett says. “We want them to learn techniques and technologies that are going to be applied in their own professional careers down the road.”

For more information about the rPPC, visit http://rppo.mccormick.northwestern.edu.