Hilldale recipient Rachel Dvorak works on genome-editing system

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Genome-editing is a complex practice that allows scientists to alter gene mutations and manipulate DNA back to normal sequences. For Rachel Dvorak, it’s just another day at work.

Dvorak, a senior Biochemistry major from Rice Lake, Wis., is one of a handful of undergraduate students currently conducting research in the Michael Cox Laboratory. She spends her days working on a potentially groundbreaking genome-editing system that, one day, could allow for human gene therapy.

This research provided the foundation for Dvorak’s winning 2013-2014 Hilldale Undergraduate/Faculty Research Fellowship proposal.

As explained in Dvorak’s Hilldale proposal, the Cox lab has discovered the potential for a more effective and efficient genome-editing system. This system, which involves the optimization of the RecA and Ref proteins, could impact many areas of scientific research.

Gene therapy is critical to many fields of science, including medicine. There are many diseases to which people can be predisposed due to gene mutations, such as cancer or sickle-cell anemia. Removing these mutations could potentially treat these deadly diseases.

Dvorak says that while systems for genome-editing do currently exist, they tend to be both difficult to use and expensive. The chance of off-target effects, which could mutate other things in the genome, also hinders these systems from being used in humans. This is what makes the Cox lab’s findings so groundbreaking.

But, Dvorak says, the research does not come without its challenges.
“Science theoretically works out really well, but when you put it into practice, the results don’t always come out as you expected,” Dvorak said. “There are so many unpredictable variables and outcomes.”

Challenging or not, Dvorak’s research in the Cox lab has allowed her to apply for many scholarships that, in turn, have further benefitted her other research and studies. One such award was the Hilldale Fellowship.

Dvorak’s Hilldale award was used to fund part of a trip to the University of Cambridge last summer to conduct other research. And the funds will also send her to a national conference this spring, where Dvorak will present her senior thesis research project.

Plus, Dvorak says, the Hilldale application process itself was beneficial. It not only helped her to prepare for other scholarship applications, but her proposal also built the foundation of her senior thesis. The ability to get so much mileage out of the one application made the work more than worth it, according to Dvorak.

It is for that reason, and countless others, that Dvorak says she would encourage all students to apply for the Hilldale Fellowship. And she is eager to offer her advice to potential applicants.

Dvorak says to lay out your project well ahead of time. This gives you the opportunity to collect preliminary data and see what results you might get from your research, which can be really helpful in pinpointing the most feasible way to carry out your project. Plus, knowing early on what your project will look like will give you plenty of extra time to write your proposal.

Furthermore, Dvorak says to never underestimate the power of a letter of recommendation. It can be critical in earning a position or an award, so take the opportunity to get to know your professors and mentors. Finally, she says to be sure to take advantage of all the resources available on this campus.

Dvorak’s suggestions are certainly to be taken to heart, as she has already demonstrated great success in the scholarship field. In addition to being a 2014 Hilldale Fellow, Dvorak is also a 2014 Goldwater Scholar and a 2015 Marshall Scholarship finalist.

This fall, Dvorak will head to medical school to pursue an MD/PhD. She foresees a future for herself as a Physician-Scientist, a position that will allow her to mediate scientific discovery and medicine.

No matter where her path winds next, it is certain that the future ahead of Dvorak is shockingly bright.