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Cailen Blaire's Research Prepares Her for Dental School Entrance Exam

Cailen Blaire discovered a new method of synthesizing vanillin. Photo by Blanton Leigh / GWU Photo Staff

BOILING SPRINGS, N.C.—For her Undergraduate Research Project, Cailen Blaire, of Hermitage, Pennsylvania, discovered a new method to synthesize vanillin, the compound that gives vanilla its characteristic taste and scent.

She was one of 15 GWU students who received a grant from the Undergraduate Research Scholars Program. She worked 40 hours a week for five weeks on her project, which she will present in a professional forum.

The experience of using the instrumentation in the GWU chemistry lab will help her when she applies to dental school. A senior, Blaire is majoring in biology with a biomedical science concentration and minoring in chemistry. "The techniques that I used—Infrared spectroscopy, Nuclear Magnetic Resonance spectroscopy and chromatography—are often questions on the DAT (Dental Admission Test) entrance exams," Blaire explained. "This opportunity has also provided me with an interesting and unique topic to talk about during any dental school interview I might receive in the future. Specifically, it will allow me to demonstrate how I applied what I learned in class to a real-world question about science."

Her mentor was professor of chemistry, Dr. Benjamin Brooks. With his guidance, she conducted a series of reactions to synthesize vanillin from pure curcumin. The first one was a known reaction that converted the curcumin to curcumin diacetate. “The next reaction used a common oxidant called potassium permanganate (or $KMnO_4$) to oxidize curcumin diacetate to vanillin acetate,” Blaire related. “This reaction had never been done before using that oxidizing agent. Once vanillin acetate was formed, a known reaction using hydrochloric acid was used to hydrolyze the product to vanillin.”

The most surprising aspect of her research was that the method she used to synthesize vanillin worked the first time. “Typically, chemical synthesis takes many attempts to produce successful results,” she observed. “Nevertheless, our hypothesis was confirmed on the first attempt of the experiment.”

Learn more about the Department of Natural Sciences and the Undergraduate Research Scholars Program.

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