Chemistry team is developing superbug-killing disinfectants

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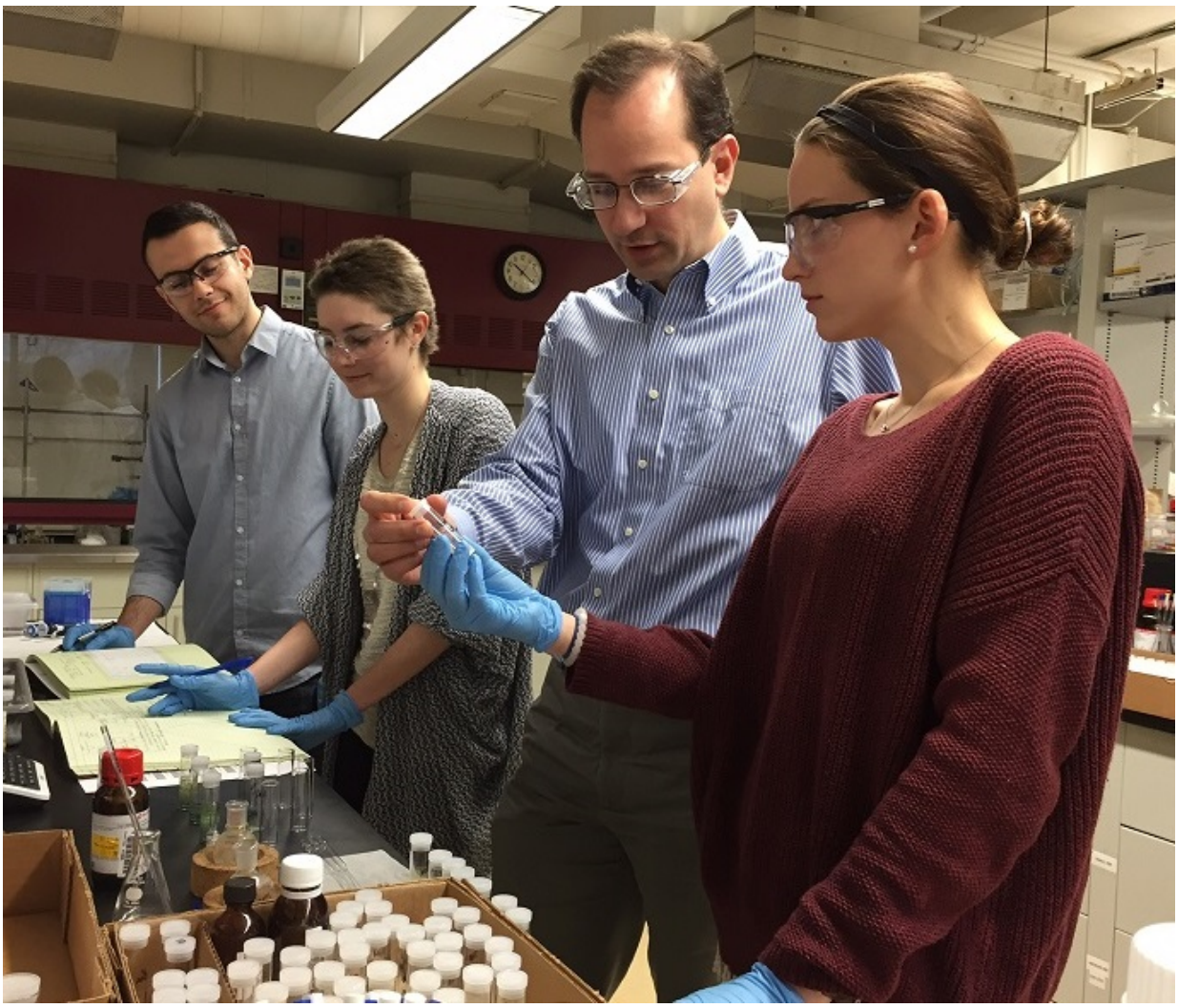

More than 100,000 people a year die from hospital-acquired infections, and a Villanova team led by Associate Professor of Chemistry Kevin P.C. Minbiole, PhD, is doing cutting-edge research to help combat infections such as these.

Minbiole and his students – graduate and undergraduate – are developing disinfectant chemical compounds that have the potential to destroy infectious bacteria, even drug-resistant strains. Disinfectant solutions are the frontline defense against infectious bacteria, but while the commercially available disinfectants have largely remained the same, bacteria have begun to develop resistance faster than new products can reach the market.

The compounds Minbiole's team is creating are distinctive for their application as well as for their shape and function. Many of the world's best known and widely used sanitizers employ quaternary ammonium compounds (QACs) to "lyse," or burst, harmful bacteria cells. Traditional disinfectant molecules are shaped like arrows; the experimental molecules developed at Villanova resemble tridents. The result is a more potent structure which offers the promise of achieving the same or better ability to kill harmful bacteria, but with less active ingredient. That's not only good for manufacturers, but great for the environment as well.

Minbiole and his researchers have created more than 300 compounds and the results so far are promising. In addition to having nearly a dozen papers published with collaborator Dr. Bill Wuest at Temple University, a spinoff company (NovaLyse BioSolutions) has been launched to move this technology to market.

"We're following the Edison model of discovery," says Minbiole. "Lots of trial and error is teaching us what compounds are the most effective and the least toxic."

To bring his antiseptic compounds to the next level, for the last year Minbiole has worked with Villanova colleague and polymer chemist Deanna Zubris, PhD, Associate Professor of Chemistry, to develop a polymer surface (plastic, for example) that would incorporate these compounds. "The ability to have surfaces – such as in hospitals – incorporating our compounds would be amazing," Minbiole says.

As a mentor, one of Minbiole's goals is to have each student in his research group start, finish and publish an academic project before graduation. The resulting academic publications have helped Villanova students gain entry into PhD Chemistry programs at Yale University, the University of Pennsylvania and Vanderbilt University, among others. As those young researchers' careers launch, a new cohort of students enlist, bringing their fresh perspectives to the project. The student researchers build upon the work of previous teams, exploring and citing prior research and creating a pipeline of innovation.

Six of Minbiole's current students will be presenting four posters at the March 2016 National Meeting of the American Chemical Society, the world's largest scientific society.

Provided by Villanova University

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