



Courtesy of David Wright

Confocal microscope images show two colors of quantum dots—red and green—that are attached to different anti-bodies that link to two unique structures on the surface of an infected cell. The image on the right shows the location of the green quantum dots. The image in the middle shows the location of the red quantum dots. The image on the left is a composite of the first two; the color yellow indicates where the green and red dots are both present: the narrow strips at the top and right side are cross-sections that show the quantum dots are concentrated on the cell's surface.

## Spin-off of anthrax mail attack

Following the anthrax mail attacks in October 2001, leaders at Vanderbilt, like those at other research universities around the country, examined the research projects going on around campus to see if any held promise for rapid detection of biological agents like anthrax. In the course of the exercise, the vice chancellor for research at the Vanderbilt Medical Center organized a meeting to encourage campus researchers to think about the issue. Both David Wright and James Crowe were invited.

"I really didn't know why I was there," says Wright. "But, as an assistant professor, when a vice chancellor invites you to come to a meeting, you go to the meeting!"



Photo by Daniel Dubois

David Wright and graduate student Elizabeth Bentzen

As a result of the get-together, Wright and Crowe met and started talking. Wright, who is a chemist, was exploring various ways to attach nanocrystals, microscopic fluorescent beads, to specific biological structures. Crowe, who is a pediatrician, is an expert on respiratory illnesses, including influenza. Although influenza isn't a "Class A" biological agent like anthrax, the government lists it as "Class C." So the two scientists realized that they could work together to design a detection system for influenza.

"We developed a plan based on this biodefense idea," says Crowe, "which was to develop a detection strategy for influenza, but our grant was not funded."

Despite this disappointment, the two men continued to talk. "For the first year to 18 months, Jim and I primarily sat around learning each other's vocabulary," says Wright, adding that their initial investment has paid off. "One of the reasons that we are able to do what we do so well together is that we really can speak each other's language."

## Nanotech detects viral infections

The first major success of their collaboration was getting a research proposal accepted by the [Southeast Regional Center of Excellence for Emerging Infections and Bio-Defense](#), a consortium that includes Duke, the University of North Carolina at Chapel Hill, Vanderbilt, University of Alabama at Birmingham, Emory, the University of Florida at Gainesville and the Southern Research Institute, which is receiving \$45 million in funding over five years. The focus of Wright and Crowe's proposal is to combine all kinds of antibodies with nanotechnology to create molecular recognition units for diagnostic purposes.

"This has become a 'high profile' objective of the regional center," says Wright, "because the leadership is looking for 'deliverables' and our systems look like they have a fairly short-time horizon for development."



Photo by Dana Johnson

Pediatrician James Crowe

For their first detection system, they turned to their core expertise. Crowe is one of the leading experts in the world on the respiratory syncytial virus, so they decided to design a diagnostic test specifically for RSV.

"This is just one example of many things we are trying to do as a team with diverse areas of expertise," says Crowe.

Over the past two years, he and Wright have assembled an interdisciplinary research group, called the Vanderbilt Alliance for Nanomedicine, which consists of some 20 scientists from a number of different disciplines at Vanderbilt and Oak Ridge National Laboratory who are tackling problems in infection and immunity on a broad scale using nanotechnology.