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Researchers uncover clue in spread of 'superbugs'

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A discovery from the Oklahoma Medical Research Foundation has put scientists are one step closer to finding a defense against dangerous antibiotic-resistant bacteria, sometimes called "superbugs."

In a study that will be published in the online early edition of the *Proceedings of the National Academy of Sciences,* OMRF researchers Philip Silverman, Ph.D., and Margaret Clarke, Ph.D., have obtained the first visual evidence of a key piece in the puzzle of how deadly superbugs spread antibiotic resistance in hospitals and throughout the general population.

"These 'superbugs' have become increasingly common since the widespread use of antibiotics began and they are now a serious public health menace," said Silverman, who holds the Marjorie Nichlos Chair in Medical Research at OMRF. "Now, for the first time, we can begin to see, literally, how they acquire and disseminate antibiotic resistance."

Last year, a government report estimated that nearly 19,000 people in the United States had died in a single year after being infected with the virulent superbug known as methicillin-resistant Staphylococcus aureus, or MRSA.

"MRSA and other antibiotic-resistant bugs are one of the greatest threats facing health care today," said OMRF President Stephen Prescott, M.D. "These infections are easily transmitted—they make their way into the body through breaks in the skin, even microscopic ones, and through

nasal passages. They resist treatment with standard antibiotics, which makes them dangerous. And they are particularly threatening in hospitals, because they attack patients whose immune systems may already be compromised."

The new study from OMRF casts light on the role that structures known as conjugative pili—slender, thread-like bacterial filaments —play in spreading antibiotic resistance. Although scientists have known for decades that these filaments are required to transmit antibiotic resistance genes from one bacterium to another, Silverman and Clarke are the first to capture images of them as they extend and retract on live cells.

The OMRF research team, which included Cindy Maddera and Robin Harris, attached a fluorescent dye to a virus, which in turn bound specifically to the filaments on live bacteria. This allowed the behavior of the filaments to be recorded with a high-powered fluorescence microscope. Using this process, the scientists were able to capture a detailed series of images showing filament growth, attachment to other cells, and retraction to pull the cells together in preparation for genetic transfer.

"This is an important step forward in understanding how antibiotic resistance spreads," said Silverman. Silverman and Clarke will continue to study the ways in which antibiotic resistance spreads. The aim of that work will be to help develop a better understanding of—and, ultimately, tools to combat—this life-threatening phenomenon.

"More people in the U.S. die of MRSA each year than of HIV/AIDS," said Silverman. "It's crucial that we do all we can to combat this profound threat to human health."

Source: Oklahoma Medical Research Foundation