

World Running Out of Weapons to Fight Superbugs

HOUSTON, Texas, February 3, 2009 (ENS) - People are dying from "superbugs" because our antibiotic arsenal has run dry, leaving the world without sufficient weapons to fight the ever-changing bacteria, warn infectious disease researchers at the University of Texas Medical School at Houston.

In an article in the current issue of "The New England Journal of Medicine," medical doctors Barbara Murray. and Cesar Arias evaluate the past, present and future response to preventing and treating "superbugs," organisms that are resistant to antibiotics.

Superbugs can evade antibiotics by by producing an enzyme that destroys the drug or creating a barrier to the drug, the doctors say. Or superbugs can pump out any antibiotic that reaches the bacterial cell or modify the target of the antibiotic so the drug cannot bind to it.



A colorized scanning electron micrograph of MRSA, methicillin-resistant Staphylococcus aureus (Image by Janice Carr courtesy CDC)

"Most of the public has heard of MRSA [methicillin-resistant Staphylococcus aureus] because it produces the most cases each year," said Murray, co-author and director of Division of Infectious Diseases at the UT Medical School. "However, they have not heard of other superbugs that can be far worse."

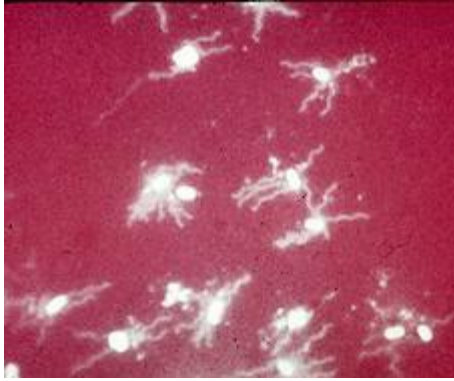
"The Gram-negative bacteria are the most antibiotic-resistant with fewer treatment options in life-threatening diseases, such as certain forms of pneumonia, bloodstream infections, gastroenteritis and even meningitis," said Murray. Gram-negative bacteria can release toxins created by their cell walls into the bloodstream, where it is harder to treat them, she said.

MRSA appears to be claiming more lives in the United States than HIV/AIDS.

According to an October 2007 report in the "Journal of the American Medical Association," 94,360 U.S. patients developed an invasive infection from MRSA in 2005 and nearly one of every five, or 18,650 of them, died. In the same year, 17,011 people died from HIV/AIDS.

Genomics is the study of an organism's genomes to chart its DNA sequencing. It was once viewed as a possible avenue to better weapons against superbugs, but Murray and Arias say that has not happened.

"We have run out of options. The promise of genomics has not panned out. Gene sequencing has not helped us find a better way to fight these bugs," said Murray.



The gram-negative bacteria *Salmonella typhi* infected peanut butter paste, causing the recall of dozens of products in January 2009. (Image by J. Michael Miller courtesy CDC)

According to a 2004 report, "Bad Bugs, No Drugs," by the Infectious Diseases Society of America, none of the 89 new drugs approved by the U.S. Food and Drug Administration were antibiotics. The report found that research on new antibiotics is drying up, due in part to the expense of bringing a new drug to market.

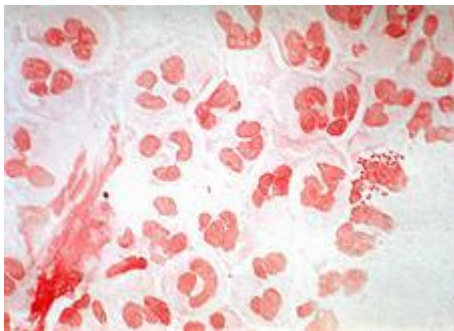
"Academics can't do it all. Pharmaceutical companies can't do it all. Everyone needs to work together to address this potential worldwide public health crisis," said Arias, co-author of the article and assistant professor in infectious diseases at the medical school.

Murray and Arias say people taking antibiotics without prescriptions or not following their prescriptions as directed allow the antibiotics to be exposed to a wide-range of bacteria in the body, both good and bad, giving the bugs an opportunity to find ways to beat the antibiotic weapons.

"This overuse threatens the effectiveness of these precious drugs," says Dr. Cindy Friedman, medical director of the Centers for Disease Control's program called Get Smart: Know When Antibiotics Work. "Doctors and patients are both part of the problem. Studies show that if a doctor believes a patient wants an antibiotic, he or she is much more likely to prescribe one, even if the patient doesn't really need one."

Most illnesses are caused by two kinds of germs - bacteria and viruses. Antibiotics work against infections caused by bacteria, like a strep throat. Antibiotics do not work against viruses like the common cold, the flu and the majority of sore throats and runny noses.

Delay in diagnosis is also an issue. Murray said even with advancements, it takes about 48 hours or more from the time a culture is taken to determine what a person may have contracted and to determine what antibiotics are likely to be effective.



The gram-negative bacteria *Neisseria gonorrhoeae* is responsible for the sexually transmitted disease gonorrhea. (Image by J. Michael Miller courtesy CDC)

"It may not sound like a lot of time, but with some of these bugs you have to move quickly to save a patient. You don't want the bacteria to spread," Murray said. "Research needs to include finding new testing methods."

"MRSA and other antibiotic-resistant bugs are one of the greatest threats facing health care today," said Stephen Prescott, M.D. president of the Oklahoma Medical Research Foundation, where researchers in November published the first visual evidence of a key piece in the puzzle of how superbugs spread antibiotic resistance in hospitals and throughout the general population.

"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," said Prescott. "And they are particularly threatening in hospitals, because they attack patients whose immune systems may already be compromised."

The Division of Infectious Diseases at the UT Medical School is working toward solutions. It has now

established the Laboratory for Antimicrobial Research, headed by Arias, within the Center for the Study of Emerging and Re-Emerging Pathogens, headed by Murray.

Supported with funding from the National Institutes of Health, the lab aims to investigate the clinical and molecular aspects of antibiotic resistance, attempting to understand the complex mechanisms by which bugs become resistant to antibiotics and then designing new strategies to combat them.

"We are struggling, really struggling, to treat patients around the world. If something isn't done soon, more and more bugs are going to gain the upper-hand. There are simply not enough new drugs to keep pace with antibiotic-resistant bacterial infections," Murray said. "We are sounding the alarm, and hopefully the world will hear it."

Click [here](#) for basic information on MRSA from the federal Centers for Disease Control and Prevention.

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