Battling 'super-bugs' to save a medical miracle

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Since its formation, the Emory Antibiotic Resistance Center has been battling a foe that threatens many of the modern miracles of medicine: the rise of bacterial strains resistant to multiple forms of antibiotics, including so-called "drugs of last resort."

David Weiss, PhD, the center's director, describes the center as a collection of experts from diverse disciplines, including clinicians, basic scientists, epidemiologists, all working together focused to combat the problem of antibiotic resistance.

"There have been traditional walls between the basic scientists, the clinicians, and the clinical microbiology lab, and we've broken down those walls." Weiss himself is a microbiologist, but as center director he is leading a team to tackle what many call one of the biggest health care challenges of our time.

James Hughes, MD, is an infectious diseases expert and co-director of the center. "This problem of antibiotic resistance is here to stay, but it has become particularly severe recently because of the emergence of these so-called 'super-bugs,' multiply-drug-resistant bacteria that cause very severe and life-threatening infections for which in some cases there is no currently effective antibiotic available."

A hundred years ago, infectious diseases constituted the leading cause of death. Then in 1928, the Scottish-born scientist Alexander Fleming made the profound discovery that the Penicillium notatum mold could

stop bacteria from growing on a laboratory plate. Eventually this discovery led to the development of penicillin, for which Fleming shared the Nobel Prize in Physiology or Medicine in 1945 with Howard Florey and Ernst Boris Chain.

But even in those early days, scientists, including Fleming, were aware of the risk of antibiotic resistance. "He warned as early as 1945 that misuse of these drugs or over-use of these drugs could lead to resistance emergence, and he was certainly correct," says Hughes.

How does antibiotic resistance develop? Infections are often initially treated with "broad spectrum" antibiotics designed to kill more than one type of bug. After a lab can test a culture from a patient and determine the type of bacteria the patient is dealing with and what medicine will work on it, treatment is adjusted. However, there are downsides to this approach. For instance, antibiotics can kill the good flora in the gut and prompt more drug-resistance bacteria to be formed. So doctors have had to improvise, sometimes using powerful "drugs of last resort." And according to Hughes, there are now cases where these powerful drugs are now proving ineffective.

Today the medical community has begun to embrace strategies of infection prevention and stewardship, a policy where antibiotics are used only when absolutely necessary. With ths and a host of other public health strategies, they hope to buy time until better therapies and more effective detection methods are developed.

Weiss and his lab team in the Division of Infectious Diseases, Emory University School of Medicine, are trying to uncover why certain strains of bacteria, which are resistant to certain dgainst these more resilient pathogens. This involves working closely with Emory's Clinical Microbiology Laboratory.

Monica Farley, MD, director of the Division of Infectious Diseases, describes the present situation this way: "We're not at the point where most infections have no treatment, but there are some infections that have no treatment and we are very concerned that if we don't interrupt that progression toward resistance, we will have more untreatable infections in the coming years."

Provided by Emory University