New tool could treat blood infections quickly

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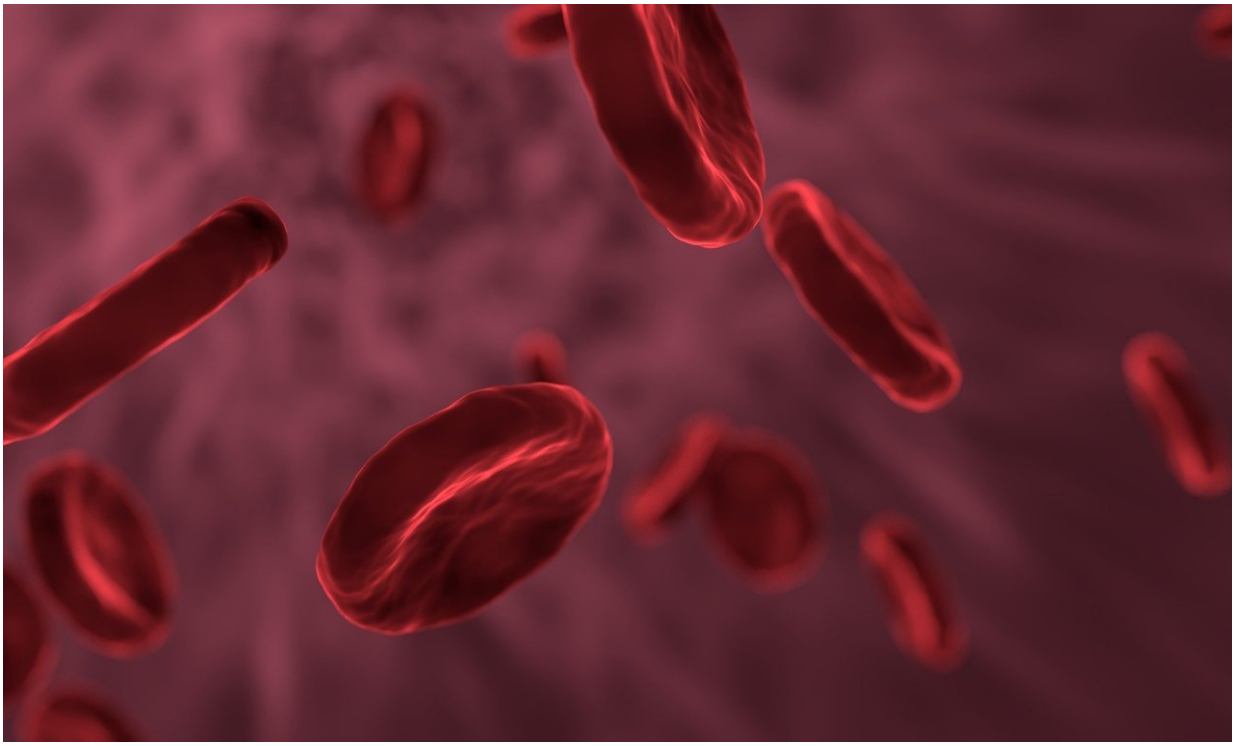

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Bloodstream infections are notoriously deadly. Not because they're untreatable, but because they work fast and are hard to diagnose. To figure out what medication to give patients, doctors need to culture the bacteria or fungi causing the infection, which takes several days.

In an attempt to treat the infection before results of the culture come

back, doctors often give patients a drug cocktail, hoping that one of the medications in the bunch will cure the patient. Often, it doesn't, and sometimes patients are harmed by taking drugs they didn't need. This practice also contributes to the increasing prevalence of antimicrobial resistance.

Mortality rates are high – bloodstream infections kill more than 600 people each day in the United States. Mohamed Seleem, a professor of microbiology in Purdue University's College of Veterinary Medicine, is trying to change this with a faster method for diagnosing these infections.

"We created a method that uses a blood sample from patients, and in 20 minutes identifies what kind of infection they have and what antibiotic or antifungal medication we should give them," Seleem said. "Doing this without giving patients the wrong treatment or creating antimicrobial resistance is really novel."

Antimicrobial resistance happens when a microorganism is able to stop a medication from working against it. As a result, standard treatments become ineffective, infections persist and continue to spread. Without effective antibiotics, major surgeries and chemotherapy become extremely high-risk.

Seleem's new diagnostic tool images the infection and identifies it from the rest of the cells and bacteria in the blood. Once he finds the bacterium he's looking for, he can go inside it and analyze it. The findings were published in the journal *Analytical Chemistry*.

"Like each person has an individual fingerprint, each bacterium has a single fingerprint that's specific to that infection," Seleem said. "We created a library with the fingerprint of each infection, that way, we can quickly identify what kind of infection the patient has."

The original study considered only a single bacterium. Now, Seleem wants to make the technique more efficient and verify that it works on the six most common bloodstream infections. With help from Ji-Xin Cheng, a professor of biomedical engineering at Boston University, and a $1.7 million grant from the National Institutes of Health, he's working toward these goals.

"The mortality rate is very high because patients can die from this in a few hours," he said. "Finding a fast, efficient diagnostic tool is in high demand. We could save a lot of lives."

More information: Weili Hong et al. Antibiotic Susceptibility Determination within One Cell Cycle at Single-Bacterium Level by Stimulated Raman Metabolic Imaging, *Analytical Chemistry* (2018). DOI: 10.1021/acs.analchem.7b03382

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