Study suggests giving infected patients combinations of antibiotics may promote resistance

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A team of researchers from the Hebrew University and Shaare Zedek Medical Center has found evidence that suggests administering combinations of antibiotics to patients with bacterial infections might be

promoting resistance transmission. In their paper published in the journal *Science*, the group describes their research on patients with bacterial infections and what they learned.

Over the past several years, researchers have found that disease-promoting bacteria have evolved resistance to many antibiotic agents. Because of that, doctors have been giving patients multiple kinds of antibiotics with the hope that at least one of them will kill the bacteria. But now, it seems that this practice might be making things worse in the long run. They found that it can lead to an increase in resistance to the drugs in combination therapies.

To investigate the issue, the researchers studied a patient with a blood infection of the Staphylococcus aureus bacteria. The patient was given vancomycin, and when that did not quash it, the doctors added rifampicin. After eight days, the doctors replaced vancomycin with daptomycin. As the patient was being treated, the researchers took blood samples to determine how well the treatment was working, but it also allowed the researchers to test the tolerance level of the microbes individually and directly against all of the drugs that were used to treat the patient.

They report that after giving the patient the combination of drugs, the bacteria were killed more slowly by daptomycin. They note that a reduction in killing speed indicates an evolutionary step toward resistance. The researchers also carried out additional tests with other kinds of infections, and report finding the same results. They suggest that giving patients combinations of antibiotics is making bacteria develop resistance to the drugs that still work. They next plan to study the effect in patients infected with different types of bacteria.

More information: J. Liu el al., "Effect of tolerance on the evolution of antibiotic resistance under drug combinations," *Science* (2019).

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