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Fewer antibiotics to better fight bacterial infections

A multicentre study conducted by a team from UNIGE, HUG, CHUV and the Cantonal Hospital St. Gallen shows that a shorter course of antibiotics is equally effective, while limiting the development of resistance.

The increase in antibiotic resistance and the lack of new antibiotics is currently a major global health problem. Reducing the use of antibiotics appears to be one of the only solutions to preserve their effectiveness and limit the emergence of resistance. Relatively long courses of treatment remain standard, however, although they seem to be based on medical tradition rather than on sound scientific evidence. For example, in the case of bacteraemia, a common but potentially dangerous bloodstream infection, it is common practice to automatically prescribe a 14-day course of antibacterial treatment. Physicians from the University of Geneva (UNIGE), the University Hospitals of Geneva (HUG), the University of Lausanne (UNIL), the Centre Hospitalier Universitaire Vaudois (CHUV) and the Cantonal Hospital St. Gallen, in Switzerland, wanted to test, in a multicentre study including more than 500 patients, whether a shorter treatment, which therefore would be less likely to select for resistance, was possible. Their results, published in the journal *JAMA*, show that a treatment duration reduced by half is equally effective. In addition, the scientists demonstrate that tailoring the antibiotic regimen to each patient's individual characteristics and disease patterns would allow the drug dose to be reduced even further without loss of therapeutic benefit. This work leads to new recommendations aimed at promoting the rational use of antibiotics, which remain our best weapons against bacteria responsible for many diseases.

Bacteraemia is a blood infection that usually originates from urinary or pulmonary infections that can be caused by several types of bacteria. Although very common in the elderly, it is still severe and must be treated effectively by antibiotics. Most physicians routinely prescribe an antibiotic for 14 days, even if the patient's condition improves rapidly. "We only have a limited catalogue of antibiotics, the effectiveness of which is constantly decreasing", explains Angela Huttner, a researcher in the Departments of Pathology and Immunology and of Medicine at UNIGE Faculty of Medicine and a physician at HUG Division of Infectious Diseases, who led this work. "We must therefore absolutely preserve our resources, and this means using them sparingly. Nevertheless, we had to demonstrate that a shorter treatment did not preclude the recovery of patients." Indeed, since the 1990s, the development of new antibiotics has nearly come to a halt due to the pharmaceutical industry's lack of interest in these unprofitable drugs, and the paucity of new therapeutic targets.

Fourteen days, seven days or less?

The research team set up a large-scale randomized study involving 504 patients recruited in three Swiss hospitals between April 2017

High resolution pictures

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and May 2019. “We randomly divided our sample into three groups”, says Werner Albrich, an infectious diseases physician at St. Gallen Hospital. “The first group, the control group, received the usual 14-day course of antibiotics. The second group received the same antibiotic, but only for seven days. The third group had their antibiotic duration determined individually, depending on each patient’s level of inflammation.”

Towards personalised treatment

“In addition, our work also shows that it is possible to customize treatment for each patient”, adds Pierre-Yves Bochud, a professor at CHUV/UNIL Division of Infectious Diseases. “This requires daily measurement of CRP - a protein present in the blood that marks inflammation - a routine test that is carried out anyway in the case of bacteraemia.” In this study, the scientists stopped the treatment course in the patients assigned to the third group as soon as their individual CRP level had dropped from its peak by 75%, though ensuring a minimum of five days of antibiotics, with the same success as the other two groups.

In addition, they identified certain risk factors: older age, in particular, as well as the pathogen involved. *Escherichia coli* is indeed more easily eliminated than other bacteria, regardless of the duration of treatment. “The principle of ‘one size fits all’ is less and less true in medicine, and the characterization of biomarkers of inflammation could lead to truly personalized treatments, while limiting the risk of resistance. As a first step, we can already recommend reducing the treatment of bacterial bloodstream infections to seven days”, the authors conclude.

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