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Pressemitteilung

Technische Universität Dresden
Benjamin Griebe

04.03.2025
http://idw-online.de/de/news848425

Forschungsergebnisse, Wissenschaftliche Publikationen
Ernährung / Gesundheit / Pflege, Gesellschaft, Medizin, Umwelt / Ökologie
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Smoking and antibiotic resistance: How cigarette waste promotes the spread of resistant germs

Antibiotic resistance is a major global health problem: it implies that vital drugs are no longer effective. A study led by researchers at the Institute of Hydrobiology at TUD Dresden University of Technology demonstrates that pollutants from cigarette smoke and cigarette waste can promote the growth and spread of resistant bacteria in the environment. The interdisciplinary and international research group also shows that smoking increases the spread of resistant bacteria in the human lung. The study is published in the journal "Environmental Health Perspectives".

Every year, millions of people die from the direct consequences of smoking. The study by the Dresden scientists, which was carried out in collaboration with the University Hospitals in Dresden and Heidelberg as well as Tsinghua University in China, now shows that smoking also poses indirect health risks when pollutants from cigarette smoke and cigarette butts are released into the lung and the environment.

"Cigarette filters contain many of the toxic substances found in cigarette smoke," explains Dr. Uli Klümper from the Institute of Hydrobiology at the TUD. "In our study, we found that when these filters end up in waterbodies, they are increasingly colonized by potentially pathogenic bugs and bacteria displaying antibiotic resistance, as these are particularly well adapted to the adverse conditions on the filters."

The cigarette butts colonized with resistant and pathogenic bacteria can then be transported to rivers, other waterbodies, or beaches, contributing to the spread of dangerous bacteria. "This underlines the need for stricter measures against the careless discarding of cigarette butts and highlights another hidden health hazard caused by smoking," Klümper emphasizes.

Smoking increases the spread of resistant bacteria in the human lung

The study also confirms the effects for the consumers of tobacco products: Smokers could promote a faster spread of resistant germs in their own lungs, resulting in a lower effectiveness of administered antibiotics in the case of future lung infections.

Different bacterial species can exchange resistance genes via so-called plasmids - small DNA molecules that bacteria pass on to each other. This enables bacteria that were previously treatable with antibiotics to acquire resistance to these antibiotics making them no longer treatable.

"In our experiments with an artificial lung medium, we were able to show that the toxic substances that accumulate in the lung fluid due to cigarette smoke trigger a stress reaction in the bacteria, which, among other things, more than doubles the frequency with which resistance genes are passed on between bacteria via plasmids," explain the researchers.

wissenschaftliche Ansprechpartner:

Dr. Uli Klümper
TUD Dresden University of Technology
Institute of Hydrobiology
Phone: +49 351 463-43273
E-mail: uli.kluemper@tu-dresden.de

Originalpublikation:

Effects of cigarette-derived compounds on the spread of antimicrobial resistance in artificial human lung sputum medium, simulated environmental media and wastewater, http://doi.org/10.1289/EHP14704

First authors: Dr. Peiju Fang & M.Sc. Diala Konyali
Correspondence: Dr. Uli Klümper

URL zur Pressemitteilung: http://Funded by the German Research Foundation (DFG), the German Federal Ministry of Education and Research (BMBF) and the Chinese Research Council (CRC) through the “Urban Resistome” and the “Explore-AMR” projects.

Researchers demonstrate that pollutants from cigarette smoke and cigarette waste can promote the growth and spread of resistant bacteria in the environment.
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