Pathogenic drug-resistant bacteria found in wastewater treatment plants

March 21, 2019 – Infections caused by drug-resistant bacteria are a global public health threat causing serious illness and even death. Strains of the bacterium *Enterococcus faecium* (*E. faecium*) are generally harmless in healthy people, but can be pathogenic in immunocompromised or severely ill patients. *E. faecium* strains from hospital environments have acquired resistance to commonly used antibiotics, including those used to treat serious infections, making these infections especially challenging to treat.

In a study published today in *Genome Research*, researchers conducted a survey of 20 municipal wastewater plants in England, and isolated drug-resistant *E. faecium* from all sites in both untreated and treated wastewater plants except three, which use ultraviolet light disinfection. Importantly, drug-resistant *E. faecium* counts were significantly higher in untreated wastewater from plants that were direct recipients of hospital sewage. A genomic comparison of *E. faecium* isolates from wastewater and bloodstream isolates of infected patients revealed two major lineages, with ampicillin-resistant bacteria in clade A1 and A2 and vancomycin-resistant bacteria exclusive to clade A1. Further genetic analysis revealed the presence of shared antibiotic, metal, and biocide resistance genes in clade A1 isolates from bloodstream, hospital sewage, and municipal wastewater.

This study demonstrates close genetic relatedness of drug-resistant *E. faecium* isolates released into the environment with those that cause serious human disease. Further research is needed to determine the public health implications of exposure to healthcare- and waste-associated pathogens. Terminal ultraviolet light disinfection of wastewater is one solution that would reduce environmental contamination with drug-resistant bacteria.

Researchers from the University of Cambridge, Public Health England, Addenbrooke's Hospital, Wellcome Trust Sanger Institute, London School of Hygiene and Tropical Medicine, British Society for Antimicrobial Chemotherapy, University of Oslo, and Mahidol University contributed to this work. The study was funded by grants from the Health Innovation Challenge Fund, Wellcome Trust Research Training Fellowship, Wellcome Trust Sir Henry Postdoctoral Fellowship, and European Research Council.

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About the article:

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distribution and release into the environment. *Genome Research* doi: 10.1101/gr.232629.119

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Launched in 1995, *Genome Research* (www.genome.org) is an international, continuously published, peer-reviewed journal that focuses on research that provides novel insights into the genome biology of all organisms, including advances in genomic medicine. Among the topics considered by the journal are genome structure and function, comparative genomics, molecular evolution, genome-scale quantitative and population genetics, proteomics, epigenomics, and systems biology. The journal also features exciting gene discoveries and reports of cutting-edge computational biology and high-throughput methodologies.

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Image Caption: Wastewater settlement tank
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