# Hospital wastewater favors multi-resistant bacteria

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Scientists from the University of Gothenburg, Sweden present evidence that hospital wastewater, containing elevated levels of antibiotics, rapidly kills antibiotic-sensitive bacteria, while multi-resistant bacteria continue to grow. Hospital sewers may therefore provide conditions that promote the evolution of new forms of antibiotic resistance.

It is hardly news that hospital wastewater contains antibiotics from patients. It has been assumed that hospital sewers could be a place where multi-resistant bacteria develop and thrive due to continuous low-level antibiotic exposure. However, direct evidence for selection of resistant bacteria from this type of wastewater has been lacking, until now.

A research group at the University of Gothenburg, Sweden, led by Professor Joakim Larsson, has sampled wastewater from Sahlgrenska University Hospital in Gothenburg, and at the inlet and outlet of the local municipal treatment plant for comparison. They first removed all bacteria from the wastewaters by filtering and tested how the filtered wastewater affected bacteria in different controlled test systems in the lab.

"The results were very clear," says Joakim Larsson. "In all assay, we could see that antibiotic-sensitive bacteria were rapidly killed by the hospital wastewater, while the multi-resistant ones continued to grow. The wastewater entering the municipal treatment plant, primarily made up of wastewater from households, showed a very slight effect, while we could not see any effect of the filtered wastewater."

"It is good news that the wastewater entering the Göta Älv river is not selecting for resistant bacteria, but the strong selection by hospital wastewater is concerning," says Larsson. "Strong selection pressure that favors multi-resistant bacteria is the most important driver behind the evolution of new forms of resistance in pathogens. We now know that hospital wastewater does not only contain pathogens, it can also favor

resistant bacteria."

Sweden uses very little antibiotics compared to many other countries in the world. It is therefore plausible that hospitals wastewaters from other places in the world also favor resistant bacteria, but this remains to be investigated. The researchers found some antibiotics that could explain some of the effects on bacteria, but they say that more research is needed to clarify exactly what is favoring the multi-resistant ones.

"One possible way to reduce risks could involve pre-treatment of wastewater at hospitals, something that is done in certain countries already", explains Larsson. "To find the best ways to reduce risks, including designing possible treatment measures, it is critical to first figure out which antibiotics or other antibacterial chemicals explain selection for resistance. That is something we are working on right now."

The study has been published in the scientific journal *Environment International*.

**More information:** Nadine Kraupner et al. Evidence for selection of multi-resistant E. coli by hospital effluent, *Environment International* (2021). DOI: 10.1016/j.envint.2021.106436

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