

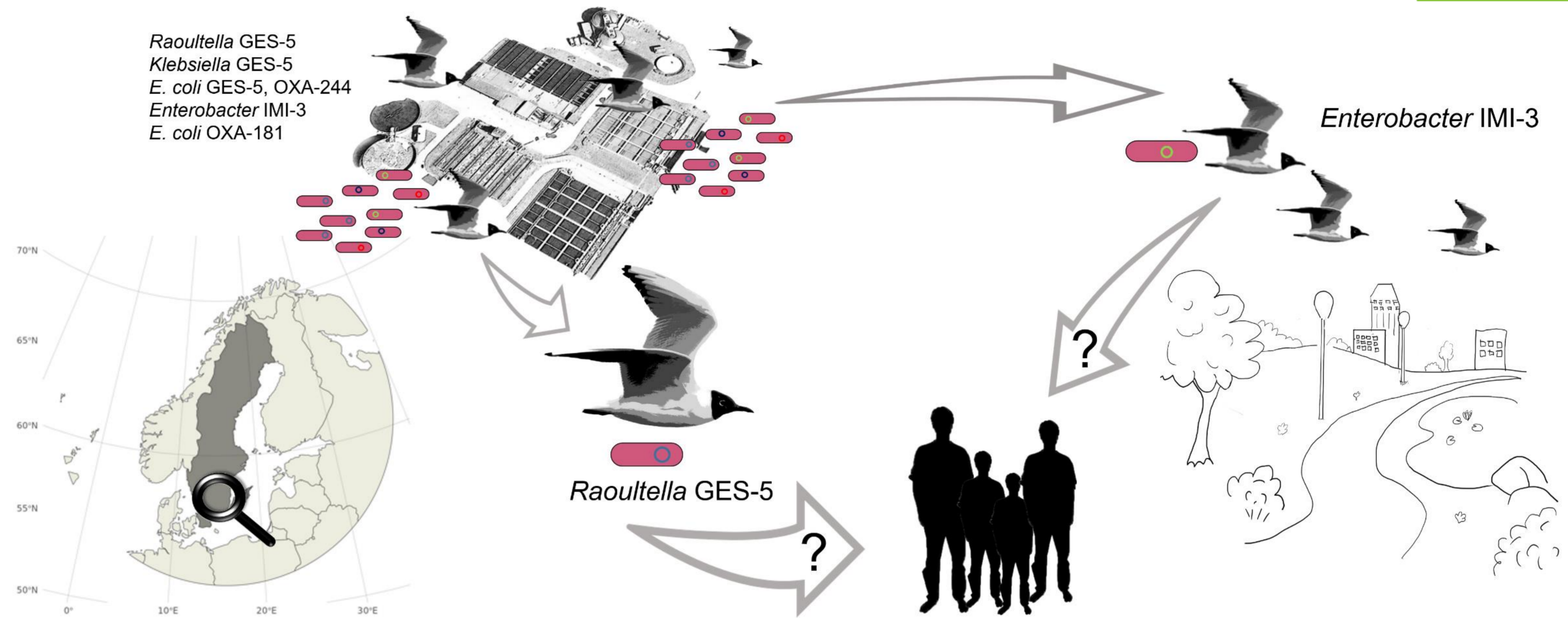
Dissemination of Carbapenemase-producing Enterobacterales through WWTP and WWTP-feeding gulls in Sweden

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- First report of CPE in animals in Sweden.
- The same CPE in both birds and the wastewater sedimentation basin.
- The WWTP may act as a point source for acquiring AMR among feeding gulls and risk of further dissemination.



Background & Objectives

- The emergence of carbapenemase-producing Enterobacterales (CPE) is a threat to both human and animal health.
- Investigation of the presence of CPE at a Swedish wastewater treatment plant (WWTP) and among aquatic birds; Black headed gulls interacting with environments impacted by the WWTP and other anthropogenic elements with a One Health approach.

PAIRWISE is a transnational research project within the Joint Programming Initiatives for antimicrobial resistance, **JPIAMR**. Partners are from five different countries: Norway, Spain, Sweden, Tunisia and Uganda. The aim is to study the role of WWTPs in dispersal of antimicrobial resistance and how it influences grazing cattle and aquatic birds in contact with surface waters.



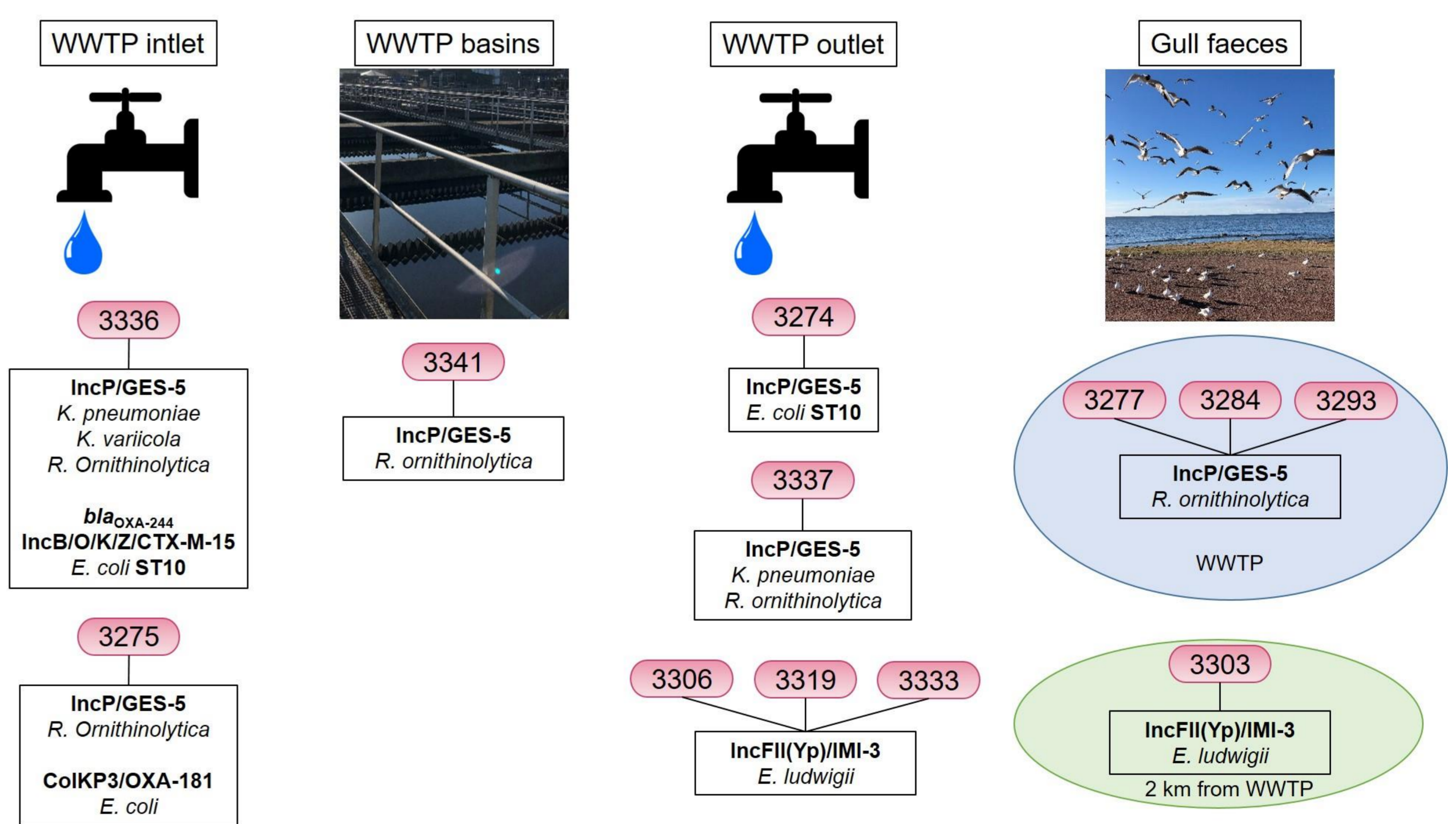
A One-Health approach within the fields of agriculture, wastewater treatment and medicine, is crucial when improving the health of humans, animals and the environment.

Methods

- Sampling of WWTP inlet and outlet, sedimentation basins, surface seawater from key aquatic bird habitats and freshly deposited gull faeces was done on six separate occasions during May to September 2021.
- Following broth enrichment, selective screening of putative CPE was performed on mSuperCarba™ (CHROMagar).
- Species identification was done with MALDI-TOF.
- Antimicrobial susceptibility testing was performed according to EUCAST.
- In total, seventeen CPE were verified by genome sequencing.

Results

- 17 CPE carrying bla_{GES-5} , bla_{IMI-3} , $bla_{OXA-181}$ or $bla_{OXA-244}$.
- bla_{GES-5} was carried on IncP plasmids in 4 different species; *E. coli* ST10 from WWTP outlet, *R. ornithinolytica* from WWTP inlet, outlet and sedimentation basins as well as gull faeces collected at the WWTP and *Klebsiella* spp. from WWTP inlet and outlet.
- The genetic environment surrounding bla_{GES-5} was similar in two *C. freundii* causing human infections.
- The bla_{IMI-3} was carried on IncFII(Yp) plasmids in 4 *E. ludwigii*, from WWTP outlet and gull faeces collected at a recreational city park 2 km from the WWTP.
- $bla_{OXA-181}$ was located on a COLKP3 plasmid found in *E. coli*, while $bla_{OXA-244}$ was chromosomally located in *E. coli* ST10, both from WWTP inlet.
- The data supports that CPE dissemination in the environment is spread by both possible horizontal gene transfer and by clonal propagation.
- The detection in gulls and wastewater, indicate a great host variability with a potential risk of environmental, anthrozoonotic and zooanthroponotic transmission.



The CPE collected in the study.

