Eawag
Swiss Federal Institute of Aquatic Science and Technology

eawag aquatic research

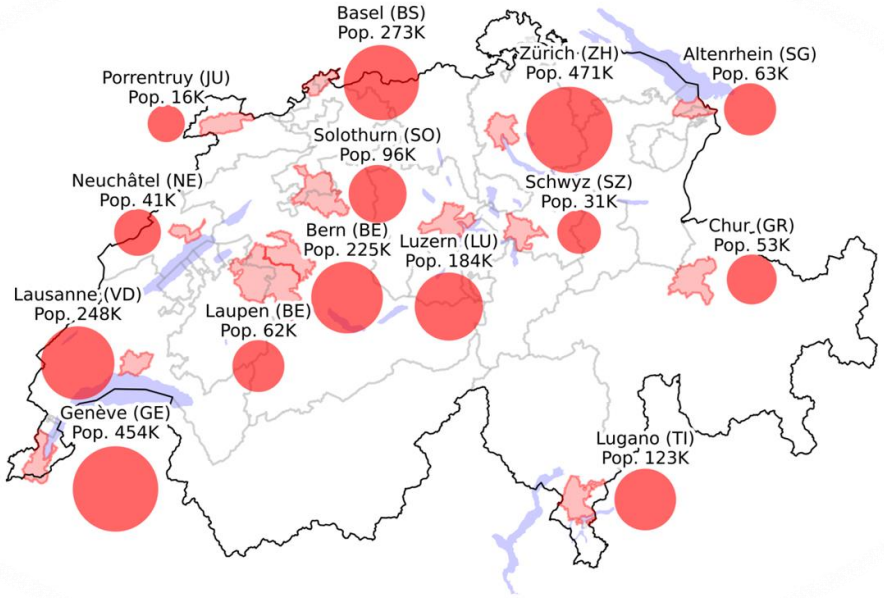
The Swiss knife of wastewater-based epidemiology: Methods to quantify viral pathogens and antibiotic resistant bacteria

Sheena Conforti & Jolinda de Korne

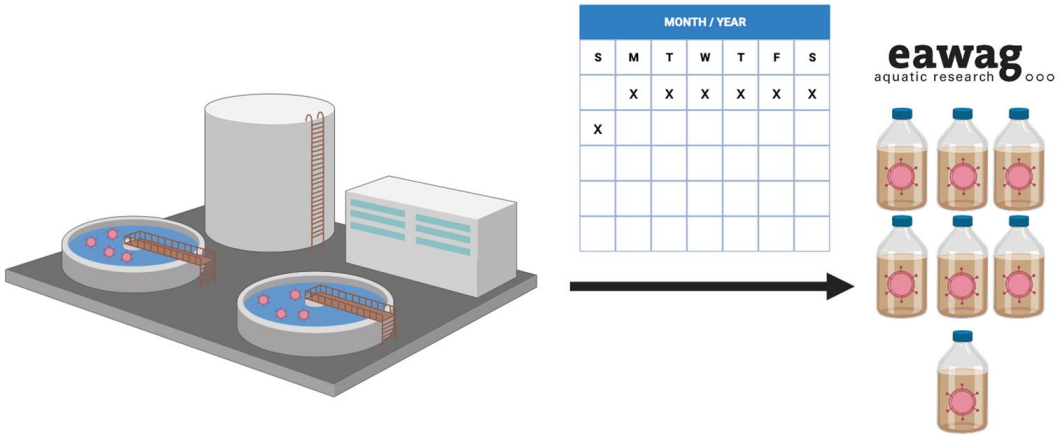
Town Hall X: Wastewater Witchers and Watchers

17 November 2023

Wastewater-based Infectious disease Surveillance and Epidemiology (WISE) project



27% of Swiss population covered



5 out of 7 samples analyzed weekly

Wastewater-based Infectious disease Surveillance and Epidemiology (WISE) project

Quantify concentration of respiratory viruses & antibiotic resistant bacteria

Calculate SARS-CoV-2 effective reproduction number from wastewater

Track SARS-CoV-2 variants using amplicon-based sequencing data

Determine RNA stability during sewage transport

Wastewater-based Infectious disease Surveillance and Epidemiology (WISE) project

Quantify concentration of respiratory viruses & antibiotic resistant bacteria

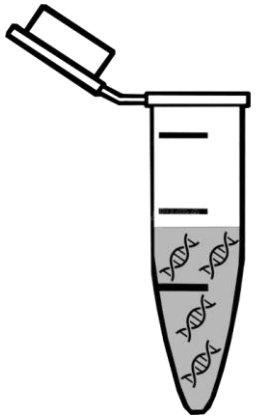
Calculate SARS-CoV-2 effective reproduction number from wastewater

Track SARS-CoV-2 variants using amplicon-based sequencing data

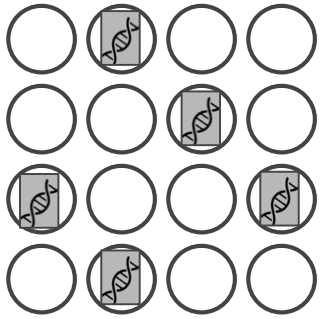
Determine RNA stability during sewage transport

The principle of digital PCR

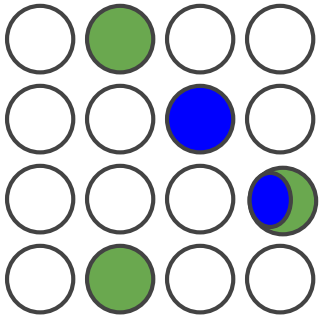
Sample preparation



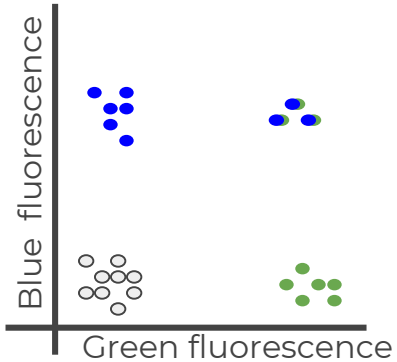
Partitioning PCR reaction



Fluorescent signal detection



Concentration calculation

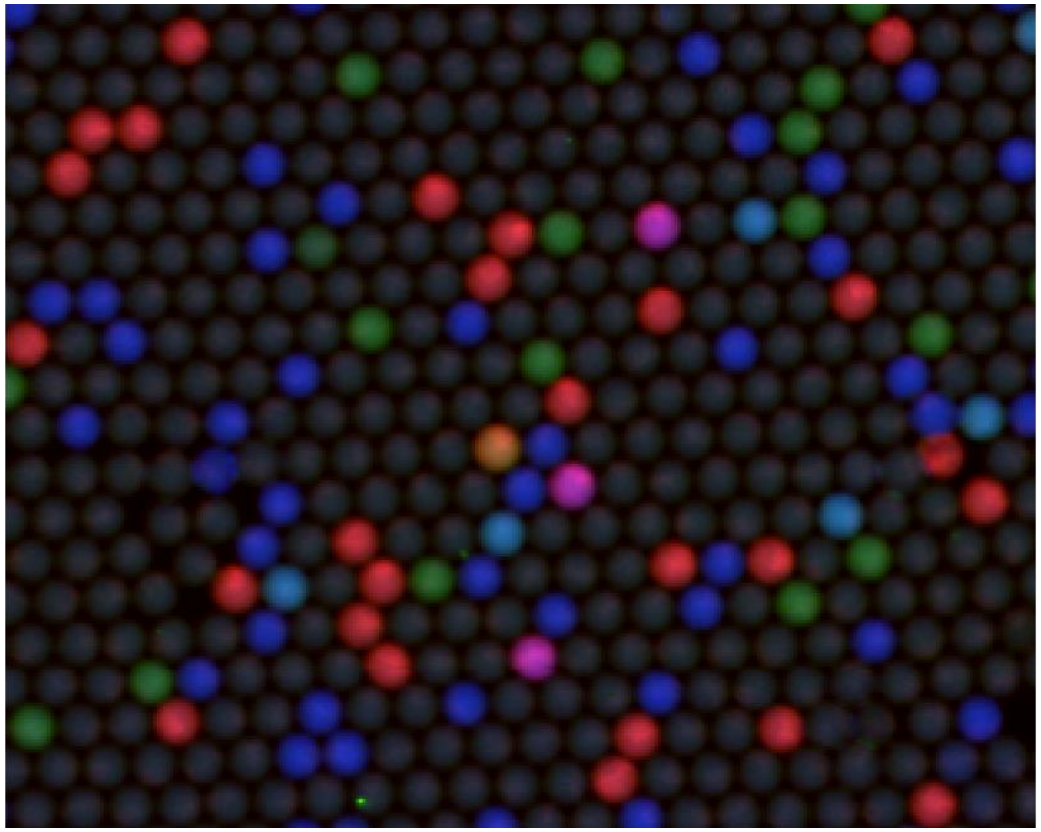


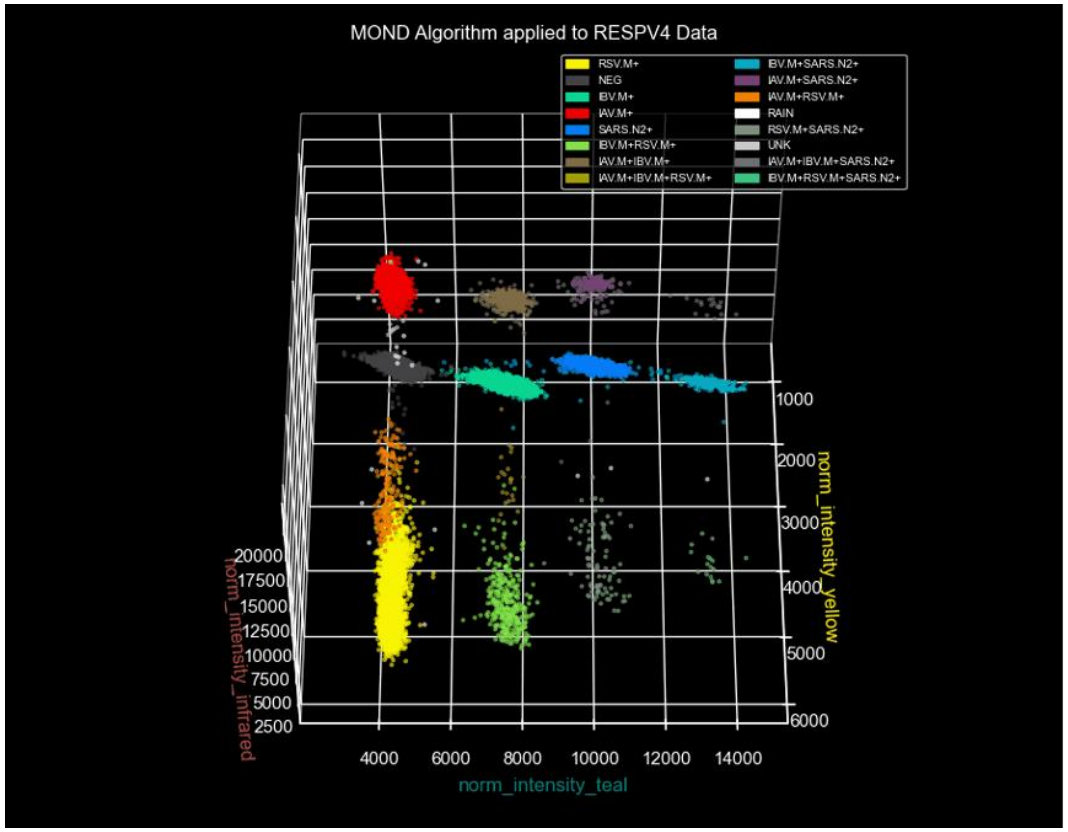
Digital PCR has several advantages compared to qPCR

1. Quantitative without a standard curve
2. More robust to inhibition
3. Ability to multiplex

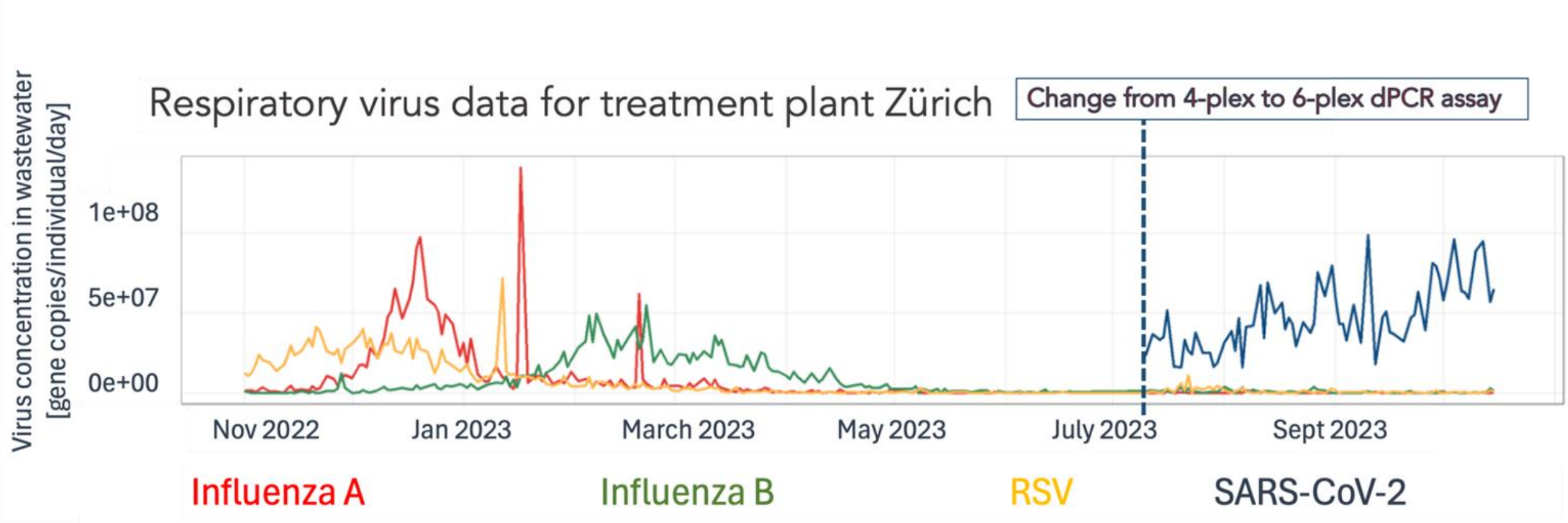
Stilla technologies

Multiplexing with digital PCR (Stilla Technologies)





Quantification of respiratory viruses using digital PCR



Monitoring clinically-relevant antibiotic resistant bacteria using culture methods

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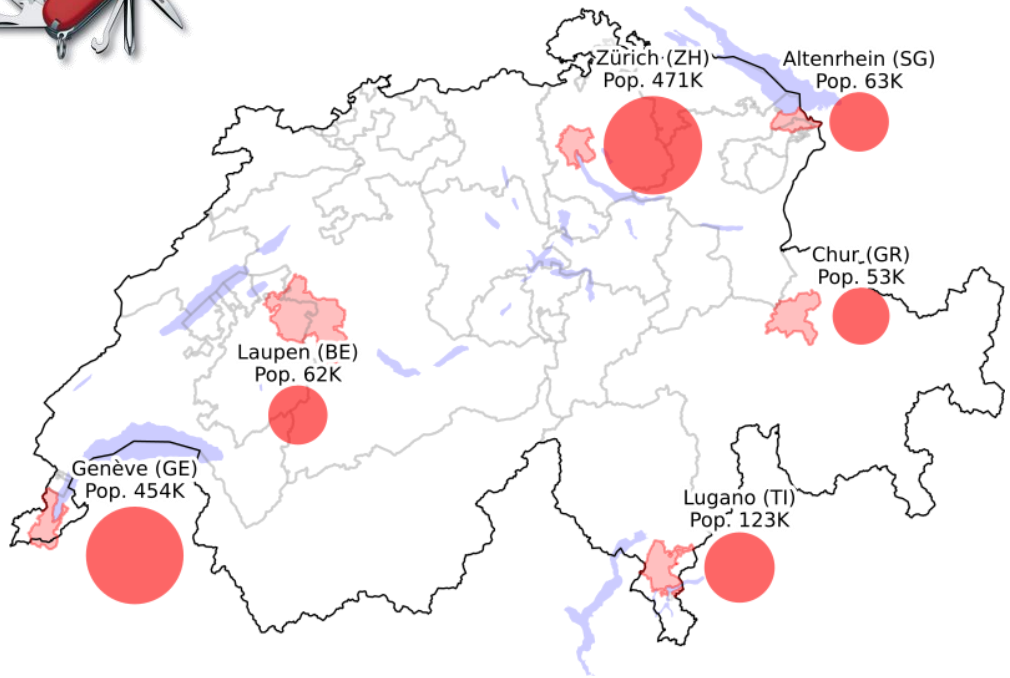
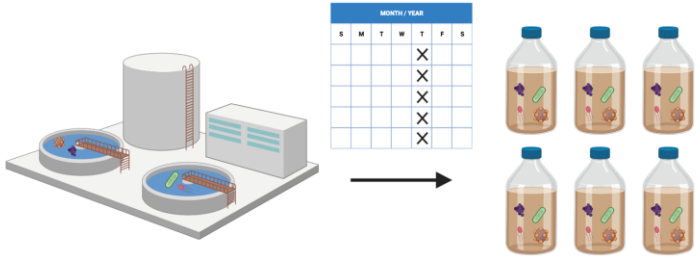
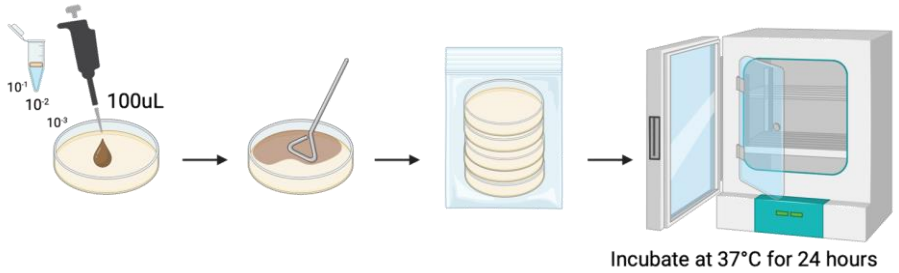
November 2021 – Now



14% of Swiss population covered



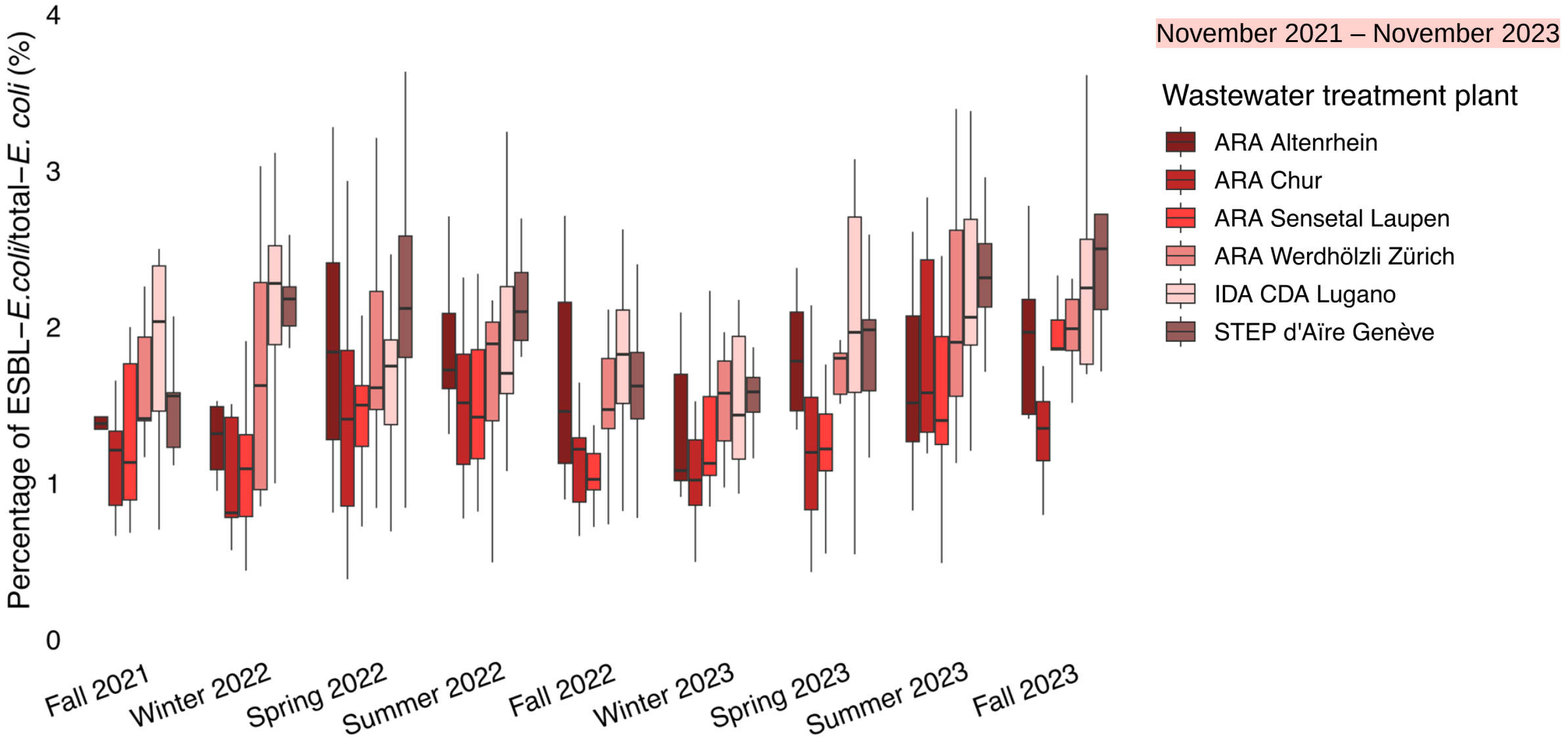
samples analyzed weekly for each WWTP



Wastewater plated on chromogenic agar with and w/o antibiotic

6 targets

Extended-spectrum β-lactamase producing *Escherichia coli*



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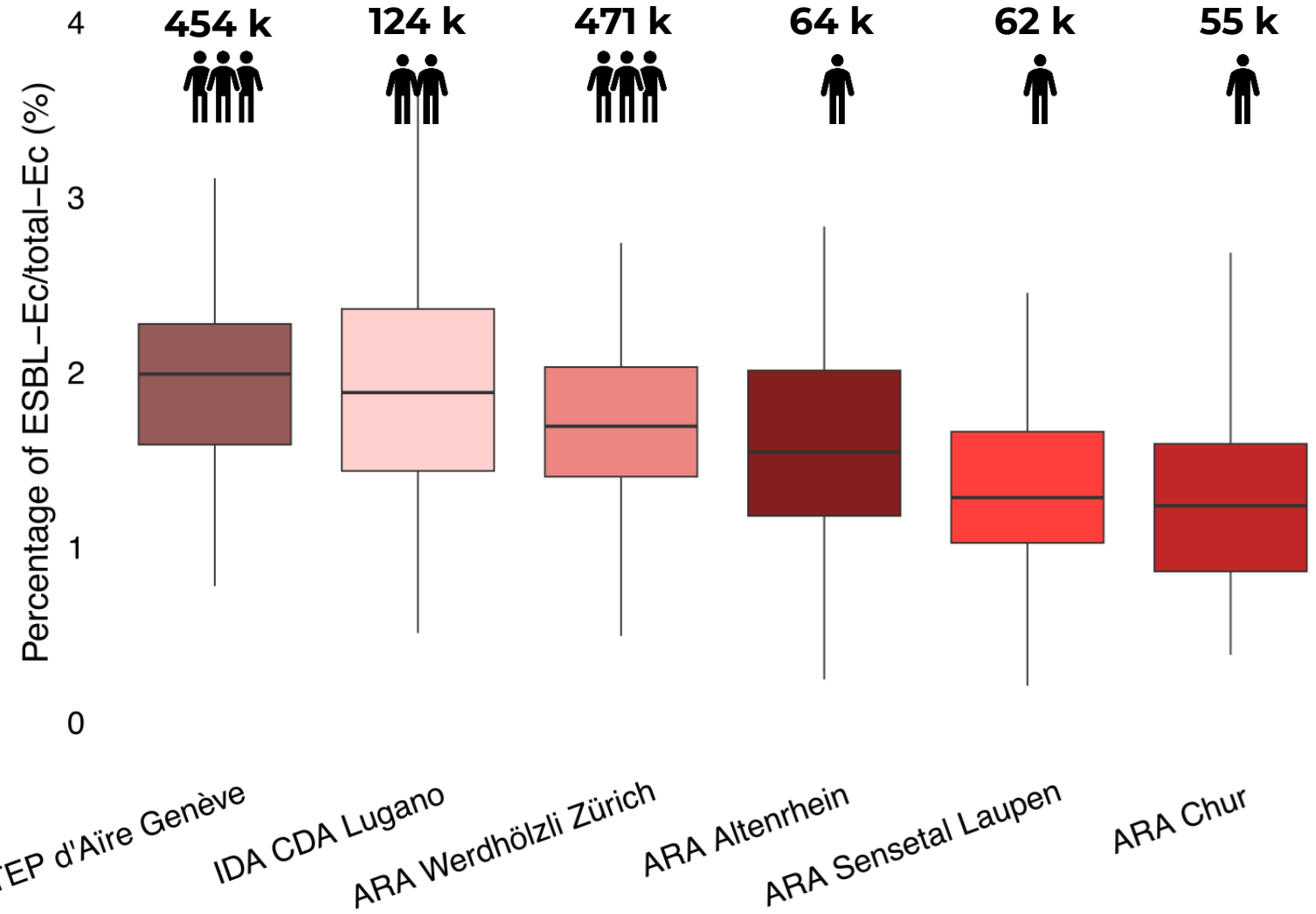


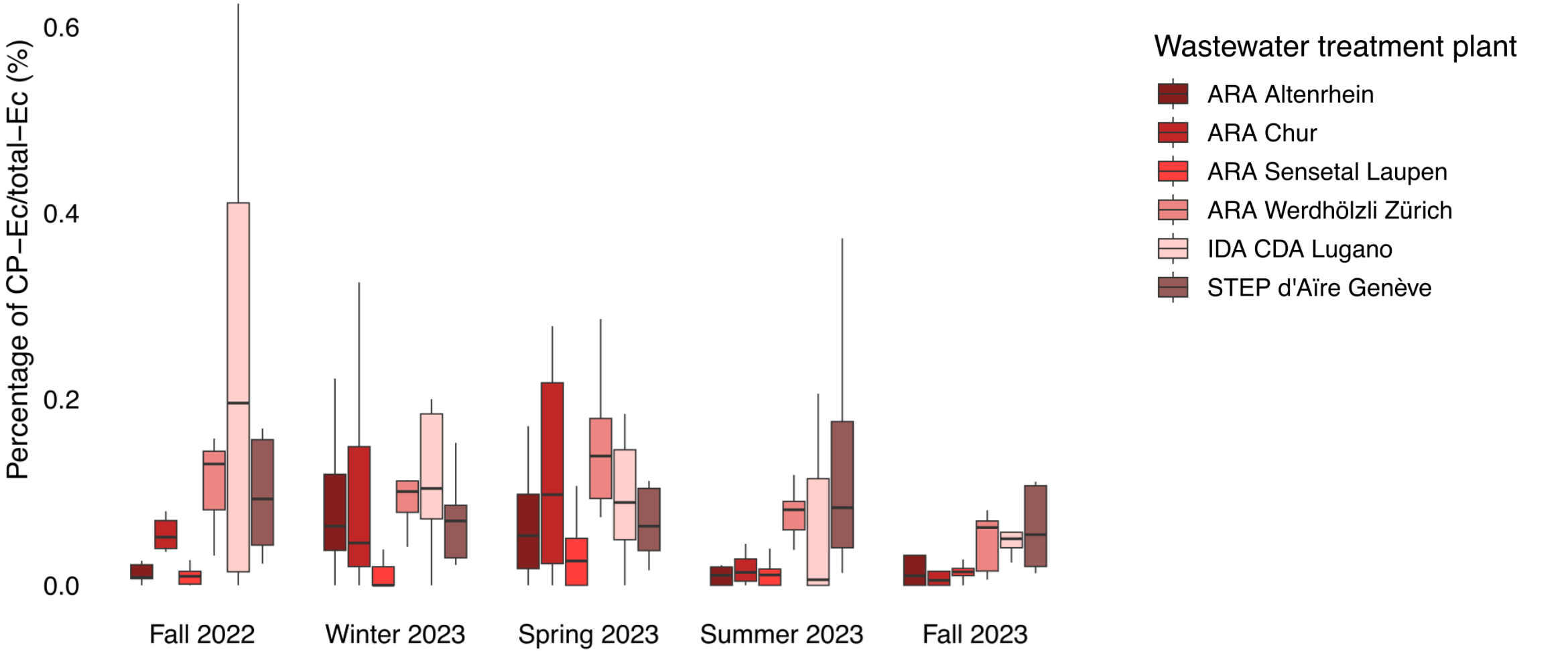
November 2021 – November 2023

Wastewater treatment plant

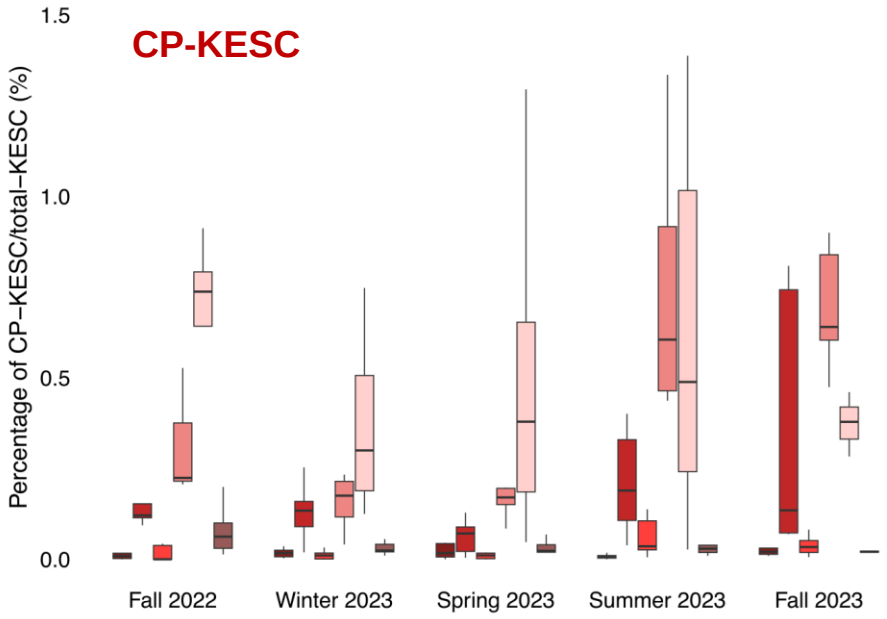
- ARA Altenrhein
- ARA Chur
- ARA Sensetal Laupen
- ARA Werdhölzli Zürich
- IDA CDA Lugano
- STEP d'Aïre Genève

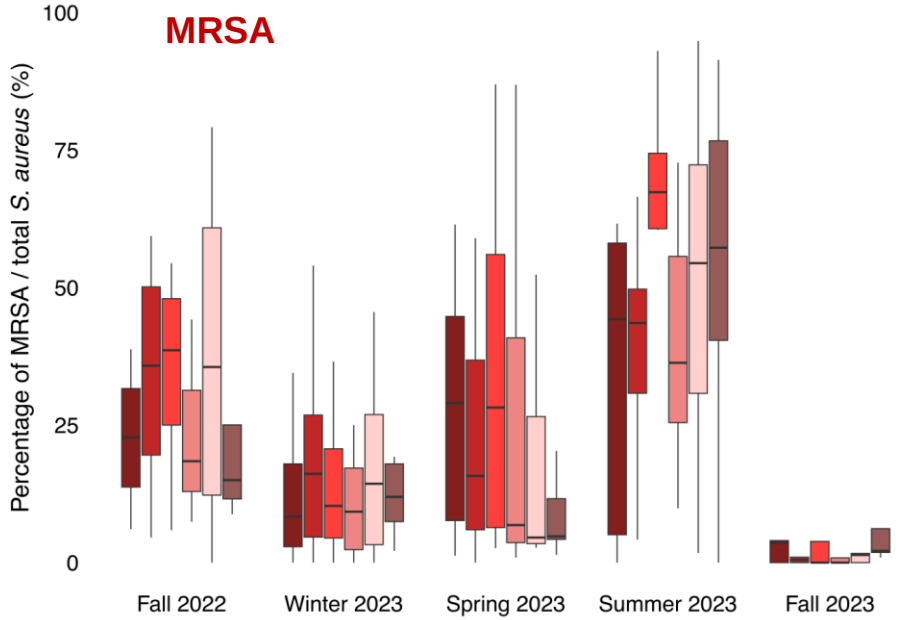
Carbapenem-producing *Escherichia coli*

November 2022 – November 2023



Additional targets





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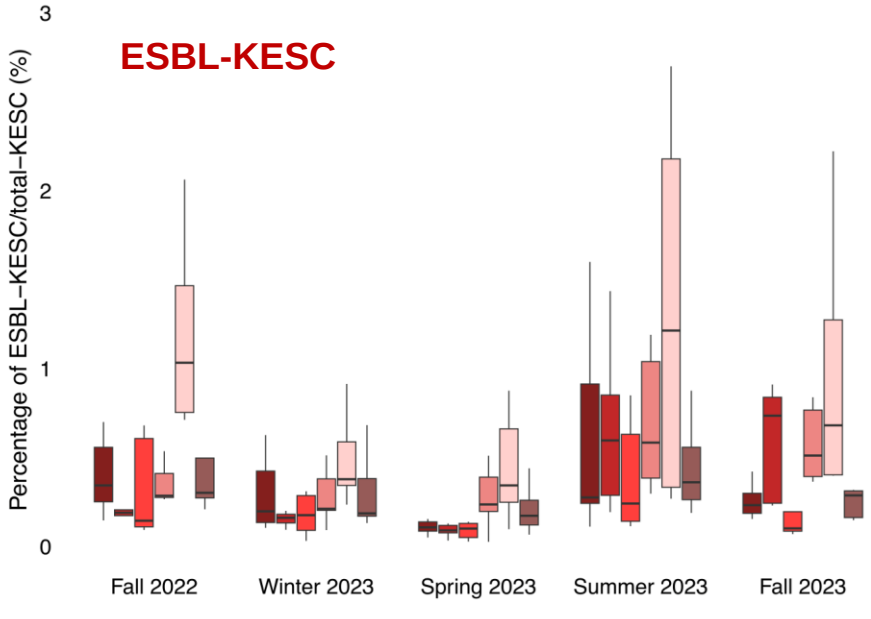

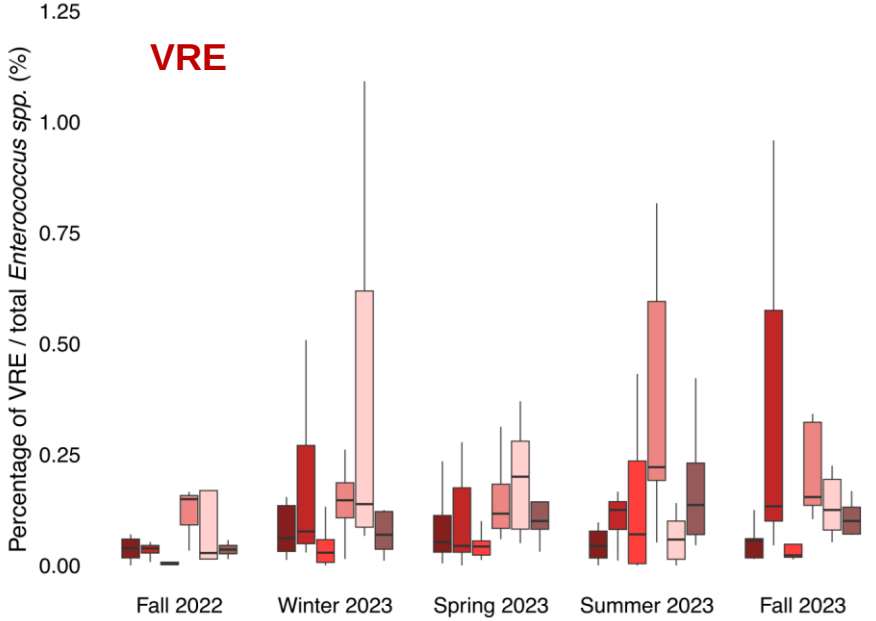

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Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Federal Office for the Environment (FOEN)

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Federal Office of Public Health (FOPH)

SIB Swiss Institute of Bioinformatics

nexus Personalized Health Technologies

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