

Intensive care unit sinks as a reservoir for bacteria with transmissible antimicrobial resistance mechanisms

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Background

Antimicrobial resistance (AMR) threatens public health and healthcare around the globe (1). AMR can spread between bacteria via plasmids and mobile genetic resistance elements (MGRE) (2). Previously, a MGRE with fourteen genes against seven classes of antibiotics has been identified conferring resistance to many first-line antibiotics (Fig1) (3). This MGRE and potential other AMR mechanisms pose a risk of creating multi-drug resistant bacteria that endanger public health and global healthcare.

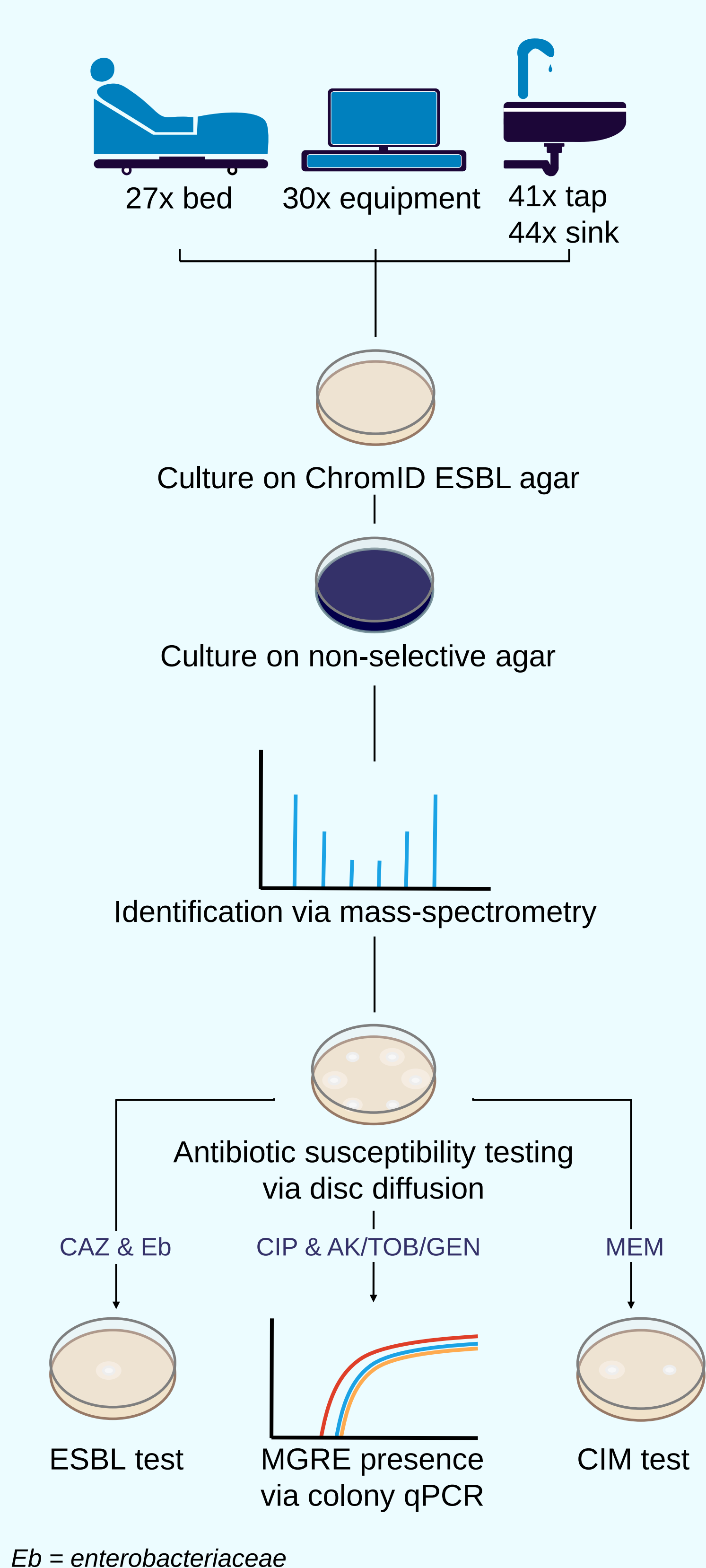


Figure 1. The antimicrobial resistance genes within the MGRE.

Objective

To investigate potential bacterial reservoirs and their antimicrobial resistance in the ICU environment to maintain effective treatments and mitigate the spread of AMR.

Methods



Eb = enterobacteriaceae

Results

Table 1. The total number of isolates and percentages of extended-spectrum β -lactamases (ESBL), carbapenemase producing (CPE) and MGRE containing bacterial isolates per time point.

Time point	#Isolates	%ESBL	%CPE	%MGRE
1	106	10,4	1,9	2,8
2	122	18,9	0,8	9,8
3	123	17,1	4,1	3,3

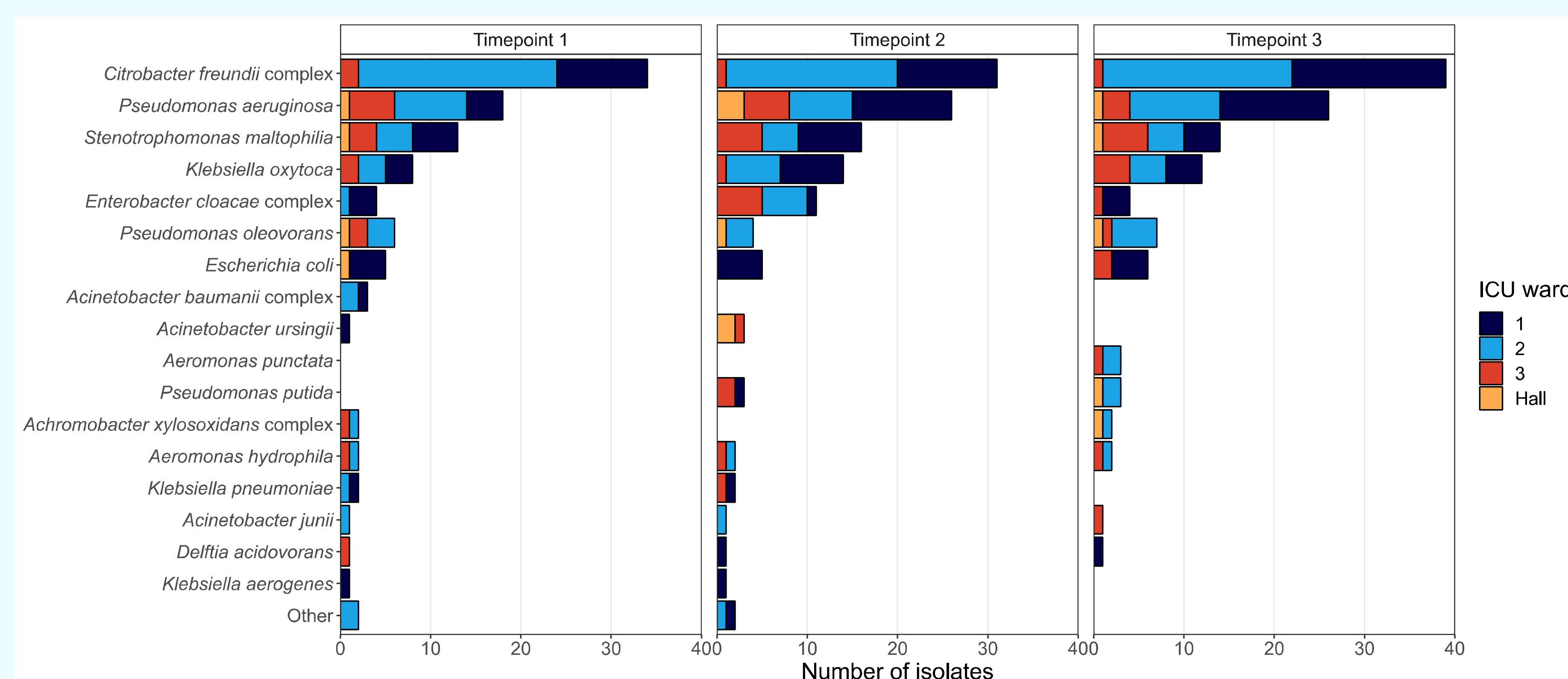


Figure 2. The abundances of the isolated bacterial species per time point and ICU ward.

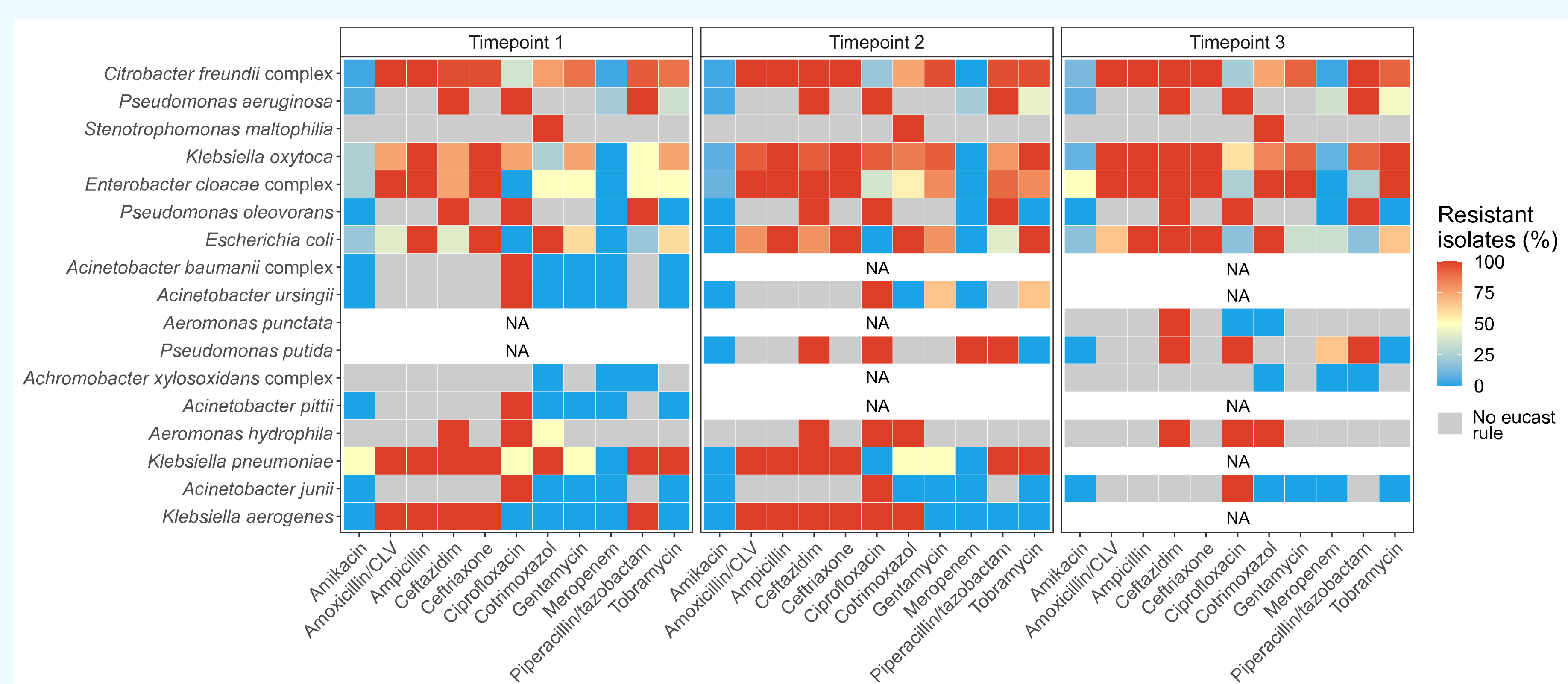


Figure 3. The percentage of antibiotic resistant isolates per bacterial species, time point and antibiotic.

Conclusion

- Over 87% of the sink drains contained bacteria that are able to grow on ChromID ESBL agar, while recovery of bacteria from high-touch surfaces was limited.
- ESBL, CPE and bacteria containing the MGRE were present within the ICU environment, although in low percentages.
- Many isolates demonstrated resistance to numerous antibiotics and future work with whole-genome sequencing will examine the presence of other transmissible genetic elements.
- Multi-drug resistant bacteria pose a risk for critically ill patients and future work will correlate the presence of bacteria in the patient environment with the risk of colonization.

References

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