

Computational approaches for antimicrobials resistance analysis

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Introduction

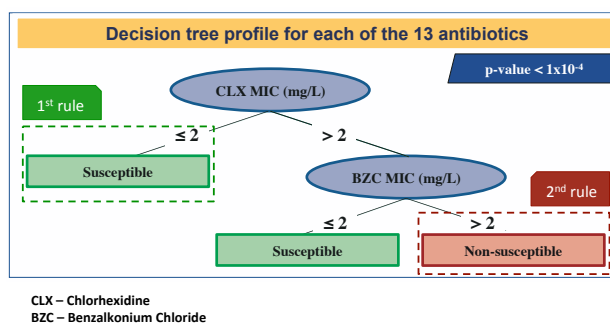
An unfortunate consequence of the **use of antimicrobials** (antibiotics or biocides) might be the **selection of resistant microorganisms**.

Antimicrobial resistance can result in **increased disease burden, morbidity, and mortality**.

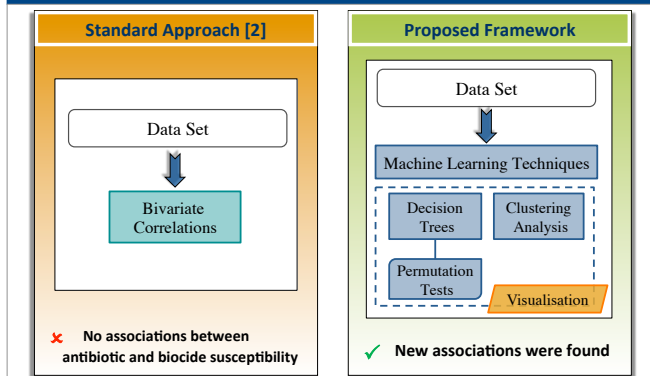
In recent years, there has been considerable **controversy** on whether **biocide** and **antibiotic decreased susceptibility** are **connected** [1].

Study: Largest data set ever studied of *Staphylococcus aureus*
Are biocides and antibiotics connected? Do biocides reduce susceptibility to antibiotics?

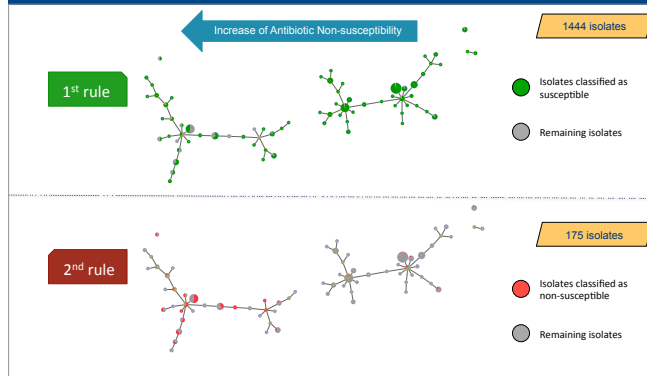
Results: Decision Trees



Framework of Analysis



Results: Visualisation



Data set description

1632 isolates of *Staphylococcus aureus* from community-acquired respiratory-tract infection.

Objects	Variables
4 Biocides	Minimum Inhibitory Concentration (MIC)
	Minimum Bactericidal Concentration (MBC)
13 Antibiotics	Minimum Inhibitory Concentration (MIC)
	Susceptible / Non-Susceptible Classification
Host	Country
	City
	Region
	Age
	Gender
	In/Out Status
Bacterium	Source
	MRSA/MSSA
Total Number of Variables	Infection Type
	43

Conclusions

- We were able to find **two subpopulations** with very **different patterns of antibiotic non-susceptibility**.
- The phenotype of two biocides, **CLX and BZC**, are enough to **discriminate the two subpopulations**.
- We propose a value for the Epidemiological cut-off (**ECOFF**) of these two biocides of **2mg/L**.
- The proposed **machine learning methodologies** are valuable tools for **extracting hidden biologically relevant information** from large epidemiological data sets.

Acknowledgements

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References

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- [2] Copitch JL, Whitehead RN, Webber M (2010) Prevalence of decreased susceptibility to triclosan in *Salmonella enterica* isolates from animals and humans and association with multiple drug resistance. *International Journal of Antimicrobial Agents* 36: 247-51.