

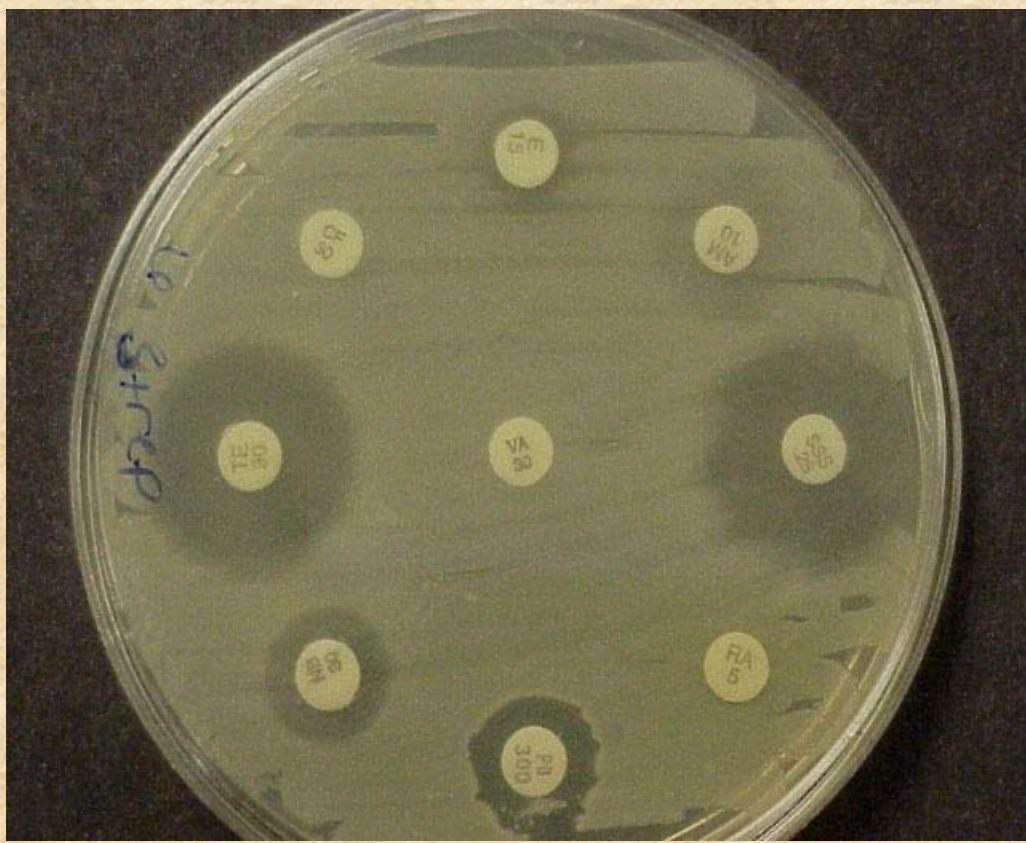


# Recovery of Antibiotic Resistant *Staphylococcus* and *Streptococcus* spp. from Landfill Leachate.



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## Introduction and Purpose



Growing concerns about antibiotic resistant bacteria continue to spread beyond health care facilities to encompass areas accessible to the public. Landfills are a potential source for accumulation of such microbes, which may be dispersed to other areas via leachate.

The purpose of our investigation was:

- ❖ To determine whether *Staphylococcus* and *Streptococcus* were present in landfill leachate and adjacent groundwater.
- ❖ To test their resistance to commonly prescribed antibiotics.

## Methods



Samples from groundwater and leachate.

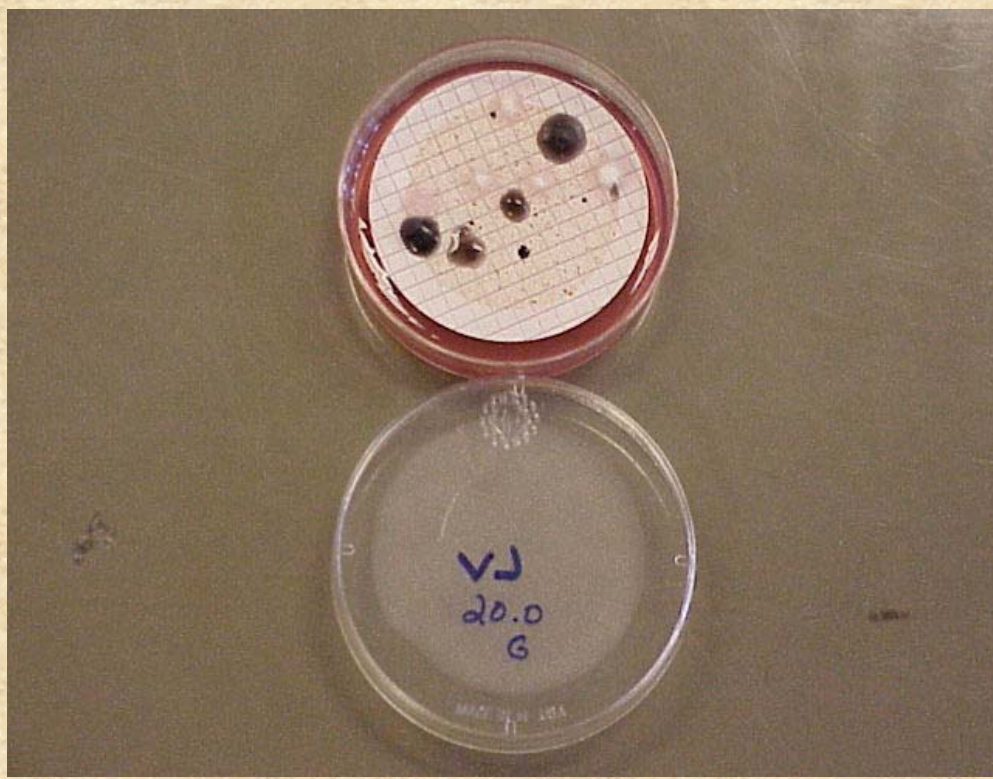


Filter membrane apparatus

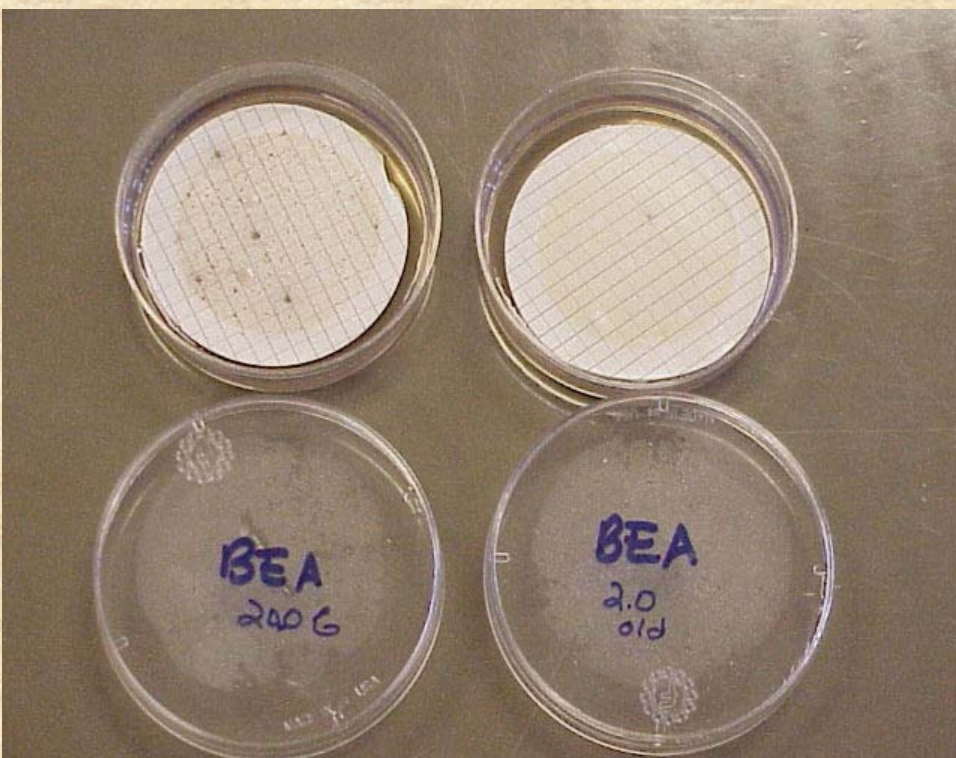
Landfill leachate and adjacent groundwater samples were aseptically collected from wells at a regional landfill site. Cells were collected by membrane filtration (0.22um filters). Ten, 1.0, and 0.1 mL aliquotes were filtered. Presumptive *Staphylococcus* spp. were isolated on Vogel-Johnson agar augmented with 1% Tellurite solution. Suspect colonies were gram-stained, tested for catalase production, and transferred to Mannitol Salt agar for confirmation. Presumptive *Streptococcus* spp. were isolated on Bile Esculin Azide agar. Suspect colonies were gram-stained for confirmation.

Confirmed colonies of *Staphylococcus* and *Streptococcus* were transferred to flasks of Brain-Heart Infusion broth. Resistance to antibiotics for *Staphylococcus* and *Streptococcus* was determined following the Mueller-Hinton protocol.

## Results



*Staphylococcus* spp. on Vogel-Johnson agar.



*Streptococcus* spp. on Bile Esculin Azide agar.



Bile Esculin Azide plates (bottom view) showing hydrolysis of esculin.

Table 1: Presumptive and confirmed *Staphylococcus* spp.

	Presumptive		Confirmed	
	Groundwater	Leachate	Groundwater	Leachate
Sample 1	43	45	2	4
Sample 2	0	44	0	0
Sample 3	20	27	0	0

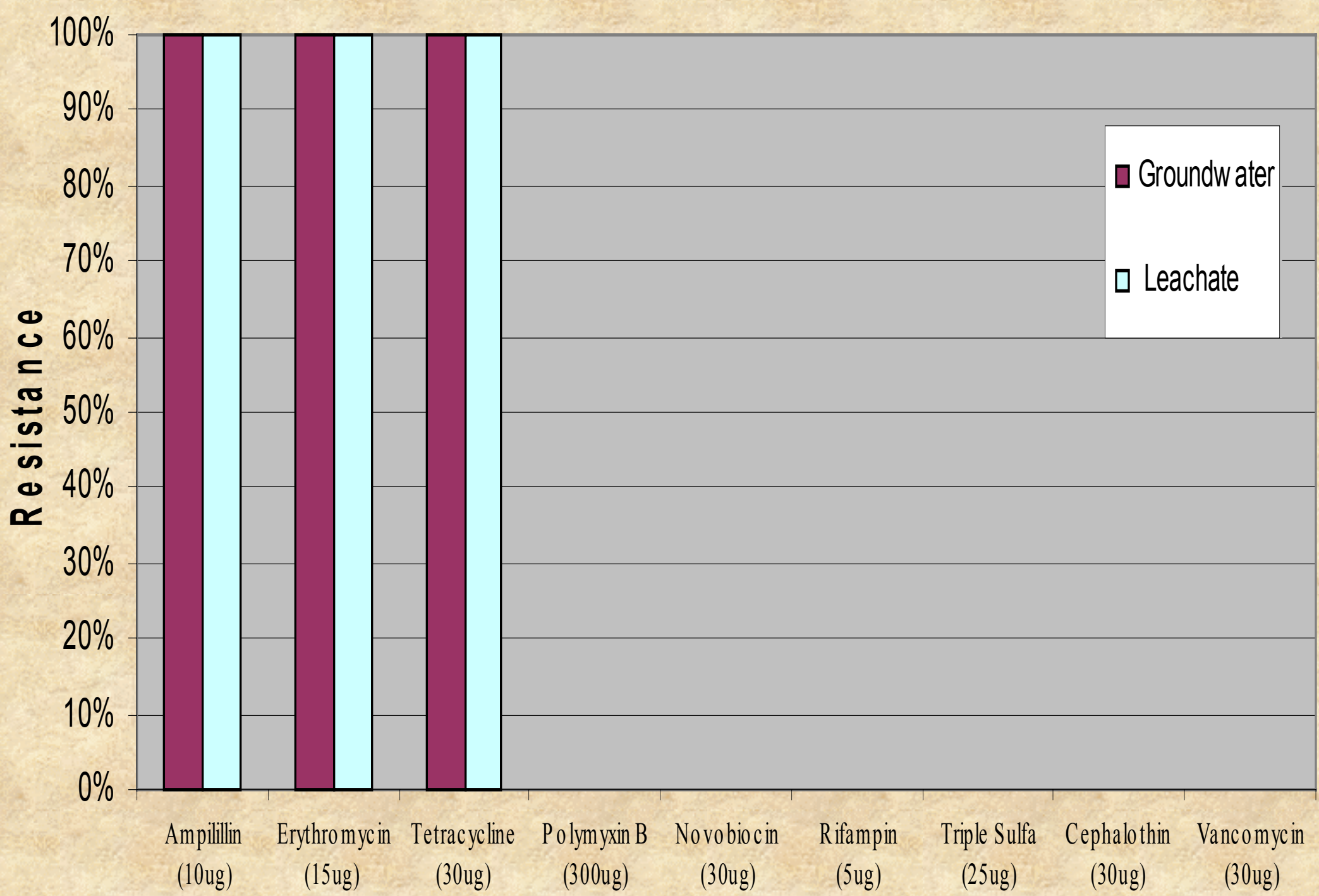


Figure 1: *Staphylococcus* spp. resistant to antibiotics tested.

- ❖ 3.4% of colonies recovered on Vogel-Johnson agar were confirmed as *Staphylococcus* spp.
- ❖ 13.0% of colonies recovered on Bile Esculin Azide agar were confirmed as *Streptococcus* spp.
- ❖ *Staphylococcus* spp. demonstrated resistance to 33.0% of the antibiotics being tested.
- ❖ *Streptococcus* spp. demonstrated resistance to 44.0% of the antibiotics being tested.

Table 2: Presumptive and confirmed *Streptococcus* spp.

	Presumptive		Confirmed	
	Groundwater	Leachate	Groundwater	Leachate
Sample 1	12	10	2	6
Sample 2	28	2	3	0
Sample 3	17	16	0	0

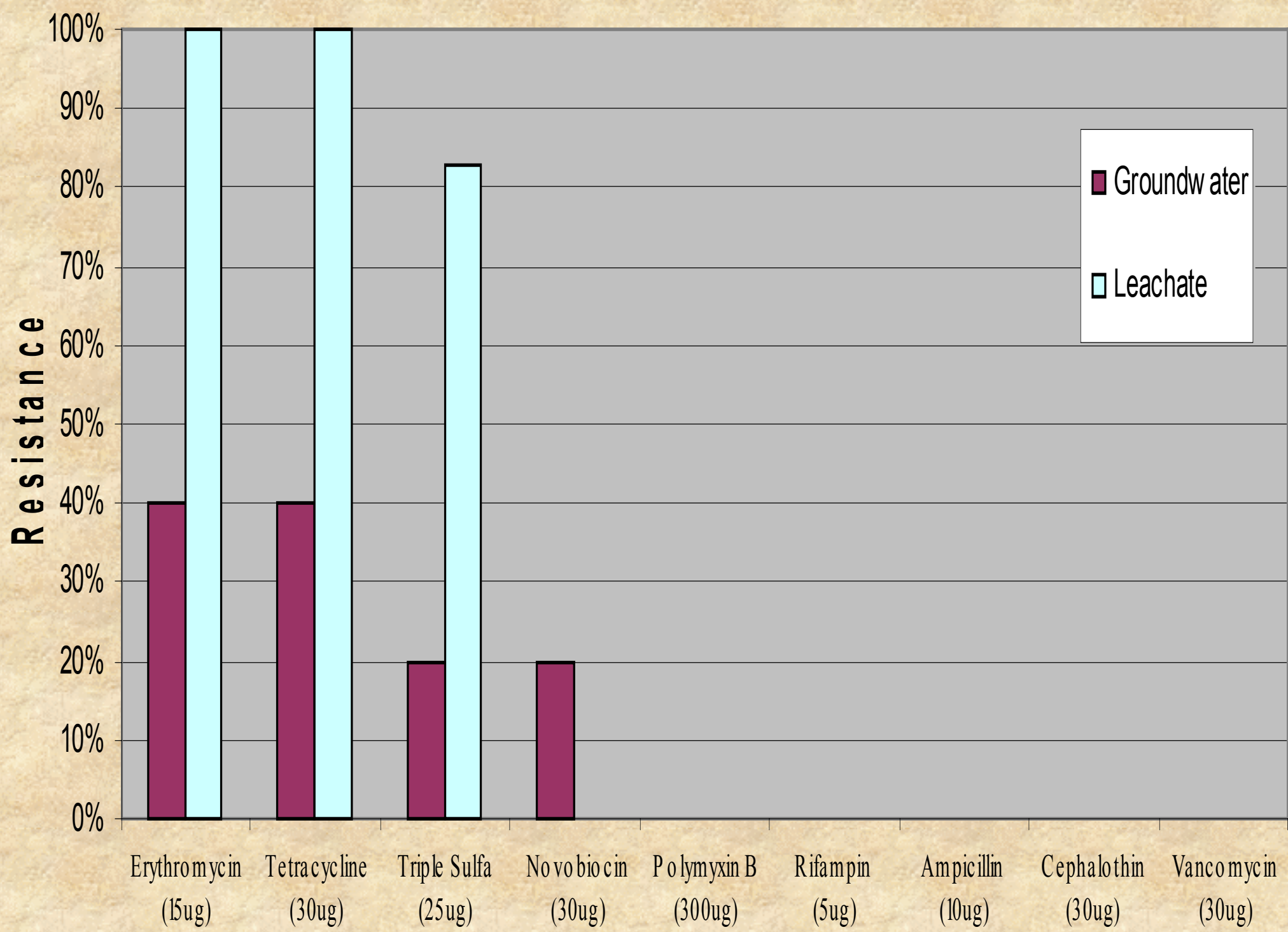


Figure 2: *Streptococcus* spp. resistant to antibiotics

## Summary

- ❖ Based on results of concurrent studies, *Staphylococcus* and *Streptococcus* spp. represent a very small proportion of the total population of bacteria found in landfill leachate.
- ❖ Antibiotic resistant strains of *Staphylococcus* and *Streptococcus* spp. exist in leachate and groundwater.
- ❖ A commonality exists between *Staphylococcus* and *Streptococcus* spp. and their antibiotic resistance.

## References

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