Antibiotic Properties of *Streptomyces* Isolate from Burlington, Vermont

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Background & Introduction

Antimicrobial Resistance (AMR) is a growing crisis throughout the world. Improper use of antibiotics in healthcare and agriculture has led to current treatments of antibiotics becoming increasingly ineffective. In response to the AMR crisis, Small World Initiative (SWI) has called upon student researchers around the world to address the need for novel antibiotics. SWI is harnessing the power of an expanding network of scientists who recognize the threat of AMR. Our goal throughout the semester was to isolate and characterize colonies from individually collected soil samples to identify possible novel antibiotic-producing bacteria. Then, to share our findings with other SWI partner institutions and scientists involved in the fight against AMR.

Materials & Methods

- Soil sample was collected from Centennial Woods on February 2nd, 2022, near the frozen stream.

Figure 1

Figure 2

Figure 4

Figure 3

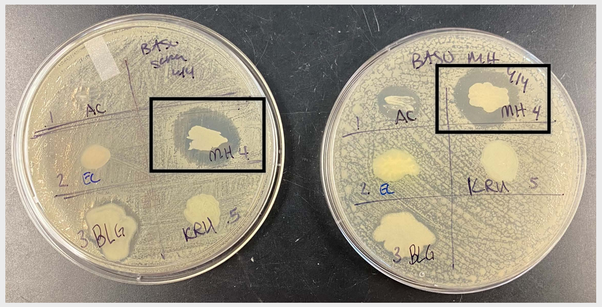
Figures 1-4. Images portray method from collection of soil sample to gram stain results.

Results

Table 1. Summary of results from screening against ESKAPE relatives with zones of inhibition measured in millimeters.

ESKAPE Relative	ENAE	ESCO	PSPO	ERCA	STEP	BASU	ERNA
Inhibition	None	None	None	Yes	Yes	Yes	Yes
Mueller-Hinton Agar	–	–	–	3mm	11mm	4mm	9mm
Tryptic Soy Agar	–	–	–	5mm	8mm	7mm	7mm

Figures 5. Screening against STEP on MH (left) and TSA (right).

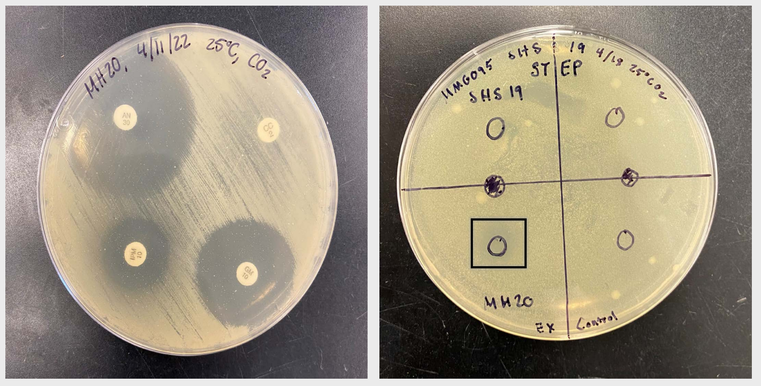


Figures 6. Screening against BASU on MH (right) and TSA (left).

Table 2. Summary of results from biochemical tests performed on isolate and conclusions drawn from results.

Test	Gram Stain	Catalase Test	Blood Agar	Fermentation Media	CNA Media	Gelatin Hydrolysis	Citrate Test	MRVP Media
Result	+	+	Growth and zone of lighter color around colonies.	Inert	Growth	Gelatin remained liquid.	Agar in test tube had no color change. Colony growth was present on agar.	No change in test tube after addition of alpha-naphthol and KOH.
Conclusion	Gram positive isolate. Contains a single cell wall.	Isolate produces enzyme catalase.	Isolate can lyse blood cells.	Inert.	Confirmation that isolate is gram positive.	Gelatinase produced by isolate.	+ for ammonium dihydrogen phosphate. – for sodium citrate use.	Mixed acid fermenter.

Results Cont.



Figures 7 & 8. Images of Antibiotic Susceptibility Test (left) and assay of organic extraction results (right).

Conclusions

- Based on the 16s rRNA sequencing and biochemical test characterization, isolate MH20 was identified as part of the *Streptomyces* genus.
- Organic extraction maintained antibiotic activity against *Staphylococcus epidermidis,* based on zone of inhibition measured to be 12mm in diameter.
- Based on the screening against ESKAPE relatives and my isolate's organic extraction activity, MH20 is active against Gram-positive species.

Future Work

- Continuing to isolate and characterize possible novel antibiotic-producers from soil across the world.
- It is possible that other environments could be a rich source of novel antibiotic-producers, such as oceanic environments, on marine organisms, and from atmospheric precipitations. (Sarmiento-Vizcaíno, et al., 2018).

References

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