



Fun With Fungi: Antimicrobial Activity of Soil Microbes on Campus

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Introduction

The BIO 411L microbiology lab course gives students the opportunity to conduct individual research on antibiotic-producing bacteria that they discover themselves on campus. A soil sample from an on-campus location of their choosing was gathered, diluted, and plated to examine microbial presence. These isolated microbes were then subjected to pathogens to test for antibiotic production. The isolates that showed antibiotic ability were further tested for chemical properties and were then sequenced to determine their identities.

Research Questions

Are there antibiotic-producing microbes in the soil on campus? How do we determine their identities?

Methods

- Soil sample obtained from outside Adele Center
- Serial dilution of soil sample
- Plate solution on TH and PDA agar
- Test for zones of inhibition against *Streptococcus epidermidis* and *Pseudomonas putida*
- Gram stain
- Biochemical tests: catalase, citrate, and gelatinase tests, SIM tests for motility, hemolysis tests, tests for growth on TSI, MSA, and MacConkey agar
- Organic extraction of antibiotics
- Test extraction efficacy against *S. epidermidis*
- Test antibiotic toxicity with growth of Chia seeds
- PCR and sequencing

Conclusions

Three isolates on TH produced antibiotics against *S. epidermidis*, all fungi. Chemical properties were tested, and two were sequenced.

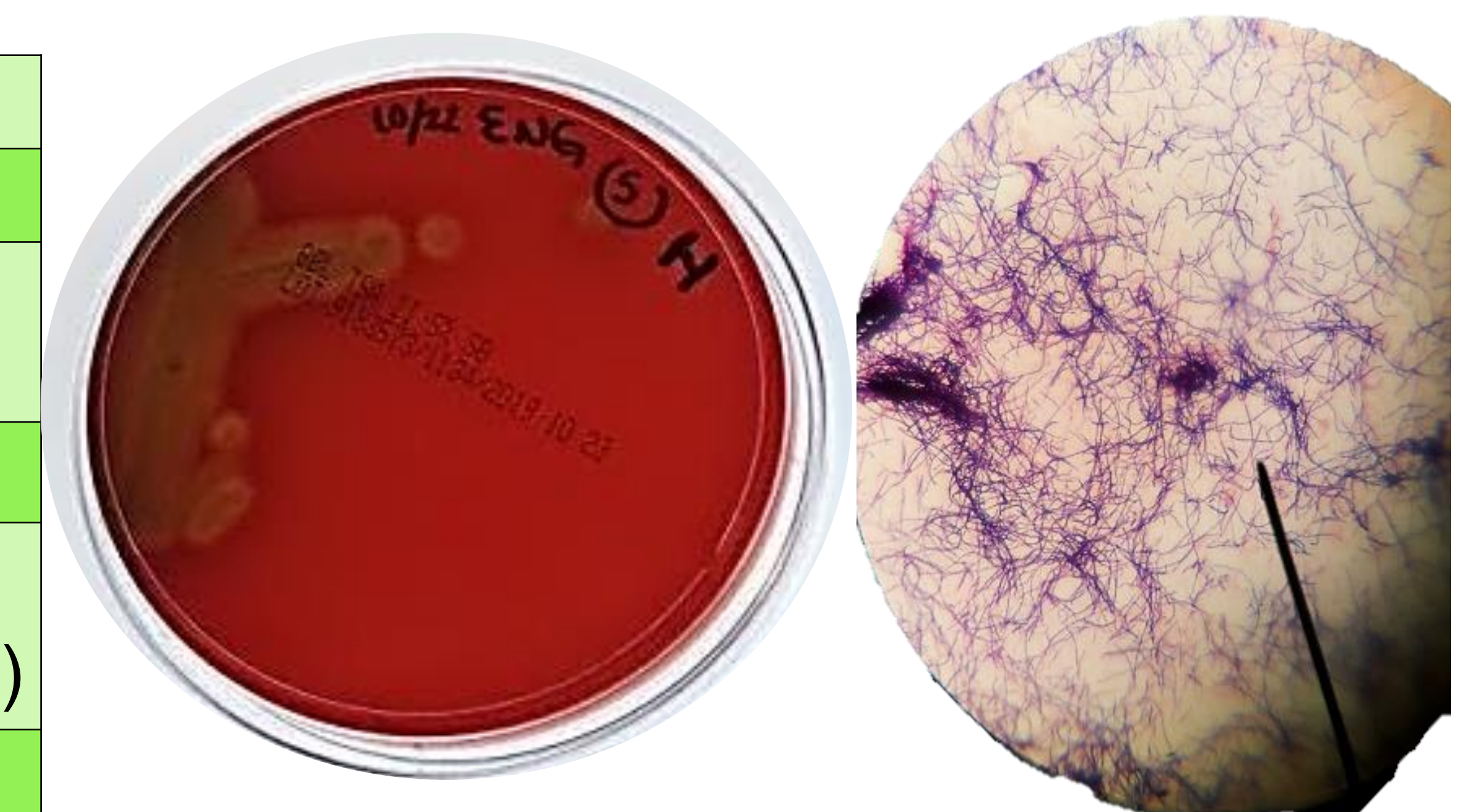
Isolate 2

Domain: Fungi
Phylum: Ascomycota
Class: Dothideomycetes
Order: Capnodiales
Family: Mycosphaerellaceae

Isolate 5

Domain: Fungi
Phylum: Ascomycota
Class: Sordariomycetes
Order: Magnaporthales
Family: Magnaporthaceae

	Isolate 2	Isolate 5
Zone of Inhibition	3mm - <i>S. epidermidis</i>	1.5mm - <i>S. epidermidis</i>
Gram Stain	Gram +, filamentous, likely fungus	Gram +, filamentous, likely fungus
Blood Agar	gamma - no hemolysis	beta - complete hemolysis
Triple Sugar Iron	K/A - alkaline/acidic (no sugar fermentation/sugar fermentation)	K/A - alkaline/acidic (no sugar fermentation/sugar fermentation)
MacConkey	pink - no fermentation of lactose	pink - no fermentation of lactose
Mannitol Salt Agar	pink - no fermentation of mannitol	pink - no fermentation of mannitol
Citrate	green - no citrate utilization	green - no citrate utilization
SIM - Motility	stab growth - non-motile	cloudy - motile
Gelatinase	solid - no gelatinase production	solid - no gelatinase production
Catalase	catalase +	catalase +
Extract ZOI	2.0cm	0.6cm
Eukaryotic Cell Toxicity	5 chia seed sprouts	9 chia seed sprouts
Identity	Fungus, family Mycosphaerellaceae	Fungus, family Magnaporthaceae



This project was successful in finding sources of antibiotics, perhaps in an unlikely source: fungi. The novelty of the microbes' antibiotic activity is unknown but could be a prospect in the battle against antibiotic resistance.