Identifying possible antibiotics in the soil for future use against bacterial resistance.

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Abstract

The new issue arising in modern medicine is the increasing resistance in antibiotics from bacteria. Antibacterial drugs have become so overused that may organisms are outright resistant to any antibiotics [1].It is such a threat that the CDC reports that antibiotics will become useless in the future [2]. Undergraduate students were given an opportunity to find new antibiotics in the soil that can be used to possibly stop the upcoming bacterial resistance. Given a chance to do independent laboratory work, Students learned how to isolated bacteria colony and gather their DNA for analysis. The DNA was sent to a lab in Reno and results were sent back .

Materials and Methods

A sample of soil was taken from the Clark County Wetland Park located in Henderson, Nevada. It was taken in clay loam soil by a stream 11.5 cm below the surface. Then the soil was put on various plates to determine how much bacteria were in the soil. There was approximately 5.83 x 10^-4 grams per plate Various bacteria was tested but only one was chosen for identification. That organism was is circled with a black pen and was dubbed Sample 7.When looked under a microscope, it appears to be a *bacillus*. It shares similar properties like being gram positive and the appearance of spores.

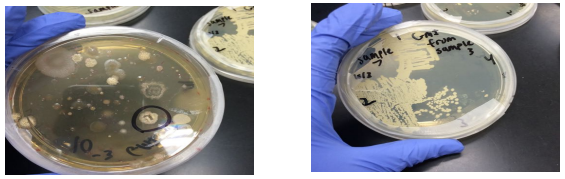

Fig. 1: the petri dish where sample 7 came from. The specific organism is circled in black shown left. The right picture is a pure colony.

Antibiotic properties

Fig 2: Sample 7 was shown to create antibiotic resistance to Straphaueus with about 3 millimeters of inhibited zone around the colony.

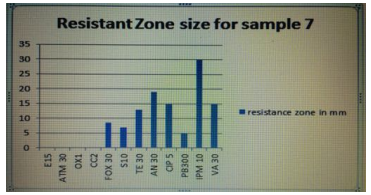

Fig 3: Sample 7 was tested on various antibiotics. It appears that it's is susceptible to only a few antibiotics (such as IPM 10, VA30, and AN30). Which made it a great candidate for running a PCR.

Bio test Results

Sample 7 was given several bio test to see if the organism could metabolize certain compounds.

- Urea: negative
- Na Citrate: negative
- Sim test: negative
- Fermentation: negative however it reacted with amino acids to make ammonia.

Nanodrop results

Sample 7 has E.coli as a positive control and distilled water as a negative control for the experiment. DNA extraction was done to both organism. The DNA was cleaned up and ran threw a nanodrop. The nanodrop tested the purity and concentration of any DNA sample.

Positve E.coli: 301.7ng/ul A260/A280: 1.67
Negative: 1.8ng/ul A260/A280: 1.68
Unknown sample: 314.9ng/ul A260/A280: 1.65

PCR results

Fig 4: shows the results
Lane 1: Ladder
Lane 2: Blank
Lane 3: Negative
Lane 4: E.coli
Lane 5: Soil Unknown

Since the negative is showing positive results, it is clear that the negative was contaminated. Whether it's contaminated with E.coli is possible, but ultimately unknown.

Results

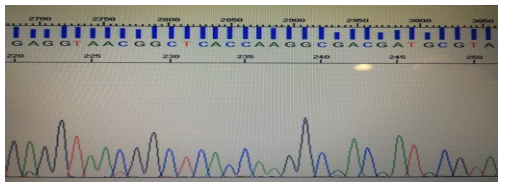

Fig 5: The DNA sequences results shows that sample 7 is *bacillus aerophilus.*

Conclusion

It is fitting that sample 7 was discovered to be a bacillus as the organism showed similar behaviors before it was tested with a DNA scan. The organism is question has been identified before, but it appears to be a specific strain. Which means that it's characteristics are well known but with unique properties of it's own. It also showed antibiotic resistance against a wide range of organisms. Sadly, there wasn't enough time in the semester to begin purifying an antibiotic culture to see if that is the case. This leaves ample chances for another student to explore the possibilities. It seems that further study on this organism is needed, as there is possible potential for use in antibiotic.

References

[1] Kupferschmidt, K. (2014, April 30). First Global Drug Resistance Overview Paints Grim Picture. *Scientific Insider.*
[2] Mckenna, M.(2013, September 16). CDC Treat Report: 'We Will Soon Be in a Post-Antibiotic Era'. Retrieved December 4,2014