**Abstract**

Biological material surviving in modern halite may point to potential life in salt deposits on Mars. This project attempts to find an efficient method extracting cells and DNA from modern halite crystals to gain more insight into efficient methods of extracting DNA from ancient salt, considering potential Mars Rover techniques. Microorganisms were cultivated from Great Salt Lake halite and identified by 16S rRNA gene comparisons. We will present data on the diversity of archaea isolated by this method. We made attempts at isolating DNA with various combinations of centrifugation columns and filters to extract and clean any DNA that may be trapped inside the halite fluid inclusions, using gel electrophoresis to analyze the purity and concentration of DNA. We noted inefficient yields in recovery of DNA, which must be improved upon before we apply the methods to ancient halite.

**Introduction**

Cell constituents and DNA can be preserved in fluid inclusions of halite crystals. Here we present methods for studying biological preservation in salt. Analyzing ancient DNA would reveal much about the biological history of Earth and provide methods for the search for life outside of Earth. Ancient DNA, however, is extremely sensitive to degradation, therefore, we sought to develop methods of DNA extraction from modern halite. Once our methods show the level of sensitivity required for ancient materials, we will apply them to halite collected from Permian deposits.

Researchers have identified DNA molecules in ancient halite (250 mya) by electron microscopy (Fig. 1). We seek to develop a DNA detection methodology that would be applicable to a distant Rover on Mars. This method would allow the robot to extract DNA from halite and analyze it without utilizing the sensitive electron microscopy technology.

**Methods**

1. **DNA extraction from halite**
   - Sample of dissolved salt added
   - Wash with water
   - Centrifuge
   - Remove fluid above the membrane
   - Place filter upside down
   - Bind, wash, elute DNA
   - Purified DNA

2. **Cultivation from halite**
   - Cultures allowed to grow on petri dishes then isolated
   - Salt crystals were grown in growth media
   - Isolated colony was placed in growth media for one week

**Results & Conclusions**

1. DNA Extraction by Amicon filter method shows about 50% recovery yield of starting material.
2. More than 1g of salt is required to detect DNA using this method.
3. This method can be used to detect whether a reasonable amount of DNA is present in ancient halite before proceeding onto stringent surface sterilization techniques, EM, and preservation methods to keep DNA from degrading.
4. Future research: at what level of DNA in environmental samples can we detect DNA using this method? How can we increase the recovery yield?

**References**


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