



## **The Possible Impact of Rising Temperatures on Food Storage in Sigluaqs (Ice Cellars)**

By Marianne Rexford

Ice cellars (Sigluaqs) are dug into frozen permafrost and are used as freezers for our subsistence foods on Alaska's North Slope. Successful whaling crews store the community share of a whale in Sigluaqs for Inupiaq feasts during the year. However, warming temperatures are causing ice to melt throughout the summer and even into the fall in some Sigluaqs. The purpose of this experiment is to determine if a 3°C rise in temperature will affect bacteria growth.

Frozen whale meat and muktuk from the fall whaling season was cut into 0.5g pieces, wrapped in sterile foil, and returned to the freezer. Bacterial levels on these samples were determined by placing the 0.5g sample into sterile water, performing serial dilutions, and culturing 1 mL of the water from each tube on agar. This process was repeated at the end of the experiment. For 24 days, experimental samples were taken out of the freezer for 4 – 6 or 8 – 12 hours each day, put

into a 3°C refrigerator, and returned to the freezer. After 24 days, the number of bacterial colonies on these samples was determined and compared to the control samples.

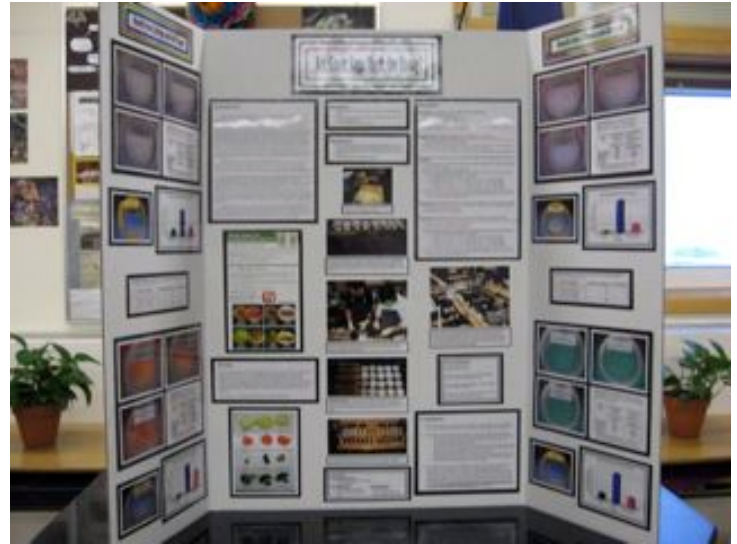
The results show a significant increase in bacterial on the experimental whale meat and muktuk. There was a 133% and a 303% increase in bacteria, respectively, from whale meat and muktuk samples A and B. This strongly indicates that continued warming temperatures may make Sigluaqs breeding grounds for bacteria, and therefore, unsafe to use.

### **Marianne's Introduction:**

Ice cellars (Sigluaqs) are dug into the frozen permafrost and are used as a freezer to keep our foods edible. As part of our Inupiaq culture, we go subsistence hunting. A big part of our culture is hunting for bowhead whales. Each year a certain amount of whales are caught and shared amongst the village. Whaling crews work together to divide the whale among their members. The successful whaling crew begins storing away the community share of whale in a Sigluaq, which will be used at future community celebrations. We store foods for the gatherings of Thanksgiving, Christmas, and Nulukutaq (Blanket-toss). The role of a whaling captain is to have a big Sigluaq and to keep it in good condition all year long. Spring-cleaning of ice cellars is a ritual in the Inupiaq culture of sharing. All the stored meat and game must be consumed or given away as a part of the cleaning process. In the words of an Inupiaq woman, "You have to clean out your Sigluaq cause the whale won't give itself unless it has a clean place to rest." Whales give themselves to whalers who respect them and treat them properly.

Changes are occurring in the arctic because of warming temperatures. Problems are happening now with Sigluaqs – people are experiencing ruined ice cellars and some are filling up with water because of temperature changes. The mayor of the North Slope Borough, Edward Itta, has personally experienced a ruined Sigluaq. Itta's children opened the lid to the ice cellar and saw nothing but water. "You can't do much gathering out there when your natural freezer quits operating," Itta said. Now as the temperature warms across Alaska, the temperature of the frozen ground is warming too. And if the projections of rising temperatures prove true, the permafrost is likely to warm and thaw much more in the future.

In general, most bacteria grow faster when the temperature warms. As the temperature increases, the foods stored in the Sigluaqs may grow more bacteria. If the weather continues to get warmer, the foods stored in the Sigluaqs will have to be watched carefully so they do not spoil. If the foods do begin to spoil, that will have a major impact on our culture. We do not have many options left if the permafrost thaws out. We cannot replace our Sigluaqs with regular store-bought freezers because of how much space the meat needs. The cost of electricity would be very expensive, while a simple natural freezer just takes effort to make. Sigluaqs play a very important role in our Inupiaq culture by keeping our foods tasty and fresh.



## **Are Green Bags Worth the Money?**

By Keith Sims and Tiffani Kayotuk

Getting fresh produce flown into villages on the North Slope is expensive. The produce is sometimes frozen or damaged. As a result, many people buy less nutritious canned or frozen fruits and vegetables.

Debbie Meyer Green Bags claim to keep fruit and vegetables fresher longer by removing ethylene gas. In this experiment, Green Bags will be compared to Zip-lock bags with and without holes. The purpose of this experiment is to determine which type of bag keeps produce freshest and bacteria growth lowest, and is therefore the most cost-effective bag to buy.

Cabbage, bell peppers, cilantro, and broccoli were used in this experiment. To determine the number of bacteria on the original produce, pieces of each fruit or vegetable were cut off with a sterile scalpel, weighed, and placed in different tubes of sterile water. Serial dilutions down to  $1 \times 10^{-3}$  were done for each tube. One mL from each solution was cultured in a Petri dish. Bacterial colonies were counted after 3 days. Larger pieces from each produce were cut off and wrapped separately in each of the 3 types of bags. They were then refrigerated. After 3.5 weeks, the same procedure was used to determine bacterial levels from each fruit or vegetable.

Results clearly showed that Green Bags had the fewest bacteria; Zip-lock bags with holes had the second lowest, perhaps because they released any ethylene gas. There were no consistent differences in produce appearance. A cost-analysis showed that Green Bags are worth the money.