

A Survey on Long-Term Storage of Biological Specimens at McGill University

Connor McCarthy

McGill University Faculty of Medicine and the Sustainability Projects Fund of McGill University

Introduction

In a research intensive university like McGill where there is innovative research using a large number of DNA and/or RNA specimens, long term storage of such material can be extremely costly and damaging to the environment, especially if the storage requires the use of freezers. It is therefore of great interest to gauge the scope and methods of long term storage currently in use, the interest in using energy efficient freezers/refrigerators, and investigate alternatives to freezing which involves a new technology for room temperature storage.

With this survey, we hoped to demonstrate a need to improve on environmentally friendly and energy-efficient practices in laboratories at McGill. It is our goal that the survey results will help give incentive to researchers at McGill to work towards using more sustainable methods in storing biological specimens as we work towards decreasing our carbon footprint as a whole.

The survey results will help us outline the areas in which environmentally friendly practices are lacking and give us an idea on how best to educate researchers on greener practices in the future.

Conclusions

- Researchers need to be better educated on the importance of using energy efficient fridges and freezers in the lab in order to make it a priority when purchasing a fridge or freezer. This will help lower the cost of operating the lab as well as reduce the carbon footprint left by the lab.
- Researchers need to be educated on the advantages of using ambient temperature storage. This technique is more environmentally friendly than storing specimens in a freezer, it costs less than using a freezer, and it makes the lab less vulnerable to having to relocate or lose specimens due to power failures. A large step in the education will be to ensure the researchers that it is a reliable technique in storing specimens.
- Researchers need to be educated on the advantages of using a Laboratory Information Management System (LIMS). Not only do these systems make storing and retrieving specimens more convenient, it also aids the researcher in keeping track of specimens making it easier to tell which samples are no longer needed and can be discarded freeing space in the freezer.

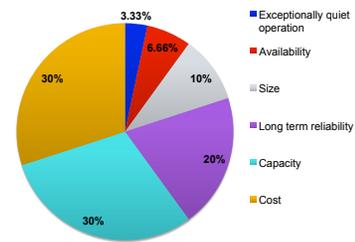
Acknowledgments

I would like to thank the McGill University Faculty of Medicine for its participation, the Sustainability Projects Fund of McGill University for funding the project, and the McGill IT Department for creating the survey. I would also like to thank Dr. Marianna Newkirk and Dr. Christian Iantzis for their help and guidance.

Results

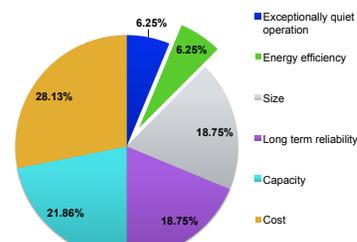
- When asked to rank in order of importance the factors that influenced the model of freezer they would purchase, the respondents answered as follows:

Ranked 1st in Order of Importance When Purchasing a Freezer



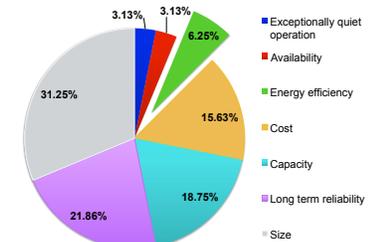
*Microprocessor Controls = 0%
**Energy Efficiency = 0%

Ranked 2nd in Order of Importance When Purchasing a Freezer



*Availability = 0%
*Microprocessor Controls = 0%

Ranked 3rd in Order of Importance When Purchasing a Freezer



*Microprocessor Controls = 0%

Green Biobanking Factoids

- 58% of respondents have an energy efficient fridge or freezer at home but 0% said that energy efficiency in a freezer/fridge would be the factor that would be most important in determining a model for a purchase for the lab.
- Only 6% of respondents said that energy efficiency would rank 2nd or 3rd as important factors for determining the purchase.
- Only 14% of respondents knew about ambient temperature biobanking of DNA.
- Approximately 40% of biobankers keep their specimen frozen for more than 10 years.
- 80% of biobankers keep their specimen frozen from 0-10 years.
- 57% store their DNA in an Ultra Low Temperature (ULT) freezer (-70°C or -80°C).
- One laboratory stores as much as 5 kg of DNA.
- Some freezers at McGill have been in service since 1992. Freezers as old as these lack the energy-efficient technology available in freezers on the market today.
- 50% of respondents have experienced 1-20 power failures in the past 5 years that have resulted in relocation of specimens.
- 25% of respondents have experienced power failures in the past 5 years that resulted in the loss of specimen.
- Approximately 40% of respondents have some form of computer based indexing of banked specimens, though it was clear from the majority of the responses that there is a need to educate researchers on what Lab Information Management Systems LIMS are and how they would benefit their laboratories.
- Only one respondent laboratory had a bar code system of indexing their specimens, and he/she is the only one to have ambient air banking established.

Other suggestions for lowering the carbon footprint of the lab in order of frequency of suggestions:

1. Turn off/unplug all electronic machines (including centrifuges) when not in use.
2. Recycle non-paper waste (plastics).
3. Recycle packing/shipping boxes.
4. Share freezer space with other investigators to maximize use of freezers.
5. Run autoclaves or washers only when full.
6. Use biodegradable detergents.