The Green Lab Group (**GLG**)

Labs consume 10X more energy than office spaces

- The largest sector contributing to Rutgers' greenhouse gas emissions is the building sector.
- A total of about 360,000 tons (76%), coming from on-campus heating and electricity generation – largely powered by fossil natural gas – and electricity purchased from the grid".

Doing nothing at all vs Making small constant efforts

$(1.00)^{365} = 1.00$

$(1.01)^{365} = 37.7$

Ultra-low temperature (ULT) are big energy consumers

=

22-28 KWhr/day

28-32 KWhr/day

Number of units at ICPH X ~70

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Factors affecting the performance, energy consumption, and carbon footprint for ultra low temperature freezers: case study at the National Institutes of Health

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- **Ambient temperature**
- **Age**
- **Capacity**
- **Set Point temperature**
- **Spacing between units**
- **Dust on the filter**
- **Ice**
- **Performance**

Good Cold Storage Practices

Full Defrost of Freezers: When you cannot easily remove ice from the interior of doors of a freezer, it might be time for a full defrost. Keeping up with brushing the frost out, tapping ice off of the gasket will ensure you don't have to do a full defrost often.

Sample Inventory: Eliminating samples that are expired, mislabeled, of unidentifiable and having detailed inventories reduce the likelihood of misplacing samples and can improve access speed.

Even better, have a searchable **electronic cold storage inventory system**! Searchable sample inventories reduce time spent locating samples, and shorten freezer door opening times, thereby increasing efficiency and workflow.

Temperature Tuning

- ULT-freezers used to be set at -65°C or - 70°C .
- Only in the 1980s-1990s producers of ULT freezers start to advertise lower temperatures of - 80°C or even -86°C.
- Although this 10°C lower temperature comes at a considerable cost (**up to 30% higher energy use**), no evidence was provided that lower temperatures improved sample stability or recovery.
- The crystallization (freezing) point of water (0°C), the 1st re-crystallization (-60 to -63°C) and 2nd re-crystallization point (-130 to -135°C) are critical temperatures for long-term storage of samples; -80°C, however, is not a critical temperature.

Temperature tuning concerns

Freeze-thaws:

That freezers may become more prone to freeze-thaw in case of power-cuts.

-70 °C : 19 hours 10 minutes

-80°C : 19 hours 45minutes

The temperature impact of opening doors is similar between freezers set at -80°C or -70°C .

Freezer content organization, however, is critical for temperature stability in case of prolonged opening or power failure: a partially empty freezer heats up considerably faster than one at capacity.

Temperature Tuning concerns

Sample integrity:

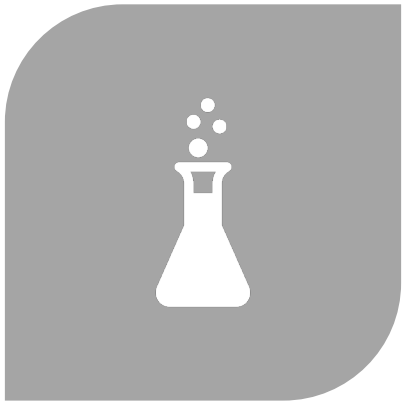
- Genomic DNA is stable at -20°C or -70°C.
- Similar stability and viability of fungal isolates was achieved after 8-year storage at - 70°C and -130°C .
- No differences were observed in a series of assessments of serum antioxidant status when samples were stored for 1 year at -20°C, -70°C or -196°C.
- Plasma antibodies against HIV, HCV and HbsAg were stable for over 15 years at -20°C ,
- Cardiac troponin T plasma concentrations are stable for over 8 years when stored at -70°C.

80	2011- June	Proteins, incl enzymes	-70	1-3 years	since 6/2011	UC Davis	Viticulture and Enology	Andrew Walker	Daniel Ng	ULT
81	2011- June	Competent cells	-70		since 6/2011	UC Davis	Viticulture and Enology	Andrew Walker	Daniel Ng	ULT
82	2011- June	Plant tissues	-70	6-12 months	since 6/2011	UC Davis	Viticulture and Enology	Andrew Walker	Daniel Ng	ULT
83	2011- June	Bacteria	-70	1-3 years	since 6/2011	UC Davis	Viticulture and Enology	Andrew Walker	Daniel Ng	ULT
84	2011- June	Glycerol suspensions	-70	3-10 years	since 6/2011	UC Davis	Viticulture and Enology	Andrew Walker	Daniel Ng	ULT
85	2011- June	DNA	-70	3-10 years	since 6/2011	UC Davis	Anatomy, CNPRC	Dallas Hyde	Lei Putney	ULT
86	2011- June	RNA	-70	0-6 months	since 6/2011	UC Davis	Anatomy, CNPRC	Dallas Hyde	Lei Putney	ULT
87	2011- June	Proteins, incl enzymes	-70	3-10 years	since 6/2011	UC Davis	Anatomy, CNPRC	Dallas Hyde	Lei Putney	ULT
88	2011- June	Physiological fluids	-70	3-10 years	since 6/2011	UC Davis	Anatomy, CNPRC	Dallas Hyde	Lei Putney	ULT
89	2011- June	Animal tissues	-70	3-10 years	since 6/2011	UC Davis	Anatomy, CNPRC	Dallas Hyde	Lei Putney	ULT
90	2011- June	Reagents & Extraction Kits	-70	1-3 years	since 6/2011	UC Davis	Anatomy, CNPRC	Dallas Hyde	Lei Putney	ULT
91	2011- June	Proteins, incl enzymes	-70		since 6/2011	UC Davis	LAWR	Kate Scow	Dianna Louie	ULT

Catalog of Scientific samples stored at -70 C (UC Boulder Green labs Program)

- https://docs.google.com/spreadsheets/d/136A8VQmOrWUFVP_EW3Q8wF4dNmRe5I9bmM6KkC8aH1o/edit#gid=1659504276

REDUCED COSTS ASSOCIATED WITH MAINTAINING REFRIGERATION UNITS



IMPROVED RESEARCHER ACCESS TO LABORATORY SAMPLES AND REAGENTS

COLD STORAGE MANAGEMENT PRACTICES SUPPORT ENERGY EFFICIENCY AND MAXIMIZE SPACE UTILITY

Store Smart Benefits