



SUSTAINABILITY UVA
From the Grounds Up



Is -80°C *necessary*?

Cold Storage Best Practices

1. Preserve gaskets for an effective seal
2. Limit open-door time as much as possible. Maintain updated inventories, discard unnecessary samples and materials
3. Regularly de-ice ULTs (ex. monthly). Defrosting ULTs is tricky and generally not recommended or necessary
4. Regularly defrost -40°C and warmer (ex. annually)
5. Carefully select the right location for cold storage units in your lab. A well-ventilated space is best. For optimal ventilation, avoid stacking or storing materials on top of or around units. Wipe or vacuum coils and clean filters periodically.
6. Preventative maintenance services can be provided for a small fee through Facilities Management. Call Jeff Gibson for more information: 434-924-8088
7. When purchasing a new unit, opt for Lab Energy Star (new ULTs use 8-12 kWh per day)
8. Monitor equipment (UVA Systems Control and Hampshire devices)



Ultralow Freezers

- One Ultra Low Temp freezer consumes about as much energy as a single American home (28-35 kWh per day)
- Ultra Low Freezers *work hard*. Helping them “work less” will extend the life of the unit, reduce the risk of unit failure, and increase the security of materials within.

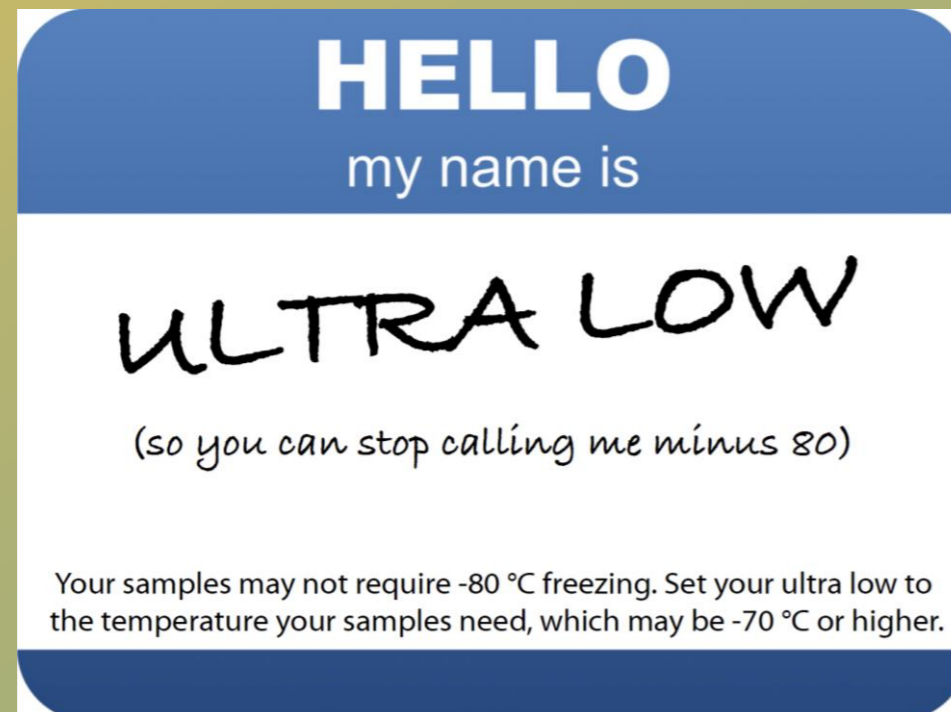


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“-70 is the new -80”

1. ...Actually, -70°C is the more traditional storage temperature for most sensitive materials. To our knowledge (that of the Green Labs community), the -80°C cultural standard was introduced about 20 years ago and is the result of marketing campaigns for colder freezers.
2. Switching can reduce a unit's energy consumption by an average of 30% (old and new units alike). UVA Green Labs saw a 44% reduction in a relatively new freezer when switched to -70°C from -80°C . ALMOST HALF!
3. Units using less energy work less, meaning they will last longer
4. Materials safely stored at -70°C include:
 - Nucleic acids (DNA in particular)
 - Most proteins
 - Bacteria and viruses (ex. bacteria glycerol stocks, viruses / cell supernatants)
 - Cell strains
 - And more reported in CU-Boulder's -70°C Cold Storage Database, available on the UVA Green Labs webpage.
5. More than one ULT in your lab? Start the transition by allocating working stocks to a -70°C ULT and archival stocks a -80°C ULT.




Evidence

1. Universities and Institutions making the change to -70°C : CU Boulder, University of Michigan, The Centers for Disease Control and Prevention, Harvard, UC- Davis, Riverside, San Diego, University of Alabama (Birmingham), AND the University of Virginia!
2. Half of ULTs at CU Boulder are set to -70°C
3. At least five ULT units at UVA set at -70°C to -75°C
4. 2012 Centers For Disease Control Freezer Challenge tuned 60 freezers to -70°C from -80°C . In 2018, UVA Green Labs followed up with the CDC to see how their materials performed in the years following the change. The CDC reported that six years later, “DNA, RNA, isolate stocks, and human specimens stored at -70°C all seem to be fine.”
5. Still not convinced? Read Farkas D, et al. 1996. Specimen Collection and Storage for Diagnostic Molecular Pathology Investigation. *Archives of Pathology & Laboratory Medicine*. 120, 6: 591-596. This article identifies ideal storage temperatures for DNA and RNA samples in a clinical setting, including the recommendation of -70°C . Referenced in the Clinical and Laboratory Standards Institute MMI3-A: Collection, Transport, Preparation, and Storage of Specimens for Molecular Methods; Approved Guideline.




Evidence

Miller, L., et al. 2008. Twenty year stability study of HIV, HBV, and HCV antibodies, antigen and nucleic acids in plasma. *Transfusion*.48,2: 103A



**Twenty Year Stability Study of HIV, HBV,
and HCV Antibodies, Antigen and Nucleic Acids in Plasma**

L Miller, B Anekella, M Manak, and P Garrett
SeraCare Life Sciences, Milford, MA



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RESULTS

- ▶ As previously reported, anti-HIV, anti-HCV and HBsAg are stable in plasma samples stored frozen at -20°C or colder for 13-20 years.³
- ▶ No trend toward deterioration over time of anti-HIV, anti-HCV or HBsAg is apparent in these seroconversion series.
- ▶ Plasma stored at -20°C for years demonstrates degradation of HCV RNA (most), HIV RNA (significant), and possibly HBV DNA. (1994 in-house HBV DNA assay was not validated/calibrated to current standards.)
- ▶ HIV RNA is still detectable in samples stored at -20°C for years, though in much lower concentration than originally found. HCV RNA becomes undetectable in some samples.
- ▶ HIV RNA, HCV RNA and HBV DNA in minimally processed plasma are stable for at least eight to ten years after transfer to long-term storage at -70°C.

