



**Temperature  
Monitoring Toolkit:**  
How to Protect  
Valuable Research  
Samples



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**When you are responsible** for tissue and blood samples, lab tests, and other frozen or refrigerated inventory, disaster is always looming...especially when you aren't at work to keep an eye on them. Frozen tissue samples for Alzheimer research can be priceless.

Medical assets can be ruined if the exact temperature is not maintained while in storage. In addition, you face the cost of delays in research findings if critical samples are ruined.

Storage and handling can be confusing, as there are rules from many different regulating bodies including the Centers for Disease Control (CDC) and state and local health departments. This eBook draws on Sensaphone's 30+ years of developing technology to monitor critical assets and provides valuable information on safe storage of these cold medical items.

By learning the basics about safe storage, you can be certain that your lab assets are never compromised and that you have the documentation to prove it.





## Recommendations for storing research samples and medical assets

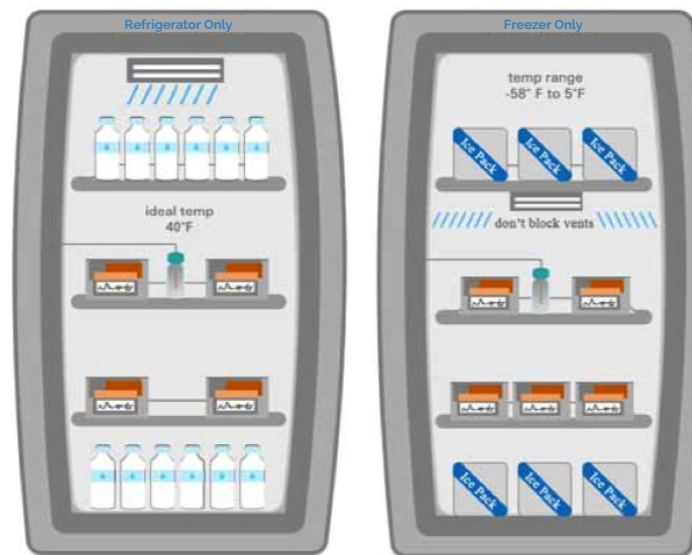
Regulatory bodies like the CDC don't recommend specific storage equipment, but they do provide guidelines for refrigerators and freezers.

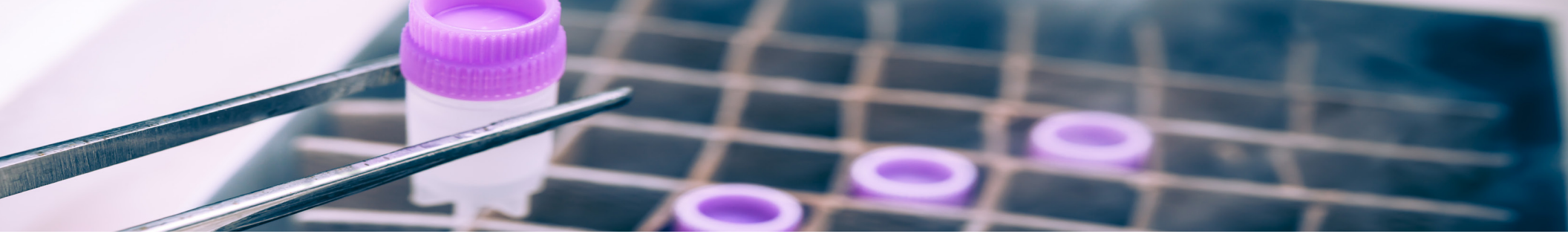
- Use stand-alone units that either refrigerate or freeze – not both.
- If using consumer-grade units, use freezerless or refrigerator only of dual-zone units. Remove all drawers.
- Pharmaceutical-grade refrigerators are ideal – full sized or under the counter.
- Make sure refrigerators and freezers can't be unplugged.
- Stabilize the temperature with water bottles and frozen coolant packs.

We suggest users set their system to monitor both the alarm panel on the refrigerator and the actual temperature inside the refrigerator. If the power goes out and they're only monitoring the alarm panel, the refrigerator can fail to trip the alarm, and the device won't be able to pass along the alarm. Monitoring both assures there are no issues with the refrigerator's electronics or the temperature inside. Ideally, the device would be plugged into the same circuit as the refrigerator to monitor power failure as well. Most medical-grade refrigerators have access ports to allow for third-party temperature probes.

Users can also drill a hole in the side, insert the probe and then seal the hole, or simply place the probe in the refrigerator and run the wire through the door opening. The gasket around the door should make a strong enough seal around the wire to keep the outside air from seeping in. We recommend the first option.

Placing water bottles in refrigerators and ice packs in freezers helps stabilize temperatures. For refrigerators, place water bottles on the top shelf, floor, and in door racks. For freezers, place ice packs along walls, back, and bottom of freezer and inside door racks.





## CASE STUDY:

### BARLOW SCIENTIFIC AND DUKE UNIVERSITY

Duke University regularly conducts genetic studies and other medical research that rely on research samples. These samples, sometimes collected over decades, include tissue, blood, plasma and DNA fragments. They are stored in commercial refrigerators and freezers provided by Barlow Scientific.

Because they can be worth hundreds of thousands of dollars, the samples are protected by wireless and wired Sensaphone temperature monitoring devices. The devices automatically record data points, date and time for up to 7000 samples stored in 22 cold storage units and eight tissue culture incubators. The units provide immediate alarm notification when temperatures go out of set parameters, as well as an audit trail that ensures proper storage.

"Any type of equipment will fail at some point in its service life. Critical samples need to be monitored so that lab managers are notified in time to save their assets," said Brian Barlow, president of Barlow Scientific. "The Sensaphone devices have saved many freezers and medical products."

“ Any type of equipment will fail at some point in its life. Critical products need to be monitored so that lab managers are notified in time to save their assets. ”

– *Brian Barlow, president of Barlow Scientific*



## Temperature sensors, probes and buffers

**SENSORS** detect or measure temperature or other physical properties. They are wired or wirelessly connected to a more intelligent device that continually displays and records the temperature readings. That device is typically called a "data recorder" or a "remote monitoring system."



**PROBES** are sensors in rod form. They are inserted inside the environment being measured and connected to another device that records the temperature reading. A probe can be used with or without a temperature buffer.

**BUFFERS** are used with probes. The air temperature inside a refrigerator or freezer changes much more quickly than the temperature of vaccines and pharmaceutical products as a result of defrost cycles, opening of doors, and fans circulating the air. Inserting a probe into a bottle filled with a buffer of glycol solution or glass beads cushions it against temporary, non-threatening temperature changes, so alerts aren't sent needlessly.





## Data logging vs. continuous temperature recording

What are your choices for keeping an ongoing record of temperatures in order to prove that assets were stored correctly?

### Continuous recording with a data logger

- 1) Install a data logger on each refrigerator and freezer.
- 2) Select a staff member to download data.
- 3) Upload data onto a computer to view and archive it.

A remote monitoring system includes a data logger, but also automatically stores data in a remote location that can be accessed by any Internet-connected device. You can log data at user-customizable intervals and log separate intervals in an alarm state. Download data remotely either via a local network or cloud, and print or export as a .pdf, Excel spreadsheet or .csv.

Remote monitoring systems also function as early warning systems. When they log a temperature that falls outside a preset range, they send a phone call, text or email to designated contacts. Advanced systems also allow users to log both the highest and lowest temperatures over a set period of time – often a 24-hour period. This provides a snapshot to make sure the temps were within range that day – convenient when the person responsible for temperatures is not the same person designated to receive alarm notifications.

### Continuous recording with a remote monitoring system

- 1) Install a device on the wall of the facility.
- 2) Connect it to the Ethernet or cellular network.
- 3) Install temperature sensors in refrigerators and freezers.
- 4) Connect the sensors to the device.

Data loggers and remote monitoring systems require a greater initial investment but cost far less when factoring in labor costs of manual recording and the "costs" of financial risk of compromised lab tests and samples.





## Important facts about calibration

The CDC recommends using calibrated temperature monitoring devices with a Certificate of Traceability and Calibration Testing. It is important to have calibration testing performed by a lab with accreditation from an International Lab Accredited Coop (ILAC) Mutual Recognition Arrangement (MRA) signatory body.

An easier alternative is to purchase your monitoring equipment from a manufacturer that provides this documentation – a Certificate of Calibration. The documentation should show that calibration testing was performed that meets International Organization for Standardization/International Electrotechnical Commission (ISO/IEC) 17025 international standards.

Once the device is installed, the CDC recommends that you do calibration testing every one to two years. A NIST Traceable Calibration performed by an A2LA or similarly accredited laboratory is the best way to ensure your data logger's accuracy.

## CDC calibration recommendations

- Get a Certificate of Traceability and Calibration Testing.
- Testing should meet ISO/IEC 17025 international standards.
- Do calibration testing every one to two years.

## Final Thoughts

Cold medical assets like research samples are expensive and sometimes irreplaceable. Their temperature has to be maintained during storage until they are ready to be used. Remote monitoring systems and data loggers protect these assets 24/7 and provide an audit trail documenting their correct storage. The devices are so inexpensive to install and maintain, you can't afford to be without this monitoring technology.

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### Have Questions? Need Advice?

Talk with a Sensaphone cold storage monitoring expert today at **877-373-2700**, [contact@sensaphone.com](mailto:contact@sensaphone.com) or visit [sensaphone.com/industries/medical-cold-storage](https://sensaphone.com/industries/medical-cold-storage).

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## About Us

Since 1985, Sensaphone® has designed and built its full line of innovative remote environmental monitoring systems and early detection products that quickly and effectively provide alerts to problems at your facilities. Over 400,000 systems are in use today around the world with the highest customer satisfaction rates in the industry.

Sensaphone is a family-owned business, and products are manufactured in the USA.

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**SENSAPHONE®**  
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