

Protecting Irreplaceable Blood Samples for Pediatric AIDS Research

Accsense Online Monitoring for Medical Refrigerators and LN2 Freezers

The University of Southern California's Maternal, Child, and Adolescent Virology Research Laboratory relies on their Accsense Online Monitoring System to monitor specimen temperature and to provide alarming for their freezer storage units. This CLIA certified lab also works under the NIH's (National Institute of Health) Division of AIDS.

Laboratory Manager Patricia Anthony, CLS, MT (ASCP) explains, "Our lab operates on a small NIH budget for pediatric AIDS research as part of IMPAACT (International Maternal Pediatric Adolescent AIDS Clinical Trials Network). One of our ongoing projects is to maintain Lab Director Dr. Andrea Kovacs' 25-year repository of specimens—these blood samples are irreplaceable. With this repository our scientists have been able to produce vital research presented at CROI and IDSA in this past year along with numerous papers in progress."



Biorepository Temperature Monitoring Requirements:

Researchers are storing blood samples taken from pregnant women with HIV for use in research testing and clinical trials. The lab stores its samples in two separate rooms containing a total of ten biorepository ultra-low freezers and eleven liquid nitrogen freezers for cryogenic sample storage. These samples primarily include plasma, serum, and PBMCs (Peripheral Blood Mononuclear Cells).

Lab Manager Patricia Anthony further outlines the lab's operation: "Dr. Kovacs started this lab more than 25 years ago when Los Angeles became one of the epicenters of HIV. She worked to help prevent the transmission of HIV from mother to child, back when little was known about the disease. Currently we have six people working in our lab, in addition to Infectious Disease Research Fellows and medical students."

The biorepository samples are critical to this work so elaborate storage precautions are necessary. As is the case with many life science products, these specimens have to be maintained at a temperature of: $-70^{\circ}\text{C} \pm 5^{\circ}\text{C}$. The viable PBMCs are kept in cryogenic storage

and need to be stored at $\leq -140^{\circ}\text{C}$ within their liquid nitrogen freezers. The lab also has refrigerators that are set to alarm if they go above 8°C .

Wireless System Installation:

The lab's wireless Accsense temperature monitoring system includes A1-13 and A1-02b Wireless Data Logger Pods and a B1-06 Gateway. The A1-13 pods connect to up to 3 RTD temperature sensors for most temperatures in the lab while the A1-02b pods use a type-T thermocouple for the cryogenic freezers. The A1-02b pods also alarm the open/close state of a refrigerator or freezer door with its digital inputs. The pods operate on either battery or AC power and the lab also uses Accsense to monitor ambient temperature, with two more probes recording this value in both specimen rooms.

The Accsense pods are connected to the lab's Ethernet network through wireless communications with the B1-06 gateway. The B1-06 Wireless Gateway collects and sends each logger's data to the Accsense secure servers. Once the data is online, staff can download it as a CSV file and load it into most spreadsheet applications including Excel™ or simply print a graph of the recorded temperatures. The secure Accsense servers also automatically transmit the alarms and can use their internal data storage to compensate in the event of Internet outages.

Staff can view the real time temperature data online using their secure Accsense account. The customizable interface and measurement dashboard shows the most recent data from each data logger, and users can display historical data with ranges anywhere from 5 minutes to 90 days.

Automated Alarm Capability:

Lab staff relies on their Accsense installation to continually monitor their freezer storage unit temperatures and to automatically generate alarms when temperatures go outside preset limits. The lab's Accsense monitoring subscription guarantees access to this functionality. In an alarm event, a group of four lab staff including the lab manager each receive an automated phone call and an email alarm.

Using the software interface, users have configured Accsense to take a temperature sample through each probe and also perform an alarm check every 15 minutes to see if any storage unit is outside its safe temperature values, with the usual alarm window being $\pm 5^{\circ}\text{C}$. After an alarm event, the research team has just one hour to respond before the samples begin to degrade.

Upon receiving an alarm event, lab staff is able to immediately respond with corrective actions including to adjust the AC in the room if necessary and also to lower the temperatures of the affected storage unit. On one occasion the lab's AC system suddenly failed and one of its freezers began to warm up. However, thanks to the automated alarms, personnel had sufficient notice to move the affected freezer's contents to another unit, thereby saving the samples.

Post-Installation Benefits:

The lab Manager describes the main benefit of her Accsense system as: “Definitely the alarming features! I wouldn’t be able to sleep at night without the system handling all the alarms for us. The temperature monitors carry us through the night and while we’re out on weekends.”

Compared to visually checking the temperature throughout the day, automated monitoring is far more reliable and the data is also documented for future reference and regulatory compliance. The system’s historic data archiving also helps maintenance efforts: recently the lab manager printed out a chart showing one of the room’s temperature profiles to prove to her facilities managers that the ambient temperatures had become too high.

Patricia Anthony continues, “We have been supportive of Accsense and have encouraged other labs at USC to purchase the same system when they have been referred to us. With your system, we can always look online to see what’s going on and immediately respond if necessary. This repository is Dr. Kovacs’ life work and is the source and center of our research. Your Accsense Monitoring system assists us in this endeavor. We’ve had five abstracts accepted for Infectious Diseases Society of America ID Week last year and we’re planning on publishing several papers this year.”