**Purpose:**

To provide instruction in response to temperature alarms, for the storage units of blood and tissue components, to ensure the products remain within the required temperature range.

**Temperature Alarm Guidelines**

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| **Monitored Storage Unit** | **Required (Acceptable) Temperature Range** | **Low Alarm Activation Temp** | **High** |
| Blood Refrigerators | 1° C - 6° C | 1.5° C | 5.5° C |
| Reagent Refrigerator | 2° C - 8° C | 2.5° C | 7.5° C |
| Platelet Incubators | 20° C - 24° C | 20.5° C | 23.5° C |
| Plasma Freezers | -18° C and lower | -50o C | -20° C |
| Ultralow Freezers  | -40° C and lower | -90° C | -65° C |
| Room Temperature | 19.4 – 23.9oC | 19.4 oC | 23.9 oC |
| Humidity | 8 – 65% | 8% | 65% |

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| **Alarms** |
| Transfusion Services Laboratory has a redundant alarm system for all blood, autologous tissue, and reagent storage devices. Room temperature and humidity are also monitored by the TempTrak System.* TempTrak is a computer monitoring system with pager notification.
* Audible alarms are in place for all units.
* All alarms will have the 1st notification sent to the HMC TSL TempTrak Pager located in BCT67
* If alarm is not acknowledged, the 1st escalation call will be made to HMC TSL main line at 206-744-3088
* All alarm issues must be resolved by the 1st escalation
* The 2nd escalation will be done via email to the TSL Manager and Compliance Manager
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| **Step** | **Action** | **Related Documents** |
| **Alarm Sounds** |
| **Initial Response for all Alarm Events**  | * Silence audible alarms and/or TempTrak pager.
* Evaluate storage unit for probable cause of the alarm event, correcting obvious problems immediately.
* Record digital and thermometer temperatures in TempTrak then acknowledge alert in TempTrak, including any steps taken to correct the alert.
* If TempTrak is not available, record alarm event on downtime log.
* Start 25 minute timer to insure frequent observations of temperature trending.
* If the storage unit is a portable, consider replacing with a functioning unit.
* Document all actions and findings.
* When temperature has returned to the acceptable range, clear TempTrak alert in order to reactivate alarm notification
 | Using the TempTrak System  |
| **Step** | **Action** | **Related Documents** |
| **Additional Investigation Steps** | * + Check the alarm and/or system battery. Replace if needed.
	+ Verify the temperature probe is not out of the solution bottle or has been damaged.
	+ Confirm the TempTrak probe is connected.
	+ Confirm the storage unit door is closed
 | Operator Manuals |
| **Acceptable Internal Temperatures** | If Temptrak is alarming yet manual temperatures are within acceptable range then proceed with the following:* Acknowledge alert in TempTrak, record manual internal temperatures and digital chart temp in TempTrak
* Document the reason in the “Comments/Corrective Action” section.
* It is **not** necessary to move components or bone at this time.
* If issue is resolved within 15-30 minutes there is no need to continue monitoring manual temperatures. Be sure to clear the TempTrak alert and state possible cause of alert.
* If issue is not resolved within 30minutes then:
* Place chart recorder on the equipment
* Record temperature every 4 hours on the Downtime Blood Storage Device Form since the TempTrak system is not transmitting or the temperature recorded is not accurate in TempTrak
* Call TempTrak if alarm is not resolved
* Follow downtime process for temperature monitoring
 | Downtime Blood Storage Device Daily QC FormUsing the TempTrak SystemDowntime Temperature Monitoring and Maintenance of Blood Storage Devices  |
| **Unacceptable Internal Temperatures** | If the internal thermometer readings are **not** within acceptable range:**Refrigerators, Freezers, Platelet Incubator*** Acknowledge the alert in Temp Trak, record manual internal temperatures and digital chart temp in Temp Trak at 15 and 30 minutes.
* If the internal temperature has not returned to the acceptable range **within 30 minutes** or the unit has failed completely, move the contents to an alternate unit.
* Notify Engineering and complete equipment out of service process
* All blood components must be relocated to the acceptable storage temperature. Do not move blood to storage temperatures that do not meet the acceptable temperature requirements
* All in-date Reagents must be relocated to the acceptable storage temperatures. Testing reagents and liquid blood should not be stored in the same refrigerator
* Relocation of all other supplies and patient samples can be delayed awaiting consult with Lead, Manager and/or Engineering
 | Downtime Blood Storage Device Daily QC FormUsing the TempTrak SystemRemoving Equipment from Service |
| **Step** | **Action** | **Related Documents** |
| **Unacceptable Internal Temperatures****(continued)** | **If NO alternate storage is available:*** Contact the TS Manager and Bloodworks Inventory Management
* Make arrangements to return components to supplier. Only components sent by blood supplier may be returned to them.

**Ultralow Freezers (Bone and Tissue Storage Units)*** Acknowledge the alert in TempTrak, record manual internal temperatures and digital chart temp in TempTrak at 15 and 30 minutes.
* Record the digital temperature at 15 and 30 minutes.
* Refrain from opening the door.
* Ultra low in OR: Notify OR front desk and deliver the key to them after insuring the freezer is locked. Notify implant room immediately if allograft contents in ultralow needs to relocated.
* At 30mins verify that the temperature is trending to the acceptable range. If unit is not trending to the acceptable range then relocation of contents must be considered
* Bone freezer contents must be moved if temperature reaches -40oC. HMC TSL is responsible for moving autologous bone flaps to alternate storage. Allogeneic tissue will be relocated by Implant
* Alternative storage is available in OR.
* If no alternate is available, immediately notify:
	+ **First call** TSL Manager or Medical Director.
	+ Risk Management (744-9574).
	+ Infection Control (744-9560).
	+ Neurosurgery Attending (for autologous cranial bone flaps on call through the hospital operator.
	+ Orthopedic Attending (for all other autologous bone, if any) on call through the hospital operator.
 | Packing Blood Products for Transport |
| **Room Temp and Humidity** | Report directly to Facilities Engineering.  | Removing Equipment from Service |
| **Notifications** | The following personnel and departments should be notified when there are issues with the storage equipment:* Contact the Lead Tech, Manager, and/or appropriate service department.
* Portable refrigerators: Notify **Clinical Engineering** to respond STAT (206-744-3496).
* All other storage equipment: Notify **Facilities Engineering** to respond STAT (206-744-3191).
* After hours, page the Nursing Supervisor through the hospital operator. They will contact the engineer on call to respond to TSL.
* Complete the Clinical Support Services Centralized Work Request on the HMC intranet
* Document equipment problems and their resolution with a QIM and include in the shift change report.

**NOTE:**  Engineering is expected to respond within 30 minutes of receiving a STAT call.  | Quality Improvement Monitoring Form |
| **Step** | **Action** | **Related Documents** |
| **Bone Freezer Alarms** |
| **Digital Display and Control Panel** | The tissue freezer alarm system is shown in Operators Manual. When an alarm is active, a message appears in the LED message center. * Press the MUTE key to silence the audible alarm for the ring back period.
* The visual alarm will continue until the freezer returns to a normal condition.
* When an alarm condition occurs and then returns to normal, the freezer automatically clears the alarm condition and the message center.
* When multiple alarm conditions occur, active messages are displayed in the message center one at a time, updating at 5 second intervals. Pressing Mute during multiple alarms causes all active alarms to be muted and ring back in 15 minutes.
 | Operator Manuals |
| **Probe Failures** | Probe failures:* If an error is detected with the control probe (PROBE 1 FAIL), the high and low stage compressors will run continuously. As a result, the cabinet temperature will decrease until it reaches the lowest temperature that the refrigeration system can maintain.
* If an error is detected with the heat exchanger probe (PROBE 2 FAIL), the freezer will cycle properly at its temperature set point using a 5 minute step start between the high and low stage compressors.
* If an error is detected with the condenser probe (PROBE 3 FAIL), there is no impact on the performance of the freezer. However, the hot condenser alarm may also occur when the condenser probe fails.

Call the TSL Manager or Medical Director (when time appropriate) regarding any probe failure alarms. Technical service is required. | Operator Manuals |
| **Remove from Service** | If the storage unit is evaluated as requiring repairs, remove the equipment from service. | Removing Equipment from Service  |
| **Wastage Reporting** | Complete an on-line incident (PSN) and an internal QIM report whenever blood components or bone are wasted due to a malfunctioning storage unit. | Quality Improvement Monitoring Form |

**References**

Standards for Blood Banks and Transfusion Services,Current Edition. AABB. AABB Press, Bethesda, MD.

Manufacturer Operator Manuals for Helmer i Series Refrigerators and Freezers

Manufacturer Operator Manual for Helmer Horizon Platelet Incubator

Manufacturer Operator Manual for VWR Tissue Freezers

Cooper Atkins, Temptrak 5.0