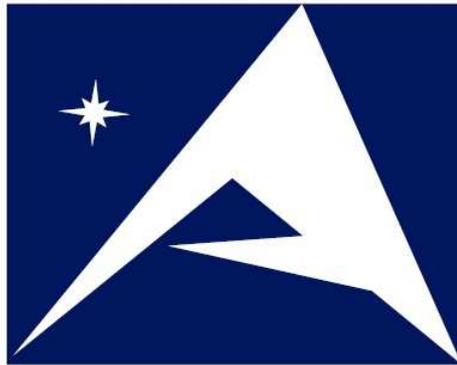


Alcor A-2830

Case Report

ALCOR



LIFE EXTENSION FOUNDATION
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Alcor A-2830 Case Report Contents:

1. Overview.....	Page 3
2. Personnel.....	Page 3
3. Pre-Deployment.....	Page 4
4. Stabilization and Transport.....	Page 4
5. Cryoprotective Surgery.....	Page 5
6. Perfusion Summary.....	Page 6
7. Timelines.....	Page 7
8. Issues & Actions.....	Page 9
9. Graphs.....	Page 9
• Transport temperatures	
• Perfusion temperatures	
• Plunge temperatures	
• Complete cooldown temperatures	
• Cryoprotection	
• Pressure and pump speed	

1. Overview

Around 1:16am on Tuesday May 5, 2015, we received an alert from Ronald Selkovitch, a 21-year member of Alcor. His 83 year-old wife, Mariette, had gone into cardiac arrest and resuscitation was being attempted. There was no membership paperwork for her and no funding arranged but he was insisting that we come for her regardless. Normally, this would rule out Alcor accepting such a case. However, on checking our records, some important details emerged. Something similar happened in 2008, when Mr. Selkovitch's 101-year old mother died, also without having any membership paperwork signed or funding arranged. Nevertheless, we accepted the case. Mr. Selkovitch followed through as promised and paid for her. His mother is still our oldest patient at time of clinical death, just short of 102 years old.

It must be stressed that the decision could easily have gone the other way, and in just about any other circumstance, would have. As it was, due to this being a third-party signup (by a member), Mr. Selkovitch was faced with the standard \$25,000 third-party fee (the primary purpose of which is to compensate for family and legal risks). He said he would gladly cover this if we would accept his wife's case.

After disclosing to Mr. Selkovitch the prospects of a delayed cryopreservation with no immediate stabilization, Alcor sent a two-person team to California to execute the documents, accept the body, perform stabilization and cooldown procedures prior to returning to the waiting surgical team at Alcor in Scottsdale, AZ. Surgical intervention and neuro cryoprotectant perfusion was then performed while the cooling process continued.

On Tuesday, May 5th, 2015, A-2830 became Alcor's 136th patient to enter into long-term storage.

2. Personnel

Stabilization: Aaron Drake, NREMT-P, NAEMSE, Alcor Medical Response Director; Steve Graber, Alcor Technical/Readiness Coordinator. Direction and oversight was provided by Max More, Ph.D., CEO; and Steve Harris, M.D., Chief Medical Advisor.

Surgery and cryoprotectant perfusion: José Kanshepolosky, M.D, Surgeon; Aaron Drake, Surgical Assistant; Hugh Hixon, Cryoprotection Perfusionist; Steve Graber, Assistant Cryoprotection Perfusionist; Max More, Scribe and Overseer.

3. Pre-Deployment

When the emergency call came in to Alcor at 1:16 AM through TeleMed, Alcor's emergency answering service, Aaron Drake, Alcor's Medical Response Director returned the call. As he spoke with Ronald about his wife, Mariette, Aaron could hear EMS personnel working in the background. Despite efforts by local paramedics, they were unsuccessful at resuscitating Mariette and official pronouncement occurred at 1:30 AM, just a short while after the call.

The husband was very insistent with the local sheriff that an autopsy would serve no purpose at this late age in life and would only interfere with cryopreservation efforts. After investigating the scene, the San Diego County sheriff agreed and said he would allow the body to be released to a mortuary without any further examination required. Ice packs were then immediately applied to the wife's head, neck and upper torso.

Meanwhile, Ronald negotiated with Alcor to accept his wife as a post-mortem member with the hope that some manner of stabilization and cryoprotective perfusion could still be performed. After discussion of the terms with several members of Alcor's Board of Directors, Max More authorized the membership and directed Aaron, and fellow employee Steve Graber, to begin preparing for the case. Normally, Alcor would call in Suspended Animation in such a case, but the unusual conditions ruled out that option. In the middle of the night, Aaron and Steve collected the response kit from Alcor and began the drive to San Diego County.

4. Stabilization and Transport

Numerous phone calls were made while en route to coordinate which mortuary would be involved and to ensure there was no delay in moving the individual to their cooler. A request was made to use the mortuary's prep room so Alcor could administer and circulate anticoagulant medications prior to the drive back to Arizona. Instructions were also given to expedite the process to obtain a transit permit from the San Diego County Health Department so there would be no delay in transporting the body across state lines.

It took a little more than six hours of driving for Aaron and Steve to arrive at the mortuary. They met with the family and then the funeral representative, who announced that the transit permit was in the final stages of approval and should be available within the hour. The Alcor duo was directed to the cooler where the patient was stored, adjacent to the prep room, where full use of the facilities was granted. Verbal authorization to proceed was granted by the family but the paperwork would have to come later as the anticoagulants needed to be administered as soon as

possible. The family said they would wait inside the mortuary until the stabilization process was completed.

The patient, who was still covered with bags of ice, was moved from the cooler to the prep room's embalming table with a MegaMover transport sheet. Two thermocouples were placed into the nasopharynx and plugged into a Reed Instruments Data Logger to record the temperature descent. The thermocouple wires were secured using an Oasis 35W skin stapler. The initial temperature was recorded as 21°C.

The ECG electrodes, defibrillator pads and endotracheal tube used by EMS personnel were removed and discarded. The existing intravenous (IV) catheter in the patient's right antecubital vein was tested for patency and found to be unusable. Therefore, a bone injection gun was used to place an intraosseous (IO) catheter into the patient's right tibial plateau for medication administration. Alcor's abbreviated medication protocol consists of six medications. These were administered through the IO port and circulated for 10 minutes with the assistance of a LUCAS 2 chest compression device. The mortuary representative came into the prep room, while compressions were continuing, to announce that she had received the transit permit from the health department and the team would be able to transport the patient upon completion.

Alcor's portable ice bath (PIB) was lined with two body bags: 1) one external heavy duty Department of Defense Spec Human Remains Pouch that is leak-proof; and 2) a lightweight polyethylene internal bag that helped create a vapor barrier from the outside ambient air. After sufficient circulation of the medications was completed, the Lucas 2 was disassembled and the body was moved to the double body bag-lined PIB using the MegaMover. The PIB was rolled into the back of the Alcor transport vehicle and fresh bagged ice, which had been purchased prior to arrival, was placed around the entire body before the body bags were closed.

While Steve reloaded the equipment into the vehicle, Aaron went back into the mortuary to complete the paperwork requirements with the family and to obtain copies of the approved transport permit. The husband came out for one last look at his wife as the Alcor team departed for the drive back to Arizona.

5. Cryoprotective Surgery

At almost precisely 18 hours after pronouncement, Aaron and Steve arrived back at Alcor in Scottsdale. The body bag containing the patient was unloaded onto Alcor's rolling gurney and taken into the surgery bay. The head and shoulders were supported from underneath so any fluids would drain away from the surgical field.

The head was shaved and prepped prior to bilateral burr holes being established. Thermocouples were inserted and secured to begin monitor and recording temperatures. The anterior neck was prepped and incised to raise, secure and clamp the carotid arteries. The remaining tissue was cut away, revealing the spinal column. Separation was made at the intervertebral disc between C2 and C3. The cephalon was moved to the neuro perfusion box and secured in the cephalon ring.

Both carotid arteries were cannulated with #14 Fr. primed catheters and secured in place. Flow was established, revealing the vertebral arteries, which were then clamped off. Venous pressure wires were secured to the side walls of the jugular veins. Once everything appeared secure and higher flow was established, the neuro box was closed so cooled perfusion could continue.

6. Perfusion Summary

From legal pronouncement until the patient was on the perfusion ramp took approximately 20 hours. In Alcor's experience, conducting cryoprotective perfusion after more than 24 hours of cold ischemia can produce extensive edema and offers little additional protection against ice formation in the brain. With greater time delay, there is increased permeability of the blood-brain barrier. This can cause the brain to swell, compressing blood vessels and impairing circulation during cryoprotectant perfusion. For this particular patient, the eyes retracted and the skin was evenly tanned which suggests good perfusion, however neither side of the brain retracted and the left side slightly protruded from the lower surface of the burr hole. There was obvious uptake of cryoprotectant, but the amount and distribution is unclear. The amount of increased volume in the circulating reservoir was, at best, minimal.

Perfusion was terminated by Hugh when it was obvious from the effluent concentration plot that cryoprotectant uptake had plateaued for unknown reasons and all that was being accomplished was cryoprotectant exposure without any additional benefit. The temperature traces for the burr hole and pharyngeal thermocouples also stalled out. Left venous [M22] was 40 Brix, or about 75% of the desired target concentration. The cooldown plot for the plunge to -110°C (shown below in "Graphs") shows there were isotherms indicating incomplete perfusion. A CT scan of the head, which will be scheduled in the future, will show more definitive results.

Upon examination, the refractometer faces were covered with an unknown type of film. This is probably the source of inconsistent traces in the effluent cryoprotectant concentration plot. This may have occurred in part due to bad timing on switching flows in the circuit; a short checklist for these transitions needs to be written.

Additional notes: The perfusion pressure software did very well; temperature control was good; and the new larger monitor made it easy to view the data.

7. Timelines

May 5th, 2015

Notification:

1:16am: Emergency Text from Telemed.
1:22am: Communication with husband.
1:30am: Pronounced by San Diego County Sheriff.
4:02am: Arrived at Alcor to package and load items into vehicle.
5:21am: Departed Alcor for San Diego County.
12:01pm: Arrived at Mortuary in Ramona, CA.

Stabilization and Transport:

12:12pm: Body moved from cooler to prep room table.
12:20pm: Placed thermocouples in nasopharynx.
12:23pm: Established Intraosseous catheter.
12:25pm: Administered 250,000 IU Streptokinase.
12:26pm: Administered 50ml Sodium Citrate 20%.
12:27pm: Administered 100,000 IU Heparin.
12:28pm: Administered 80mg Gentamicin.
12:29pm: Administered 500ml Mannitol.
12:34pm: Circulation started with Lucas 2.
12:36pm: PIB prepped with double body bag liner.
12:45pm: Circulation stopped.
12:50pm: Body moved to PIB.
12:52pm: Clean-up of prep room.
12:58pm: Met with family to finalize Alcor paperwork.
1:10pm: Completed administrative paperwork with mortuary.
1:15pm: 7.9°C nasopharyngeal (NP) temperature
1:17pm: Departed mortuary towards Arizona.
7:35pm: Team arrives at Alcor with patient.
7:48pm: 1.5°C NP.

Surgery at Alcor:

8:07pm: Started shaving head to prep for burr holes.
8:12pm: Burr holes established.
8:17pm: Cleaning up burr holes.
8:18pm: Finished.
8:17pm: Priming system.
8:22pm: Anterior neck prepped.
8:23pm: Thermocouple in left side of brain surface and secured.

8:26pm: Finished the fill. Recirculating. Incised left side of neck.
8:28pm: Isolated left carotid artery.
8:29pm: Incising right side.
8:33pm: Right carotid isolated.
8:36pm: Cryoprotectant hooked into system; Brix readings from computer inaccurate therefore decision made to unplug refractometers in an attempt to reset.
8:39pm: 5 PSI system pressure.
8:41pm: Both left and right jugulars severed.
8:43pm: Cephalon separated from torso.
8:44pm: Unplugged and replugged chassis component – fixed refractometers.
8:45pm: Clamped both vertebrals.
8:47pm: Cephalon in neuro box.
8:49pm: Cephalon secured.
8:55pm: Left carotid cannulated and secured.
8:57pm: Right carotid cannulated and secured.
8:58pm: NP = 9.5°C. Burr hole = 9.9°C
9:01pm: On open circuit flush. Increasing arterial pump speed to 120 mL/min.
Target pressure at 56 mmHg.
9:03pm: NP = 10°C.
9:08pm: Left venous return secured.
9:09pm: Good flow out of both vertebrals.
9:12pm: Getting refractive readings on sampling lines now.
9:12pm: Ramp started.
9:18pm: On closed loop recirculation. On ramp again.
9:22pm: Lost HDMI signal to large monitor.
9:23pm: HDMI signal back.
9:26pm: Brain not retracting.
9:40pm: Pressure test. Clamped each side and saw pressure rise by more when the right side was clamped. Volume of mixing reservoir is increasing.
10:01pm: SG changed temperature from 4°C to 3°C and arterial dropped rapidly to minus -0.4°C.
10:56pm: Down to 1.0 liter from 1.65 liters in mixing reservoir.
10:56pm: Mixing reservoir: 1.0. Concentrate reservoir 7.2 Effluent reservoir 2.0.
11:08pm: Ramp off. Brix: R: 32.28. L: 29.71. Box going to minus 3°C.
11:22pm: Back on the ramp. Mixing: 0.98. Conc 6.83. Effluent: 2.2. Speed 90.
11:35pm: Ramp off. CC-Arterial 53.3. R venous: 35.69. L venous: 39.74.

May 6th, 2015

12:05am: Ramp on.
12:13am: Ramp off.

8. Issues & Actions

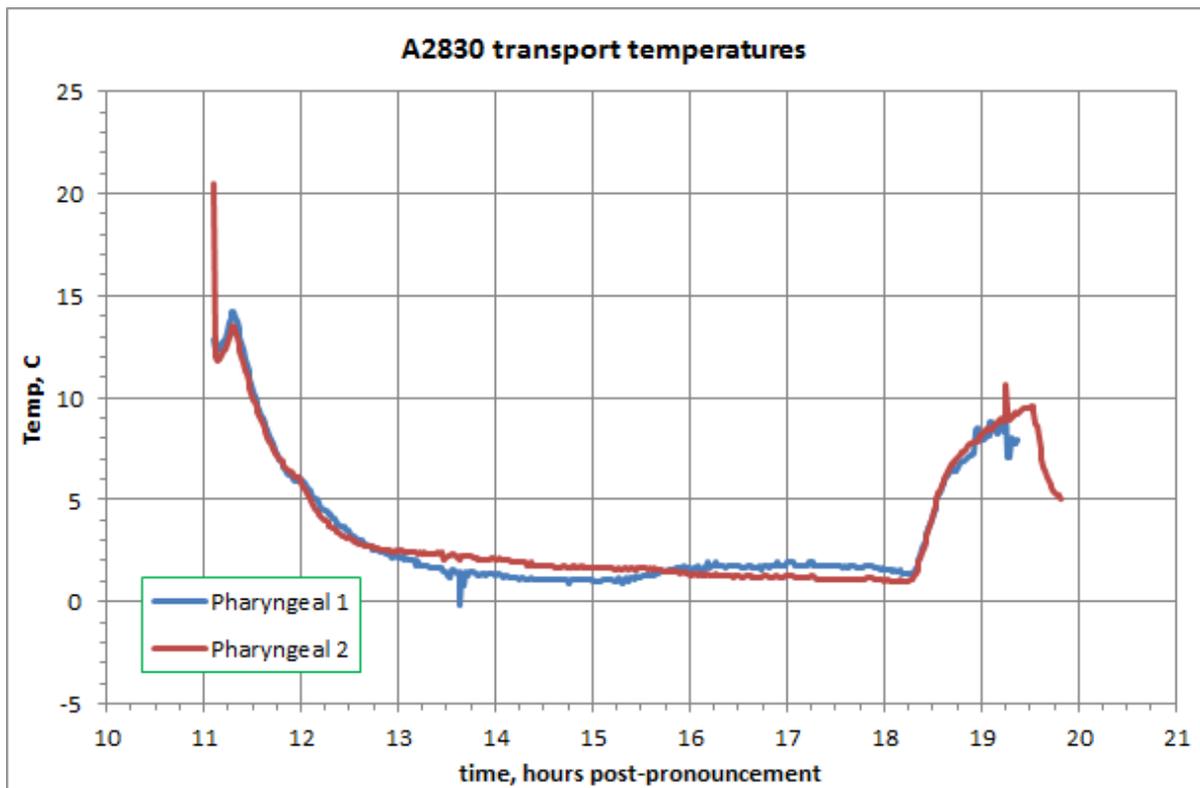
Issue: Operating room was not well prepped prior to patient’s arrival. Items needed but not ready included digital camera, perfusate, circuit primed, thermocouples, and personnel in appropriate OR attire.

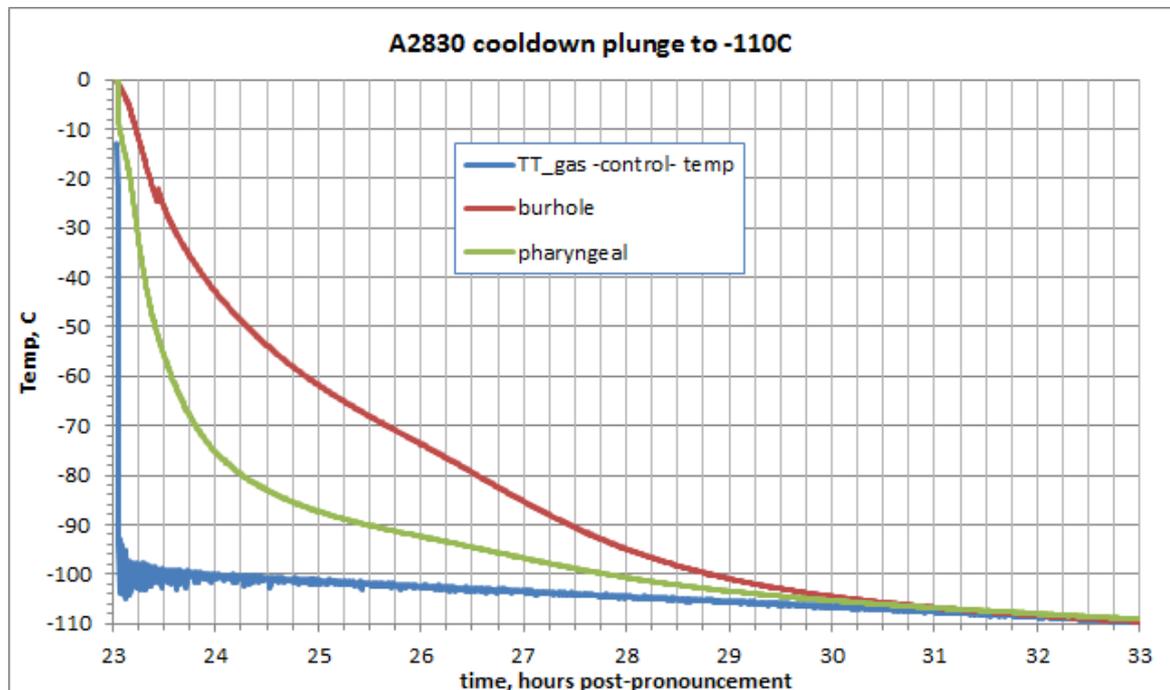
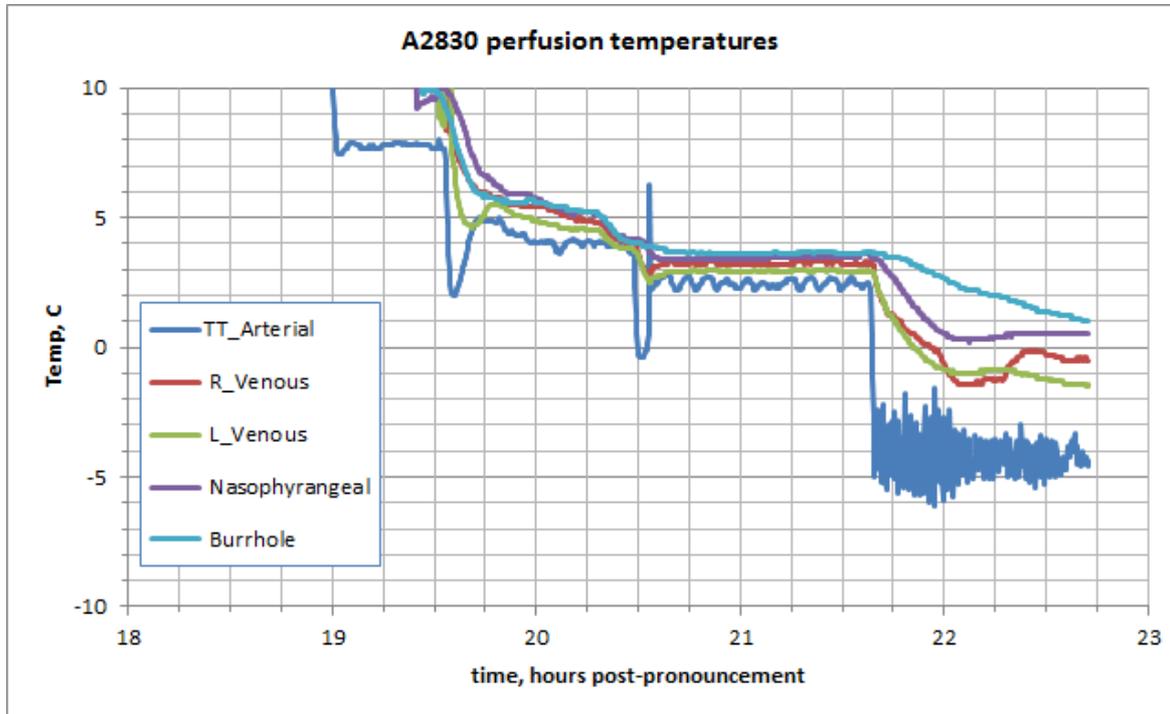
Action: Develop an OR checklist to ensure that items are not forgotten.

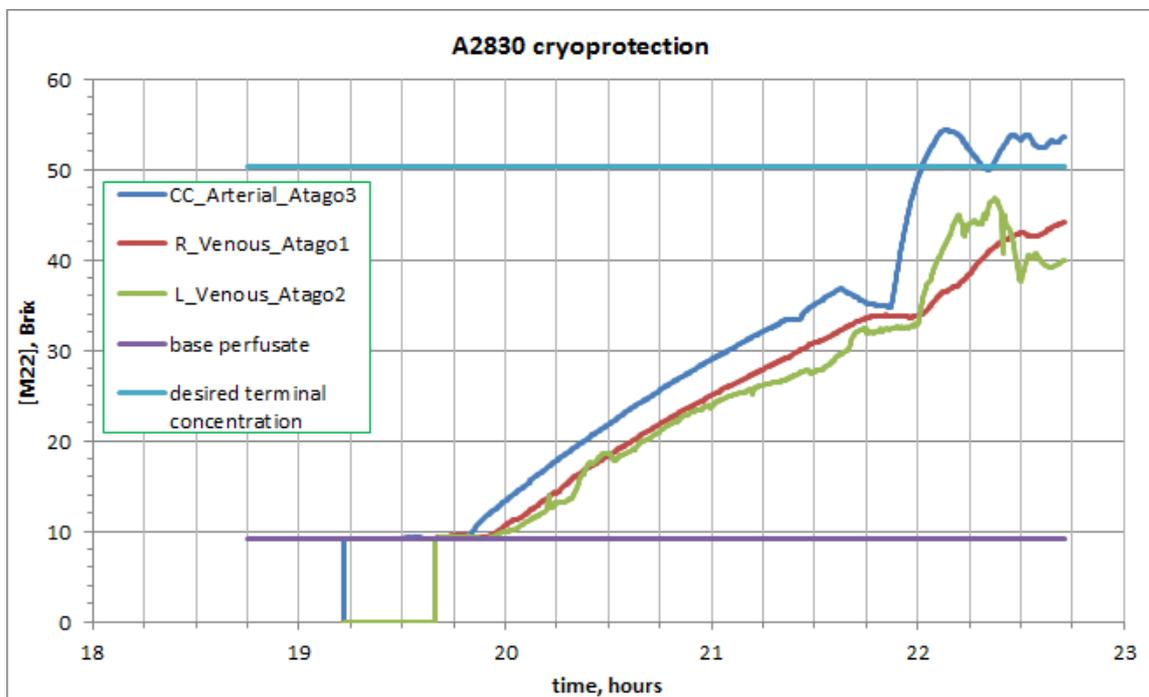
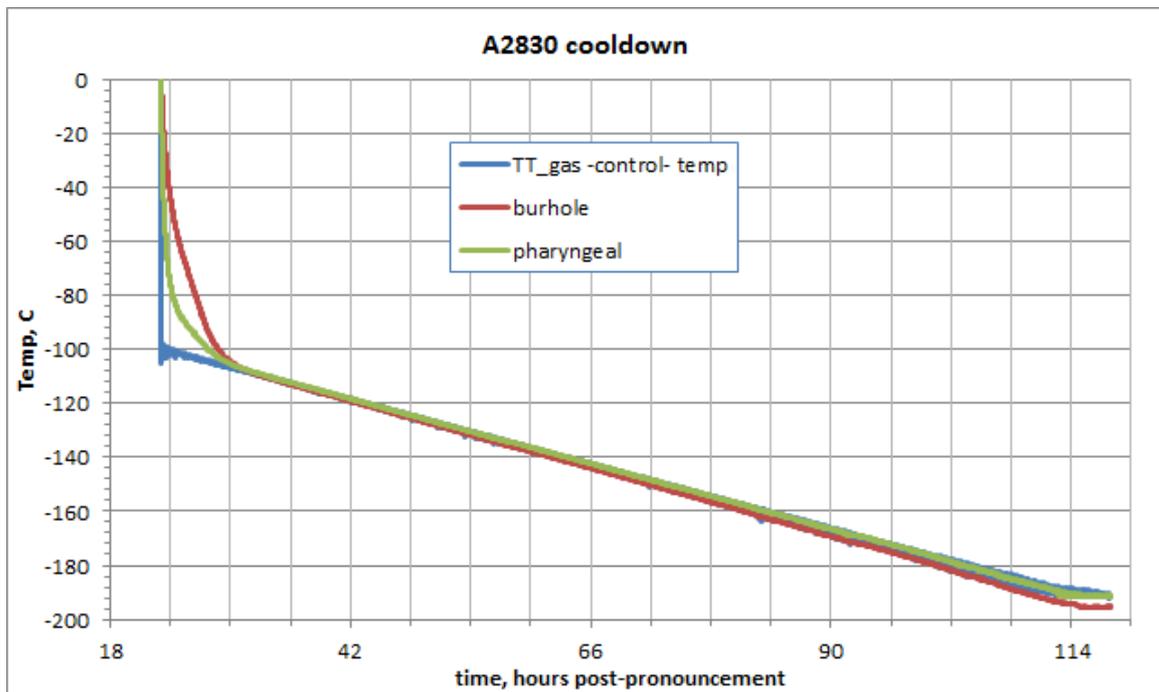
Issue: Confusion identifying proper thermocouples.

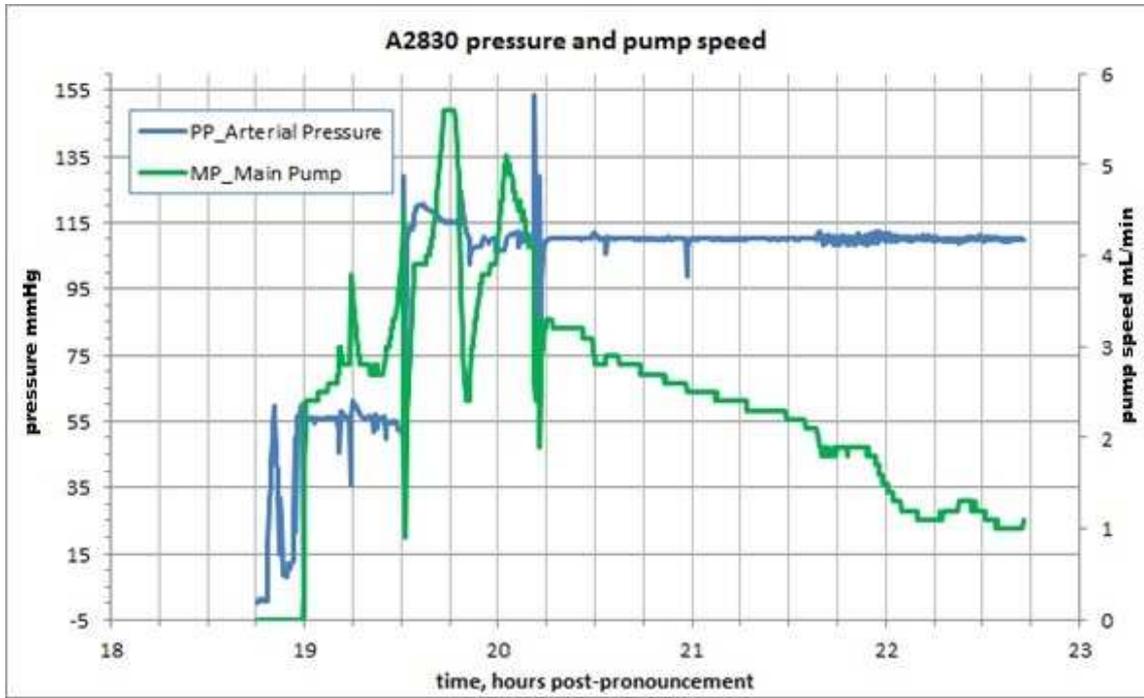
Action: Steve Graber will label all the thermocouples for easy identification.

9. Graphs









--End of report--