

Worker Sustains Cryogen Burn While Using Liquid Nitrogen Fill Station

Event: LBNL Event

Event Date: 06/07/2018

Category: ESH-Cryogenics – Cryogen Handling

Lesson Learned Statement:

Cryogen burns can happen quickly, and due to the extreme cold there may be little pain during skin contact. The extent of damage may not be apparent for hours after the injury occurs. Filling cryogenic liquid Dewar flasks at LBNL is a routine operation. Though routinely used, it is essential to recognize that contact with the cryogenic liquid or extremely cold objects can lead to rapid tissue damage. Inherently safe filling procedures, on-the-job training (OJT) from an experienced and responsible user, proper equipment selection, and fully functional and undamaged Personal Protective Equipment (PPE) are essential to ensure prevention of skin or eye contact during filling operations.

Discussion:

A new user was receiving OJT to fill a 4L Dewar flask at a liquid nitrogen filling station, along with two other trainees. An experienced user walked through the procedure with the trainees. The experienced user then supervised as one of the new users performed the liquid nitrogen filling procedure, which appeared to proceed successfully. The operation was carried out using a face shield with safety glasses, lab coat, long pants, close-toed shoes, and cryogen gloves from the user's lab. When the group returned to the lab and the new user removed the cryogen handling gloves, they discovered signs of skin exposure or extreme cold. The group called x6999 to summon paramedics, and the exposed user was transported to the hospital for evaluation. It later became evident that the user sustained tissue damage as a result of the exposure.

An investigation into the causes of this incident is ongoing, but preliminary evaluation of the filling station equipment, filling procedure, and PPE revealed several key contributing factors. Most significantly, there was a leak in the filling hose that may have contributed to the injury. Contact with frozen metal filling components is also a possible contributing factor. During the initial investigation, it was learned that the written filling procedure had been modified and that a funnel was being held over the Dewar flask during the filling. The cryogen gloves in use during the filling operation were found to have several small holes in the splash-resistant outer layer, which may have also contributed to the skin exposure.

This incident underscores the importance of worker training and understanding of the hazards associated with any work. An investigation into the incident is ongoing, and recommendations may be updated when more is known about the contributing factors. Until then, EHS recommends the following general precautions:

1. Read and understand the activity, complete all online training and OJT, and obtain authorization on the activity prior to performing work.
2. Do not perform any tasks unless you feel comfortable and confident that you can perform the work safely. Inform your activity lead or supervisor before beginning a task if you have concerns about the safety of the work.
3. Review and be familiar with operating procedures or other formal written procedures for a particular task. If there is reason to deviate from normal procedures, evaluate the change to ensure continued safe work practices and document the change appropriately.
4. Inspect PPE and other equipment before starting work. Never use PPE that is damaged. Report damaged PPE so that it can be taken out of service and replaced.
5. Be aware of the limitations of any PPE that you use. Cryogen gloves are not intended for prolonged contact with cryogenic liquids or cold surfaces. Additionally, if the insulating material of the glove becomes wet, it is no longer protective.
6. Visually inspect equipment before starting work and carefully monitor performance during filling operations. Immediately report any leaking or defective equipment, no matter how minor, to the Activity Lead, Division Safety Coordinator, or other responsible persons.
7. Stay alert for anything unusual or concerning about equipment or procedures, and stop work as needed. Notify your Activity Lead of any potential problems so that they can be investigated.
8. Decommission (e.g., lock out) defective equipment, tools, or machines immediately. Do not attempt to "work around" defective equipment. Post or lock out the equipment with a highly visible notice to ensure that all users are notified.

Lessons Learned are part of the ISM Core Function 5, Feedback and Improvement. Applicable Lessons Learned are to be considered during working planning activities and incorporated in work processes, prior to performing work.

Please contact the following subject matter experts if you have any questions regarding this briefing.

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