A Practical Guide to Dealing with Laboratory Floods

June 2015

APHL ASSOCIATION OF PUBLIC HEALTH LABORATORIES®

This project was 100% funded with federal funds from a federal program of $676,628. This publication was supported by Cooperative Agreement # U60HM000803 funded by the Centers for Disease Control and Prevention. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of CDC or the Department of Health and Human Services.
National Center for Immunization and Respiratory Diseases (IP)
Office of Surveillance, Epidemiology and Laboratory Services (OSELS)
National Center for HIV, Viral Hepatitis, STDs and TB Prevention (PS)
National Center for Zoonotic, Vector-borne, and Enteric Diseases (CK)
National Center for Environmental Health (NCEH)
Coordinating Office for Terrorism Preparedness and Emergency Response (CTPER)

Table of Contents

Damage caused by water pipes in 2014 at the Minnesota Department of Health Laboratory

Frozen plumbing, leaky water tanks, excessive rainfall and other problems have all precipitated laboratory floods. Whether the water is "coming under the doors," "cascading down stairwells" or "seeping through the ceiling," your colleagues have seen it all. The good news is that, short of a lab-closing catastrophe like Hurricane Katrina, most laboratory flooding is survivable. Following are recommendations from laboratory staff who speak from experience.

Section 1: Preparing for the Worst

Advance planning can take the guess-work out of emergency response and prevent a bad situation from becoming worse.

- **COOP planning:** Continuity of operations (COOP) planning is now routine for public health laboratories, which face a range of possible work disruptions, including flooding. Although COOP planning is too broad a topic to explore in detail here, a number of helpful resources are available on the APHL web site. At a minimum, (1) local first responders should be familiar with the laboratory and potential laboratory hazards, (2) agreements should be in place with external partners for surge capacity, in the event some laboratory testing must be performed off site temporarily, (3) there should be plans for what to do with samples that arrive at the laboratory when the building is shut down and (4) there should be up-to-date communication phone trees and plans for communicating with staff when the laboratory is disabled (via laptops, for example).

- **Be mindful of neighbors:** If the laboratory building is shared with another agency, be sure there are advance arrangements to notify all occupants of any crisis that impacts the building. One public health laboratory, for example, suffered a HVAC malfunction over a weekend, followed by freezing temperatures and burst water pipes. Even though alarm systems sounded, only one building occupant was notified; public health laboratory staff did not learn of the problem until at least 24 hours later.

- **Damage restoration:** Laboratory operations staff should maintain a short list of qualified contractors specializing in water removal and water damage restoration. In one public health laboratory, facility maintenance staff were familiar with such a company and able to get contractors on-site within two hours of flood detection. In addition, there should be current contact lists for every analytical section in the laboratory noting who is responsible for that area. These lists should be visible within each lab (and on file).

- **Insurance:** If the laboratory lacks insurance coverage for remediation of water damage due to acts of nature and other causes, consider adding this coverage.

- **Inventory:** The laboratory should maintain a detailed current inventory of all instruments (with model numbers and serial numbers) and supplies, along with contact information for vendors. In the event of a disaster, this inventory will serve as a checklist to gauge losses and to help facilitate a speedy recovery.

Section 2: Water, Water, Everywhere

When water is first detected where it shouldn't be — inevitably afterhours, or so it seems — several things need to happen ASAP.

- **Notification:** Whoever spies the water first — whether a laboratory security guard in the middle of the night or a scientist in the middle of the day — needs to begin a call chain that includes, at least, the laboratory director, chief of laboratory operations/maintenance, laboratory biosafety officer and, depending on the severity of the situation, the local fire department. Fire fighters are trained to minimize the water damage incurred while putting out a fire and to help property owners deal with any unavoidable water damage that occurs. Thus, they are familiar with damage-control protocols (such as poking a hole in the ceiling to release pooled water and prevent ceiling collapse) and may be able to supply water pumps, heaters, wet vacuums, tarps, etc. If your laboratory is affiliated with a university, you may also want to notify university maintenance crews, who likely can offer additional assistance and may have an existing relationship with water damage remediation contractors.

- **Safety first:** If hazardous laboratory materials are compromised or threatened, the local HAZMAT team should be involved in the response. Laboratory staff may also need to shut off the electricity in water-exposed areas, as electricity flows easily through water and poses a lethal risk. In some cases, trained laboratory personnel may need to be called in to shut off sensitive laboratory instruments. Mass spectrometers, for example, have potentially hidden high voltage lines that power overhead vacuums. Trained laboratory staff know where those voltage lines are, while first responders may overlook them. In any case, from a policy standpoint, first responders may be reluctant to touch laboratory instrumentation.

Note: *If deemed safe, do not unplug refrigerators and freezers. Laboratories have found that refrigerators and freezers can actually withstand a good amount of water exposure (including water "gushing from ceilings") without suffering damage or compromising stored items.*

- **Triage:** If water threatens immediate damage — such as in a laboratory-wide event involving a burst overhead sprinkler system — safeguard priority items as much as possible. For example, use plastic biohazard bags to cover expensive laboratory instruments and computers, close doors, remove paper files from desktops, etc.

- **Locate the source:** Of course, it is paramount to stop the flow of water, if you can. In one situation, for example, laboratory maintenance workers were able to manually shut off the valve allowing water to spew from a 2,000-gallon rooftop storage tank. Even if the worst damage is already done by the time the flood is discovered, it is necessary to identify the source of the water, so measures can be taken to avert a similar crisis in the future.

Section 3: In the Wake of the Flood

After the immediate crisis is more or less contained, the lengthy process of recovery begins. This process encompasses four activities, which will likely overlap in time: (1) assessing damage, (2) assuring continuity of vital laboratory operations, such as newborn screening; (3) restoring water-damaged areas and equipment; and (4) implementing reasonable measures to prevent future water catastrophes.

- **Calling in help:** Now is the time to call pre-identified water damage remediation experts. The sooner you begin the better.

- **Calling all staff:** If parts of the facility are unusable, you may need to notify select staff to stay home. Or, if there is extensive damage — possibly including falling ceiling tiles, electrical issues and unknown safety hazards — you may want only a core group of staff to work on flood recovery. One laboratory, which was closed by the local fire department in the wake of extensive flooding, worked through the state public information office to issue a press release notifying staff to stay home. Be sure to let staff know how they will receive (or how to access) updates including how they will be notified to return to work.

- **Initial damage assessment and clean-up:** The initial water damage assessment and clean-up will likely include removing standing water, making sure water has not infiltrated into electrical junction boxes, assessing the saturation of drywall and implementing measures to stop water migration within the drywall (e.g., using high-intensity heaters and fans to evaporate the water or cutting out a section of wet drywall to prevent further wicking). Thorough damage assessment is important to identify safety hazards and to assure proper remediation and thus prevent mold and other issues further down the road.

Note: *Some damage may not be obvious. For example, small cooling fans on computers can "grab" water and fling it across the computer's internal electronics. Water will follow the path of least resistance, which means along instrument seams and through exhaust vents in ceiling tiles. Follow the water.*

A Color-coded System for Damage Assessment

Red Stickers
Major damage. Complete replacement recommended.

Orange
Noticeable damage. Repair or restoration recommended.

Yellow
Wipe-down restoration, i.e., clean up and assess.

Green
No apparent water contact. Proceed with use/evaluation.

*Developed by the Office of Indiana State Chemist

- **Continuity of operations:** If it is obvious that some laboratory areas are unsuitable for continued usage, activate the laboratory's COOP plan. Priority work can sometimes be relocated in-house (e.g., to a training laboratory) or may need to be temporarily relocated to a partner laboratory off-site. It may also be necessary to set up a makeshift specimen receiving area or to notify submitters to hold specimens, if they can.

- **Document everything:** Make sure all damage, remediation efforts and remediation costs are documented (including photographs of flood damage), as government officials, insurance agents (and perhaps the news media) will inevitably ask for this information. It will also be helpful for after-action reviews.

- **A data-driven approach:** Laboratories have emphasized a data-driven approach to water damage remediation, especially in highly regulated areas, such as BSL-3 suites. One approach is to use infrared technology to map out where water has migrated within drywall. One water-damaged laboratory, for example, was able to cut out a section of wall from the hall side of its BSL-3 suite and use heating elements to dry the wall from the outside in, thereby avoiding alterations that would require re-certification of the BSL-3 space.

- **Better safe than sorry:** If the water event is associated with freezing temperatures in the laboratory, any exposed reagents will need to be analyzed or discarded. Qualified laboratory staff will also need to assess data on impacted instruments to verify that the instruments are in proper working order. Instruments may need to revalidated, repaired or replaced. In any case, staff should document the initial condition of the instruments, as well as all quality measures taken to assess and revalidate them. In general, an instrument should not be approved for use unless approved by the laboratory director or quality assurance officer.

If laboratory data are used as the basis for regulatory or other legal action, the laboratory must be able to defend the data, if challenged, and demonstrate they are not skewed by flood-related problems.

Note: *Staff should conduct a performance qualification even on apparently undamaged instruments, using certified reference materials or samples tested prior to the flood. If instruments generate unexpected results, staff should investigate all aspects of sample preparation and analysis.*

- **Instrument/supply inventory:** Conduct an inventory of instruments, centrifuges, computers, refrigerators, etc., and compare this with the laboratory's most recent inventory on file. Again, it is important to document all damage and losses, to assess what needs to be replaced/repaired and to document the cost of recovery. (Expect to lose considerable staff time completing insurance paperwork, obtaining purchase orders and overseeing repairs. In addition, expect to forfeit service contract renewals on instruments that require flood-related repairs.)

- **Keep communication lines open:** Throughout the recovery, it is important to keep staff, customers and the public informed about the laboratory's status. One water-damaged laboratory issued a newsletter every 3-4 weeks with post-flood updates, including what labs were coming back on-line, the status of performance qualifications, etc. The newsletter was also posted on the laboratory's website.

- **After-action review:** Laboratory leaders should undertake a detailed review of the cause of the crisis, the response to the crisis and the cost of the crisis. Based on findings, COOP plans and biosafety checklists can be updated and measures implemented to safeguard the laboratory against future water events and to improve the laboratory's emergency response.

- **Preventing future water catastrophes:** Depending on the cause of the water crisis, you may be able to implement measures to prevent a reoccurrence. After enduring two water events in quick succession, one public health laboratory met with the lab's construction design team to identify safety features that could be installed; in this case, sensors to measure the flow of water coming from rooftop deionization tanks and devices to automatically shut off the water flow when it exceeds normal thresholds. Other precautions could include improving the insulation around water pipes potentially exposed to freezing temperatures and assuring doors to utility rooms seal securely.

Section 4: Conclusion

Laboratories' extensive plumbing infrastructure places them at increased risk for adverse water events, and, unfortunately, these are not uncommon. However, as with other aspects of laboratory safety, pre-planning can mitigate the impact of water crises. Core preventive measures include comprehensive COOP planning, agreements with other building tenants for joint disaster alerts, advance identification of water remediation contractors, prominently displayed contact lists for laboratory managers (who may need to turn off instruments in flooded areas) and maintenance of a current laboratory inventory and flood insurance policy. In the aftermath of a flood, triage, damage assessment and continuity of operations are all-important. Thorough documentation of water damage, response activities and recovery costs will ensure maximum insurance payments and help laboratory leaders hone their emergency response plans. In general, the more transparent the recovery, the better; laboratory leaders should keep key stakeholders (staff, customers, government leaders and the public) apprised of the laboratory's operational status at all times.

Association of Public Health Laboratories

The Association of Public Health Laboratories (APHL) is a national nonprofit dedicated to working with members to strengthen laboratories with a public health mandate. By promoting effective programs and public policy, APHL strives to provide public health laboratories with the resources and infrastructure needed to protect the health of US residents and to prevent and control disease globally.

APHL®

8515 Georgia Avenue, Suite 700
Silver Spring, MD 20910
Phone: 240.485.2745
Fax: 240.485.2700
Web: www.aphl.org