Mishaps, Lessons Learned & Success Stories – January 2013 Report

SUCCESS STORIES

As part of our environmental management process, NBACC collects batteries for recycling. All batteries that are collected together in tubs or bins should have their ends taped so that they do not react with each other and cause a fire.

A BNBI employee noticed that many of the batteries that have been collected at the Annex were not taped and had become corroded. The employee realized that this could be a fire risk and spent a few minutes ensuring that the batteries were taped and affixing appropriate signage onto the container (see below). This was a very thoughtful response; their efforts are a model on how to take action in the presence of an unsafe situation.

LESSON LEARNED: "Dead" batteries can still pose a safety risk if they are not managed properly. Also remember that the use of batteries inside the laboratories can present some unique safety risks. The practice of taping the ends of batteries must also be used in laboratories (unless another method is used to prevent the ends from touching) but the tape must be removed during decontamination. Also, batteries should NEVER be autoclaved.

LESSONS LEARNED (for home use): Many landfills are making concerted efforts to minimize batteries being placed into landfills and have established recycling programs for them. If you participate in a battery recycling program at home, remember to tape the ends. If you don't participate in a battery recycling program, consider joining one.

NEAR MISSES

1. **FIRST AID SUMMARY:** 12/07/2012; A BNBI employee scraped their arm on a key that was left in a file cabinet at the Annex. First aid only.

   ROOT CAUSE: Unsafe practice (leaving the key in the file cabinet in the path of staff walking).

   CORRECTIVE ACTIONS: The key was removed from the file cabinet. Other cabinets were inspected for similar hazards.

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LESSON LEARNED: Situational awareness can be "key" in maintaining a safe work environment. Be aware of items that could cause a potentially unsafe situation by jutting out into the path of foot traffic – keys, file drawers, boxes of supplies, etc.

2. **OSHA RECORDABLE ILLNESS:** 12/12/2012; A BNBI employee reported feeling unwell the day after receiving (b) (3) (B), (b) (7)(F) . It was determined by the CMA that their symptoms were attributable to the immunization.

   ROOT CAUSE: The vaccine caused the illness.

   CORRECTIVE ACTIONS: Treatment through the CMA.

   LESSONS LEARNED: Continue to monitor your health after you receive an immunization and be watchful for the signs and symptoms of adverse health effects. Remember that illnesses need to be reported to supervisor and CMA as soon as possible.

3. **FACILITY PROCESS FAILURE SUMMARY:** 12/13/2012 and 12/17/2012; A BNBI employee noticed a small leak in a condensate drain line coming from the HEPA filter on the EDS vent. This pipe drains from the contaminated side of the HEPA filter located in an industrial space. Although the effluent from the containment laboratories is chemically decontaminated prior to disposal the entire vent system is considered contaminated until it passes through a HEPA filter.

   The total volume of material from this event was less than 10 mL. FMO and H&S staff decontaminated the piping and the spill site with an approved disinfectant while wearing respiratory protection. The CMA was contacted regarding personnel who reported the spill.

   It was determined that there was no potential exposure. The RO was notified and the CDC was also informed about the spill.

   ROOT CAUSE: The stainless steel connection became loose over time, possibly due to expansion and contraction due to temperature changes.

   COREECTIVE ACTIONS:

   1. The union was repaired on 12/13/2012 but leaked again on 12/17/2012. The entire assembly was rebuilt using proper PPE on 12/27/2012.

   2. A container of bleach solution was left underneath the leak as a way to catch any potentially infectious material that could have leaked from this pipe until the assembly could be rebuilt.

   3. All of the other unions on the vent platform assembly were also checked for tightness.

   LESSONS LEARNED: Staff should be vigilant and watchful for any leaks of fluid in the industrial and interstitial support areas of the building, as well as the laboratories and hallways. If you see liquid somewhere it does not belong, such as on the floor, immediately notify Facility and/or Health and Safety staff (b) (7)(F) .

4. **EQUIPMENT FAILURE SUMMARY:** 12/13/2012; A BNBI employee discovered a small hole in the left shoulder of their BSL-4 environmental suit (suit #24) while they were in the chemical shower. The employee had been working in the BSC with a BSL-4 agent prior to noticing the hole.

   The CMA concluded that there was no potential exposure.

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Mishaps, Lessons Learned& Success Stories – February 2013 Report

SUCCESS STORIES

An employee was reading the Wegman's circular from their newspaper when they noticed an informational column about bleach. The column stated that bleach manufacturers have decided to increase the concentration of sodium hypochlorite (the active ingredient in bleach) in their products by one third. The employee brought the circular to work and wanted to know if this will impact use of bleach in the laboratory. As it turns out, it will not impact laboratory use because the laboratory buys commercial products with a guaranteed concentration of sodium hypochlorite. However, this was an excellent question and is an example of someone displaying good safety awareness.

LESSONS LEARNED (for home use): In future, household bleach from the store will be more concentrated. Manufacturers decided to concentrate their bleach because many consumers were not using sufficient bleach for their tasks. Take this into consideration when deciding how much bleach to use at home.

NEAR MISSES

BY THE NUMBERS:

- Five Laboratory Process Failures (2, 4, 5, 7, 12)
- One Facility Process Failure (11)
- One First Aid Summary (1)
- One OSHA Recordable Injury (9)
- One PPE Failure – BSL-4 Suit Related (10)
- Two PPE Failures – Glove Related (3, 6)
- One Equipment Failure – Other (8)

1. **FIRST AID SUMMARY:** 01/03/2013; A BNBI employee sustained a burn on their finger from steam condensate that leaked suddenly out of a loosened compression fitting. The individual was wearing work gloves which provided minimal protection from the heat allowing him to replace the fitting but did not fully protect from sustainipg the burn. First aid only. There was no restriction to work due to injury.

   ROOT CAUSE: Loose compression fitting on steam line.

   CORRECTIVE ACTIONS: The compression fitting was replaced.

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The RO contacted the CDC in Atlanta, GA.

ROOT CAUSE: PPE Failure

CORRECTIVE ACTIONS: The suit was retired and taken out of service.

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LESSONS LEARNED: Personal protective equipment requirements for tasks are determined based on the expected hazards for the work. When conditions change in a work environment, as in the case of the failed fitting, the assigned PPE may not fully protect the worker. Always remember to step back and re-evaluate hazards when conditions unexpectedly change.

2. **LAB PROCESS FAILURE SUMMARY:** 01/10/2013; After the (b) (7)(F) BSL-3 laboratories were activated, staff realized that they had forgotten to remove clean animal cages from the lab space before it went "hot."The animal cage racks were removed from the BSL-3 laboratory using an alternate method (other than VHP decontamination). Although the method was evaluated and determined to be acceptable, it was one of multiple deviations from normal procedures that had recently occurred.

   ROOT CAUSE: The Health and Safety Office approved the chemical decontamination due to a reportedly urgent need for cage racks in BSL-2. Upon further investigation, it was discovered that there was no urgent need for cage racks.

   CORRECTIVE ACTIONS: An email was sent reminding staff that animal cage racks are to be decontaminated out of BSL-3 through a VHP decontamination process only.

   LESSONS LEARNED: As NBACC starts up normal operations, every effort should be made to use existing SOPs, WI, and other procedures as planned. If for some unique reason an SOP cannot be followed, a deviation needs to be approved in advance of the action occurring.

   NBACC operating procedures are developed using a team of subject matter experts to fully evaluate all aspects of the work including: Hazards, regulatory requirements, efficiency, and interactions with other activities. Experience has repeatedly shown that staff members are most at risk during deviations from standard practices – even if they receive prior approval. Deviations should only be considered for true emergencies and every effort should be made during work planning and execution to ensure that standard processes are used in completion of work activities.

3. **PPE FAILURE SUMMARY:** 01/11/2013; A BNBI employee discovered a small hole in the outer glove (black neoprene) of their BSL-4 environmental suit while they were changing autoclave gaskets in the BSL-4. The inner glove was not breached and the employee followed all emergency glove change out procedures prior to exiting the suite.

   The CMA concluded that there was no potential exposure.

   The RO contacted the CDC in Atlanta, GA.

   ROOT CAUSE: PPE failure.

   CORRECTIVE ACTIONS: The gloves on the suit were replaced.

4. **LAB PROCESS FAILURE SUMMARY:** 01/15/2013; during transition of NBFAC out of the (b) (7)(F) of the BSL-4, it was discovered that two 96 well plates were left in a scientific instrument. The plates were found by FMO prior to the suite decontamination. The plates contained two BSL-2 agents that were non-BSAT, and very old. Health and Safety staff removed and destroyed the plates.

   ROOT CAUSE: Human error. The users who placed the plates did not remove them.

   CORRECTIVE ACTIONS: The two scientific groups in question have discussed the incident and agreed to better communicate when common equipment is shared.

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LESSONS LEARNED: Clear expectations of responsibilities must be established and communicated for groups that work together and share equipment and space.

When completing highly involved work activities, especially those requiring extensive set up, staff should make time to double check prep work. The use of checklists (using a hard copy of the SOP if no checklist is available) can greatly reduce the chances of overlooking steps in the process.

5. **LAB PROCESS FAILURE SUMMARY:** 01/17/2013; A shipment of inactivated viral antigen was improperly addressed and delivered to the NBACC Annex (b) (7)(F) The package contained dry ice, and was labeled as "dangerous goods."Staff at the Annex contacted the H&S office for directions on how to manage the package. The package was reshipped to the NBACC via FedEx.

   ROOT CAUSE: Staff (b) (7)(F), (b) (6) used the incorrect address for material.

   CORRECTIVE ACTIONS: The NBACC Principal Investigator (PI) confirmed the correct address with the UTMB staff. The package was reshipped to the NBACC on Fort Detrick.

   LESSONS LEARNED: Since there are two addresses for NBACC, do not assume that vendors know the correct address. Due to increased risks, staff should confirm the correct address as (b) (7)(F) for all hazardous materials (Dangerous goods).

6. **PPE FAILURE SUMMARY:** 01/18/2013; A BNBI employee discovered a small hole in the outer glove (nitrile) while working with a BSL-3 agent in BSL-3. The inner glove was also discovered to have a hole in the same place on the same finger. The employee immediately stopped work, decontaminated the gloves, removed their hands from the BSC and washed their hands after removing the inner gloves. The employee's skin was intact.

   The CMA concluded that there was no potential exposure.

   The RO contacted the CDC in Atlanta, GA, and a Form 3 was submitted for this incident.

   ROOT CAUSE: PPE failure (It was never discovered what caused the tears)

   CORRECTIVE ACTIONS: The gloves were replaced.

7. **LAB PROCESS FAILURE SUMMARY:** 01/22/2013; A shipment of sterile DNA was improperly addressed and delivered to the NBACC Annex (b) (7)(F) . The package contained dry ice, and was labeled as "dangerous goods." Staff at the Annex contacted the H&S office for directions on how to manage the package. The package was reshipped to the NBACC via FedEx.

   ROOT CAUSE: Staff at Illumina used incorrect address for material.

   CORRECTIVE ACTIONS:

   1. The NBACC Principal Investigator (PI) confirmed the correct address with the Illumina staff.
   2. An email from the Infrastructure Operations Director was sent to all employees at the Annex regarding how to handle incorrectly addressed dangerous goods.

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LESSONS LEARNED: Since there are two addresses for NBACC, do not assume that vendors know the correct address. Due to increased risks, staff should confirm the correct address as (b) (7)(F) for all hazardous materials (Dangerous goods).

8. **EQUIPMENT FAILURE SUMMARY:** 01/22/2013; A tube designed for use with the bead homogenizer cracked and leaked material onto the lid of the instrument. The instrument was being used with a BSL-4 agent.

   ROOT CAUSE: The integrity and the safety of the tubes for this instrument are being investigated.

   CORRECTIVE ACTIONS: The homogenizer has been taken out of service until the vendor is contacted to verify safe operation can be established.

9. **OSHA RECORDABLE INJURY SUMMARY:** 01/23/2013; A BNBI employee cut their finger while in the BSL-3 containment personal shower. The CMA reviewed the case and restricted the employee from BSL-3 for 3 days while the wound healed.

   ROOT CAUSE: The employee compared their household shower head to the laboratory shower head and noticed a difference in their functionalities. The shower head at home can be adjusted easily with one hand. Its adjustment knob requires a turn of no more than 45° to loosen and tighten, yet it holds the shower head securely in place. Depending on how firmly it is fastened, the laboratory shower head may require at least two 360° turns of the knob to properly loosen and tighten. When this incident occurred, the employee was expecting the shower head to work similarly to their unit at home. The shower head was not loose enough when they tried to move it, and their finger was jammed in the process.

   CORRECTIVE ACTIONS: N/A

   LESSONS LEARNED: Similar equipment that can perform the same basic functions can have different operating characteristics. Even the same equipment from different manufacturers can operate differently. Staff should take the time to ensure that they fully understand the specific piece of equipment that is being used.

10. **PPE FAILURE SUMMARY:** 01/23/2013; A BNBI employee discovered a small hole(face shield) in their BSL-4 environmental suit (Dover suit #38) while they were exiting the chemical shower. No water entered their suit but the suit was bubbling at the face shield. The employee was engaged in preparations for a VHP decontamination.

    The CMA concluded that there was no potential exposure.

    The RO contacted the CDC in Atlanta, GA.

    ROOT CAUSE: PPE failure.

    (b) **RRECTIVE ACTIONS:** The suit was repaired by Health and Safety and returned to service.

11. **FACILITY PROCESS FAILURE SUMMARY:** 01/24/2013; Two BSL-3 exhaust fans failed during a test of the BAS communication system. The result of this was that several rooms in the BSL-3 (b) (7)(F) went static or showed positive pressurization relative to the BSL-3 hallway (within the suite). There was no loss of inward airflow into any BSC or animal HEPA filter isolation racks. The BAS test was not coordinated with laboratory operations.

ROOT CAUSE: Testing during operations caused the failure.

CORRECTIVE ACTIONS: This incident is still under investigation.

LESSONS LEARNED: Testing of any engineering system should be pre-coordinated with the occupants of the area to minimize any potential for disruptions to work activities.

12. **LAB PROCESS FAILURE SUMMARY:** 01/31/2013; After a successful VHP decon of the (b)(7)(F) side labs, they were being prepared for upcoming remediation activities. During the preparation work, several effluent pipes from the BSL-4 (b)(7)(F) sinks were opened to the decontaminated rooms. The pipes are part of the common drain system that connects the (b)(7)(F) side labs to the EDS.

    ROOT CAUSE: Human error (the sink pipes were properly tagged as out of service).

    CORRECTIVE ACTIONS:

    1. The pipes were reattached and then separated at the shutoff valve with FMO staff in respiratory protection equipment.
    2. Training was given to all FMO staff on the hazards of BSL-4 diseases as a way to further improve appreciation of the risk of BSL-4 agents.
    3. All maintenance work that is conducted in BSL-3 or BSL-4 (regardless of its state of contamination or decontamination) will at a minimum be required to undergo a review/approval by a facility coordinator to help ensure hazards are recognized and mitigated.

    LESSONS LEARNED: There are several engineering systems that are not sterilized during a VHP decontamination. Some examples of these other systems are: the (b)(7)(F) animal watering system, the effluent drain and vent lines, and the HVAC system. Staff should always appreciate the complex nature of the design and the risk within these supporting engineering systems.

    The use of lockout/tagout protocols are designed to identify hazardous situations to individuals that may not have been involved in a particular work activity. Locks and tags should never be ignored since it is there for a safety reason. Staff encountering a lockout/tagout device (e.g. a sign or lock) should consult the person who tagged it out prior to handling the tagged out equipment.

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Mishaps, Lessons Learned & Success Stories – March 2013 Report

SUCCESS STORIES

1. A BNBI employee reported the following discussion between their daughter and some of her friends. Several kids in her high school chemistry class had complained that wearing eye protection was a hassle. She pointed out to them that they did not understand the definition of "hassle". She then went on to explain that in reality, a "hassle" is going through life blind because you weren't wearing eye protection. This level of safety awareness in a high school student is quite remarkable and sets a great example for adults who should already know the importance of wearing PPE.

2. A BNBI employee recently reported several hazardous situations and reminders for staff about the parking lot.

   - When you are driving, always be aware of pedestrians even when you are looking for parking spaces, especially during the times of dawn and dusk when it is more difficult to see them.
   - When you are a pedestrian, be aware of the color of the clothes you are wearing (especially at dawn and dusk). Drivers will have a harder time seeing you if you are wearing dark clothing.
   - As a driver or a pedestrian, be aware that drivers use our parking lot as a way to get to the road that leads to the other parts of the Interagency Biodefense Campus (like the Navy building).

NEAR MISSES

BY THE NUMBERS:

- Two OSHA Injury Summaries (1, 5)
- Two Laboratory Process Failures (2, 4)
- One PPE Failure – Glove Related (3)

1. **OSHA INJURY SUMMARY:** 02/08/2013; A BNBI employee reported wrist pain to the CMA, which was attributed to repetitive work during manual ELISA plate washing. The plate washer was broken and awaiting parts so that all plates during an assay had to be washed and dumped into a bucket by hand, which came to a total of 30 washes on the first day and a similarly high workload on two subsequent days.

   ROOT CAUSE: There were several factors that contributed to the cause of the injury:

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- The ELISA plate washer for this protocol is broken and awaiting parts requiring manual plate washing to become the norm rather than the exception.
- The temporary work station used for washing ELISA plates was not ergonomically optimized for staff use.
- The amount of work was higher than normal, requiring the employee to work several hours in the lab without relief.
- The employee worked through physical discomfort rather than seek relief.

CORRECTIVE ACTIONS:

- The plate washer should be repaired so that staff members do not have to manually wash LRN TRF plates.
- Until it is placed back into service, a smaller bucket should be used to limit awkward positions.
- Consider using two people during manual plate washing to minimize repetitive motion issues.

LESSONS LEARNED: Any pain associated with a work activity, especially one requiring repetitive motion, should be viewed as an indication to stop work and re-evaluate the situation. These types of situations should be immediately reported to your manager and the NBACC Health & Safety Office for evaluation.

Early reporting of pain or discomfort from repetitive motion can allow for proactive measures to prevent a serious time loss event from occurring.

2. **LAB PROCESS FAILURE SUMMARY:** 02/20/2013; A BNBI employee opened a BSL-3 airlock while the timer was still running during a chemical decontamination of an object. The decontamination process needs to run for 15 minutes to allow for proper disinfectant contact time and for an airwash of the airlock to occur.

   ROOT CAUSE: Human error (The employee forgot to read the clock prior to entry into the airlock.)

   CORRECTIVE ACTIONS: A more visible reminder is being investigated to help people can remember to check the timer on the far side of the airlock.

   LESSONS LEARNED: Staff members should remember that the work environment can change resulting in different hazards being present. Several processes used (and their associated hazards) are transient in nature so staff should continually evaluate their surroundings.

3. **PPE FAILURE SUMMARY:** 02/21/2013; A BNBI employee discovered a small hole in their outer glove (nitrile) while working in a BSC with a BSL-3 agent. The inner glove was not breached and the employee followed all emergency glove change out procedures.

   The CMA concluded that there was no potential exposure.

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Mishaps, Lessons Learned & Success Stories – April 2013 Report

SUCCESS STORIES

1. A request was submitted and approval was granted by the IACUC for Comparative Medicine to begin behavioral task-training, which was then started in March. This training was suggested by the Attending Veterinarian (AV) and supported by a Comparative Medicine staff member, who had received previous training in this technique. This is positive reinforcement training that uses both visual (laser pointer) and audible (clicker) cues, along with food treats to train nonhuman primates to perform basic functions such as checking their own water valve to ensure proper operation and presenting themselves for health observations.

   If successful, this will allow the process to be used for nonhuman primates entering containment and will be a huge improvement in both human safety and animal welfare, since water valves won't have to be checked by placing a long stainless steel rod into the cage every day, and the animal will not have to be anesthetized each time a close observation of a specific anatomical area or general health status may be needed. If it is found that the process can be implemented to any extent over the course of a few weeks, then in the future the training could occur during the quarantine period when animals first arrive and before they are used on a study. The positive interactions with staff conducting the training will result in better acclimated animals with less aggressive tendencies and allow a less stressful transition into new environments (e.g., ABSL-3/4). The increased behavioral complexity provided by the task-training will provide sensory and motor stimulation through the addition of cognitive challenges and manipulative activities to the behavioral enrichment repertoire.

2. Based on the AAALAC experience of the AV, a request to increase the time between cage changes to every two weeks was submitted by Comparative Medicine to the IACUC, and subsequently approved. The granted exception to the National Research Council *Guide for the Care and Use of Laboratory Animals* recommendation of changing cages weekly was based on published scientific data and experience with ventilated caging systems. Performance standards were established to ensure there are no negative effects to the animals' environment. Caging will be monitored on a daily basis for 6 months to ensure that the performance standards are being met before the change is made permanent. The exception not only results in significant labor cost savings, but also provides a safety improvement by reducing by half the number of times cages and the agent-challenged animals contained within them must be handled.

NEAR MISSES

BY THE NUMBERS:

- **Three PPE Failures (1, 3, 4) – BSL-4 suit s**
- **One PPE Failure (2) – Glove**
- **One Containment Boundary Breach (5)**

The ARO contacted the CDC in Atlanta, GA.

ROOT CAUSE: PPE failure (no direct cause of the tear was reported)

CORRECTIVE ACTIONS: The employee changed their gloves, reported the incident and returned to work.

4. **LAB PROCESS FAILURE SUMMARY:** 02/25/2013; A BNBI employee dropped a glass biological indicator ampoule containing BSL-1 agent onto the floor of a BSL-3 suite. The glass broke and the agent spilled out. The employee followed all procedures and eventually went back into the suite to clean up the material with an appropriate disinfectant.

   ROOT CAUSE: Human error.

   CORRECTIVE ACTIONS: The staff suggested that the ampoules be placed into a screw cap conical tube or another means of secondary containment during movement.

5. **OSHA INJURY SUMMARY:** 02/25/2013; A BNBI employee reported right arm pain to the CMA which was attributed to repetitive work sometime in the past during heavy activity in the BSL-4—specifically, opening the APR door levers. There was no lost time and no restrictions on work from this injury.

   ROOT CAUSE: The employee worked through discomfort, and they did not immediately report the repetitive trauma to their arm to the occupational health clinic because they thought the pain was attributable to another cause.

   CORRECTIVE ACTIONS: Alternate which hand you use when operating the levers on the APR doors.

LESSONS LEARNED:

Any pain associated with a work activity, especially one requiring repetitive motion, should be viewed as an indication to stop work and re-evaluate the situation. These types of situations should be immediately reported to your manager and the NBACC Health & Safety Office for evaluation.

Early reporting of pain or discomfort from repetitive motion can allow for proactive measures to prevent a serious time loss event from occurring.

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- **<u>One Equipment Failure (6)</u>**

1. **PPE FAILURE SUMMARY:** 03/04/2013; A BNBI employee noticed a small air leak in the visor section of their BSL-4 suit (Sperian #59) while taking a chemical shower. The employee had been working with a BSL-4 agent in the BSC prior to the suit shower. The CMA concluded that there was no potential exposure.

   The RO contacted the CDC in Atlanta, GA.

   ROOT CAUSE: PPE failure (the delamination of the visor seams will continue to be monitored in other suits)

   CORRECTIVE ACTIONS: The suit was repaired and placed back into service by H&S staff.

2. **PPE FAILURE SUMMARY:** 03/13/2013; A BNBI employee reported a 1/8" tear in one of the gloves (Hypalon) of a Class III glovebox. The glovebox was being used during an aerosolization of a BSL-2 agent. All procedures for an emergency glove change out were followed. The glovebox never lost negative pressurization and maintained its flow set points throughout the breach, and subsequent emergency glove change out. There was no breach of the inner gloves. In addition, all personnel in the room were in respiratory protection during the experiment as called out by the Risk Assessment. The CMA concluded that there was no potential exposure.

   The RO contacted the CDC in Atlanta, GA.

   Though all gloves are to be inspected prior to use, and this required inspection is identified on a pre-work checklist, it was reported that this specific glove was not inspected prior to this experiment.

   ROOT CAUSE: It is unclear what caused the glove failure.

   CORRECTIVE ACTIONS: Staff members involved were counseled on the intent of process checklists and the importance of accurately completing them.

   LESSONS LEARNED: NBACC tries to develop processes that are user friendly with built-in safety steps but the "human factor" can never be completely removed from the equation. Even with the use of checklists and "peer checking" important steps can be missed during hazardous operations. One of the best ways to manage the human factor is to be aware of error precursors (e.g. complex tasks, slipping into routines, process deviations) and to help look out for each other.

3. **PPE FAILURE SUMMARY:** 03/15/2013; A BNBI employee noticed a small air leak in their BSL-4 suit (Sperian #53) while taking a chemical shower. The employee had been working with a BSL-4 agent in the BSC prior to the suit shower. The CMA concluded that there was no potential exposure.

   The RO contacted the CDC in Atlanta, GA.

   ROOT CAUSE: PPE failure (the delamination of the visor seams will continue to be monitored in other suits)

   CORRECTIVE ACTIONS: The suit was repaired and placed back into service by the BSL-4 Manager.

4. **PPE FAILURE SUMMARY:** 03/18/2013; A BNBI employee noticed a small air leak in their BSL-4 suit (Sperian #53) while taking a chemical shower. The employee had been working with a BSL-4 agent in the BSC prior to the suit shower. The CMA concluded that there was no potential exposure.

The RO contacted the CDC in Atlanta, GA.

ROOT CAUSE: PPE failure (the delamination of the visor seams will continue to be monitored in other suits)

CORRECTIVE ACTIONS: The suit was repaired and placed back into service by the BSL-4 Manager.

5. **CONTAINMENT BOUNDARY BREACH SUMMARY:** 03/27/2013; When the [redacted] autoclave was run empty (to periodically exercise it), the unit experienced a low steam pressure failure and shut down at approximately 11:35 am. On March 28, 2013 at approximately 10:30 am, NBACC staff discovered that the gaskets on both the inner and outer doors had been partially retracted when they heard air whistling around the autoclave door (air moving from clean to dirty from the [redacted] corridor into [redacted] To immediately rectify the situation, [redacted] technician used the autoclave panel to engage the gaskets using compressed air.

   The RO notified the CDC in Atlanta, GA.

   After an autoclave cycle, the steam supply to the heating jacket is closed which cools the chamber and generates a vacuum in the heating jacket. Under normal operations of the autoclave, the pressure to inflate the door gaskets is supplied by compressed air during standby but switches to steam pressure during run cycles. An investigation was conducted and it was determined the steam supply to the autoclave was isolated for maintenance in early February, 2013. When the autoclave was later returned to service, the steam supply was still in isolation mode. With the running of an autoclave cycle, the unit switched from compressed air to steam pressure for inflation of the door gaskets but steam was not reaching the unit so the vacuum in the heating jacket was equalized with the two door gaskets resulting in both seals being broken. The negative pressure in room [redacted] then resulted in air being drawn into the room through the autoclave which created the whistling sound.

   A review of operational records demonstrated that during the March 27th – 28th time frame, room [redacted] maintained its negative air balance, resulting in air traveling from the clean buffer corridor into [redacted] Facility staff were able to generate a BAS data graph verifying the lab maintained negative pressure throughout the timeframe in question. It was also able to be determined that during the time frame, no work had been conducted inside room [redacted]. As a result of this review, it was able to be determined that there was no risk of release or exposure.

   ROOT CAUSE: The design of the autoclave links together the steam pressure for the door gaskets and the heating jacket without a check valve or isolation. This results in the potential to deflate the door gaskets prior to the unit shutting down from a low pressure steam alarm. In addition, prior to returning the autoclave to service, the steam isolation had not been fully removed.

   CORRECTIVE ACTIONS: Feedback was provided to [redacted] on this issue through our [redacted] technician with a request for corrective actions. This appears to be a design flaw which can allow a steam outage to compromise the laboratory containment boundary (still ongoing).

   The process for returning equipment to service is being evaluated to identify verification steps for the functionality of the system.

   LESSONS LEARNED: Return to service verification is a critical step in the maintenance process and needs to be a full part of the overall job planning.

6. **EQUIPMENT FAILURE SUMMARY:** 03/28/2013; A BNBI employee reported a spill from a 15 mL vial that that had been placed in a homogenizer/cell disrupter. The failure rate for this incident was 1/40 tubes. The speed of this run was Speed 8 for 30 seconds. Although this instrument is located in a BSC inside a BSL-3 space, the agent used during the incident is a BSL-2 agent. However, there is a need to use it with a BSL-3 agent in the near future.

   This is the second reported spill of material caused by this instrument (Next Advance Bullet Blender Blue 5). This same model but a different individual instrument had a similar spill in BSL-4 (22 January 2013) when 3 vial caps actually cracked and spilled some of their contents into the instrument. That instrument was taken out of service and the tubes in the current lot examined for defects. The failure rate for the 22 Jan. 2013 incident was 3/32 tubes. The speed of this run was Speed 8 for 12 minutes.

   The Next Advance Bullet Blender Blue 5 in the BSL-3 has caused other (unreported) tubes to leak as evidenced by apparent contamination in the void beneath the tube rack. The contaminated area was opened by [redacted], cleaned by research staff and reassembled by [redacted]

   ROOT CAUSE: Although there is evidence that the vials are physically worn by the disruption process, the vial in question (3/28/13) was not broken. The only other explanation is that the vial cap was not on tight enough or somehow worked loose during the process.

   CORRECTIVE ACTIONS:

   - Feedback was provided to the manufacturer related to instrument design. Specifically: Lack of a gasketed instrument lid; potential for catastrophic failure of vials; lack of guidance on procedure for lid closure; and lack of an adequate decon process.
   - The homogenizer in the BSL-3 was taken out of service until further notice.
   - A new homogenizer of a different model and manufacturer (and process) was purchased on 1 April 2013. Although this new homogenizer is useful for larger volumes, the Next Advance Bullet Blender Blue 5 will still have to be used for smaller volumes.
   - Vial caps should be verified to be tight prior to any future runs.
   - Lower speeds should be considered for homogenization.
   - Additional testing with enhanced cap seals (parafilm) will take place and the results will be used to increase the engineered controls for the process.

   LESSONS LEARNED: Similar instruments are used by multiple groups across the NBACC. Experience collected by one group should be routinely shared with other groups.

EVENTS

BY THE NUMBERS:

- **Two OSHA Injuries (1, 2)**
- **One Fire (3)**

1. **OSHA INJURY SUMMARY:** 03/5/2013; A BNBI employee sustained a leg injury while moving liquid nitrogen (LN2) tanks into an interstitial support area. The regular pathway had been blocked by stored

materials placed by another staff member. The employee was being careful not to hit their head on low and overhanging pipes when they mistakenly struck the VHP port with their leg. The employee immediately reported the incident and consulted the CMA. The CMA restricted the employee from the containment suites until the wound scabbed over.

ROOT CAUSE: The path design for normal operation had been blocked by a staff member not normally involved in the movement of LN2 tanks.

CORRECTIVE ACTIONS: The stored materials that blocked the safer pathway were moved. A Footprints ticket was also generated for FMO to sheath the VHP ports in close proximity to the LN2 station in foam padding and mark it with caution tape so that they is more prominently visible.

LESSONS LEARNED: Planned routes of travel should never be blocked, even temporarily. In the event that an alternate route must be used, it should be thoroughly evaluated for potential hazards before proceeding. Even routine tasks can present hazards to seasoned workers when the conditions change.

Staff members should always consider whether the actions they are taking could be creating a more hazardous situation for others. Changing work place conditions represent one of the more prevalent hazards faced by staff. The simple act of leaving open a door that is normally closed or closing a door that is normally open creates a changed work place condition that may not be immediately recognized by other staff resulting in injury.

When faced with a changed work place condition, staff should take the time to analyze the situation to identify all of the hazards.

2. **OSHA INJURY SUMMARY:** 03/15/2013; A BNBI employee sustained a laceration on the knuckle of one of their fingers while repairing BSL-4 suits in the BSL-4 suit room. The employee reported the injury to the CMA and was restricted for 5 days until the wound scabbed over.

   ROOT CAUSE: The employee surmised that the cut could be attributed to a sharp zipper.

   CORRECTIVE ACTIONS: N/A

   LESSONS LEARNED: All workers should pay close attention to their hands and wear gloves while working with cutting tools or with objects that may perforate/abrade their skin.

3. **FIRE SUMMARY:** 03/18/2013; A control unit for a computer server back-up battery located in an interstitial space overheated and caught fire. The smoke alarm was activated and Fort Detrick Fire Department responded.

   ROOT CAUSE: The cause of the fire is under investigation. The control unit was returned to the manufacture for further evaluation.

   CORRECTIVE ACTIONS: Other servers and batteries of this type are in the building. Once a root cause has been established, corrective actions will be enacted.

Mishaps, Lessons Learned & Success Stories – May 2013 Report

SUCCESS STORIES

1. A request to reduce the frequency of (b) (3) (B) testing of nonhuman primates from quarterly to biannually was submitted by Comparative Medicine to the IACUC and subsequently approved. There is no specific guidance for routine monitoring of (b) (3) (B) in nonhuman primates. Under current housing conditions, the risk of acquisition of (b) (3) (B) either colony animals or animal care staff was determined to be minimal. Normal (b) (3) (B) testing requires chemical restraint and handling of nonhuman primates, anesthetics and (b) (7)(F) needles. This schedule change will reduce the frequency of handling nonhuman primates, chemical anesthetics and sharps, thus providing a safety improvement.

2. Due to effective communication and good working relations among the research staff and IACUC members, questions were brought forward regarding a classic LD50 experiment using over 500 guinea pigs. The possibility of alternate approaches was brought to the PI's attention by the IACUC members and the Attending Veterinarian. The PI went to the statistician, who researched other methods and proposed a stair step method that would reduce the number of animals needed to complete the study. The number was reduced to 120 animals and subsequently approved. This reduction in animal numbers will help to improve human safety by reducing the number of entries into the BSL4 and reduce the number of hours spent in the BSL4 on a daily basis, as well as the number of animals being handled and injected.

3. While working in a BSL-2 laboratory, a staff member noticed a tear in one of the gloves on the Class III Glovebox in that same room. The unit was not in use, but the staff member took the initiative to get the issue addressed. The gloves were changed and the proper tests performed. The unit was turned around quickly with no issues, and no work was affected. It was a great demonstration of being aware of your surroundings and making sure that NBACC is always ready to go.

EVENTS:

BY THE NUMBERS:

- OSHA Injuries: 0
- One First Aid Only Injury: (1)

1. **FIRST AID INJURY SUMMARY:** 04/16/2013; A BNBI employee was exposed to a very loud bang (peak noise level of unknown sound power). They reported ringing in their ears immediately after the event and followed up with the occupational health clinic 4 days later. The exposure did not result in a permanent threshold shift in hearing.

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ROOT CAUSE: An o-ring that was not manufacturer specific had been fitted onto the high pressure oxygen manifold on an anesthesia machine in the ABSL-2. After the gas was turned on, the o-ring failed to contain the pressure which allowed a pressure release resulting in the loud bang similar to the popping of a balloon.

CORRECTIVE ACTIONS:

1. The instrument was tagged out of service.
2. A manufacturer specific o-ring was ordered and installed on the manifold.

LESSONS LEARNED: Much of the equipment used at NBACC involves highly engineered systems which can include specialized parts/components. Whether it is a sensitive medical instrument or the office copier, swapping out a part that "looks the same" can result in failure. Just because an o-ring looks the same or a bolt is the same size, does not mean that it has the same physical properties. When staff are not specifically familiar with the engineering of a part, they should limit replacement to the use of manufactured-issued parts when they are available.

NEAR MISSES

BY THE NUMBERS:

- Five Lab Process Failures: (1, 2, 3)
- One PPE Failure: (4) – BSL-4 suit
- Three Facility Process Failures: (5, 6, 7)

1. **LAB PROCESS FAILURE SUMMARY:** 04/03/2013; A BNBI employee did not follow the guidance described in (b) (7)(F) , which requires a (b) (3) (B) (every 10 years) immunization to be in room (b) (7)(F) when the SPRI-TE Library Prep, Glomax or Agilent instruments are in operation with either known (b) (3) (B) or unknown samples.

   ROOT CAUSE: There was not adequate hazard recognition when this set of samples was moved from BSL-2 to BSL-3.

   CORRECTIVE ACTIONS:

   1. New risk assessments need to be considered and drafted for Genomics BSL-2 casework.
   2. The NBACC SIPC will re-evaluate vaccination requirements for the risk assessment.

   LESSONS LEARNED: Many of the activities conducted at NBACC, both in and out of the laboratories are governed by numerous risk assessments, procedures, policies, and guidance documents that can be difficult to keep straight. Being sure to understand the "why" in addition to the "what" of requirements can help staff to implement tasks correctly when experiencing changes in the work place (i.e. moving between a BSL-2 and BSL-3 laboratory setting).

2. **LAB PROCESS FAILURE SUMMARY:** 04/16/2013; A BNBI employee spilled approximately 5 mL of a BSL-2 toxin solution inside a Class III BSC.

ROOT CAUSE: The employee accidentally bumped the tube with their arm while attending to another task. The spill was contained within a secondary container inside the Class III BSC.

CORRECTIVE ACTIONS: The spill was cleaned up with an approved disinfectant that is effective against the toxin.

LESSONS LEARNED: Assuming things can go wrong during pre-job planning and implementing hazard mitigation in advance are excellent ways to prevent simple situations from becoming more hazardous. By analyzing a situation for hazards (i.e. potential for a spill) and putting in place mitigating factors (i.e. secondary containment), this situation was confined to a limited space thus minimizing the hazard to staff.

3. **LAB PROCESS FAILURE SUMMARY:** 04/18/2013; An FBI HEAT Examiner wore a watch into BSL-3 containment.

   ROOT CAUSE: The escort did not notice the watch until the person was inside the containment corridor. The person immediately stopped the examiner and contacted the Health and Safety Office.

   CORRECTIVE ACTIONS: The watch was decontaminated with an approved disinfectant and allowed to be passed through the shower into the inner change room.

   LESSONS LEARNED: Both an increase in operational activities and work with new staff members represent error precursors. Be especially vigilant for procedural errors during these times.

   When staff members are serving as escorts, they are taking on the responsibility of communicating requirements for entry with the person being escorted. Whether it's a clothing requirement for entering a laboratory or a no electronics requirement for entering a secure area, escorts need to take extra time to ensure entry requirements are being followed by everyone (including themselves).

4. **PPE FAILURE SUMMARY:** 04/18/2013; A BNBI employee noticed a small air leak in their BSL-4 suit (Sperian #54) while taking a chemical shower. The employee had been working with a BSL-4 agent in the BSC prior to the suit shower. The CMA concluded that there was no potential exposure.

   The RO contacted the CDC in Atlanta, GA.

   ROOT CAUSE: PPE failure (the delamination of the visor seams will continue to be monitored in other suits).

   CORRECTIVE ACTIONS: The suit was repaired and placed back into service by the TSS.

5. **FACILITY PROCESS FAILURE SUMMARY:** 04/18/2013; A BNBI employee noticed a leak in the man-way gasket on one of the Effluent Decontamination System (EDS) tanks. The leak released approximately 1/2 gallon of material from one of the EDS vessels. Although it is likely that the leak began when the EDS vessel was brought up to pressure during a sterilization cycle, a full cycle was not completed prior to the leak. Therefore, the material was treated as potentially infectious material. The CMA concluded that there was no potential exposure to individuals who entered the room without RPE.

   The RO contacted the CDC in Atlanta, GA.

ROOT CAUSE: The closure bolts of the man-way were not tightened to manufacturer's specifications. Although the tank did pass its own internal pressure decay test prior to beginning its fill cycle, the man-way seal was not sufficient to hold at elevated temperature and pressure.

CORRECTIVE ACTIONS:

Health and Safety staff were contacted and a spill plan was prepared and executed.

1. One FMO and One Safety staff member would enter the room 1-927 space in:
    a. Scrubs
    b. Tyveks
    c. Double gloves taped to the Tyveks
    d. Designated shoes
    e. Shoe covers
    f. Full face respirators

2. A bucket with about ¼ gallon of undiluted bleach was placed under the leak.
3. Absorbent towels were placed on the spill working from the outside in.
4. About 1 gallon of undiluted bleach was poured onto the towels and allowed a contact time of 30 minutes.
5. All of the bolts on the gasket on Vessel C were tightened by the FMO staff member.
6. Once the EDS leak had stopped, the area on the vessel was sprayed with a 1:10 bleach solution and allowed to sit for 30 minutes.
7. The towels were picked up and placed in a biohazard bag for disposal.
8. The floor was mopped with undiluted bleach
9. All PPE was removed at the threshold of the room and placed into a biohazard bag. RPE was decontaminated with a light spray of 1:10 bleach.
10. The telephone was sprayed with 1:10 bleach.
11. The staff changed out of their scrubs, placed them into a containment laundry bin and took 3 minute personal showers.
12. The room was cleared for entry of after a 1.5 hour air exchange.

Numerous engineering and administrative corrective actions were identified for implementation.

1. Changes to the closure process for EDS tanks that will prevent reoccurrence.
2. Changes to the pre-entry process for the EDS room.
3. Evaluation of the leak detection system for the EDS room for easier identification of leaks.
4. Tighter access controls on the EDS room.
5. Additional HAZCOM signage for the EDS room.
6. Spill response kits staged in EDS control room.
7. Further clarity on Emergency Management communication.
8. Global dissemination of lessons learned to IO staff.

LESSONS LEARNED: The NBACC Facility team is conducting several follow up meetings to identify potential lessons learned for communication to staff.

6. **FACILITY PROCESS FAILURE SUMMARY:** 04/18/2013; A BNBI employee reported that a HEPA filter serving a BSL-3 corridor failed during annual certification. During the investigation into the failure, it was discovered that the correct process for testing and certifying the contaminated

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HEPA filters was not being followed by the subcontractor performing the work; the result was that two photometers had been potentially contaminated.

ROOT CAUSE: (b) (7)(F) , HEPA Caisson Certification, was not being followed by the subcontractor. The specific subcontractor staff member was new to the NBACC and was not familiar with the HEPA certification process used at the NBACC.

CORRECTIVE ACTIONS: All future contaminated HEPA filter certifications will follow the guidance contained in (b) (7)(F) and (b) (7)(F) Laminar and Non-Laminar Clean Air device Certification.

LESSONS LEARNED: Changes in staff should be carefully monitored by managers and supervisors; don't assume that the more senior staff will pass on institutional knowledge to less experienced staff. This includes changes to subcontractor staff and service personnel. For situations where it is known that individuals will be changing, a mentoring process should be considered for this type of transition.

7. **FACILITY PROCESS FAILURE SUMMARY:** 04/23/2013; A BNBI employee reported a smell of sewer gas in the BSL-4 suit room bathroom. The toilet was found to be dry after the bathroom had been sealed for approximately 4 weeks of wall remediation. This toilet drains to the EDS but the vent goes to the sanitary vent. There is a nine inch running trap as well as a two inch toilet trap between the room and the EDS.

   Since the mechanic smelled sewer gas and not Microchem, it was determined that the running trap did not go dry and that the toilet bowl and trap were the only water losses to the system. The CMA concluded that there was no potential exposure.

   ROOT CAUSE: Lack of use and evaporation.

   CORRECTIVE ACTIONS:

   1. The FMO mechanic filled the bowl with 5 gallons of water while holding his breath.
   2. The FMO is evaluating whether changes are needed to the vent line serving the toilet.

NON-NBACC EVENTS:

1. Recently a BNBI employee sustained a serious head injury during a car accident when some loose items in their car struck them. Heavy items in cars will carry all of their inertial energy with them during accidents. Many people do not think to tie things down inside their cars. Attention to this issue could help save someone from a serious or life threatening injury.

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Definitions:

Event: An unintended situation that resulted in a negative impact.

Examples:

- A glove tear that resulted in a potential exposure
- OSHA recordable injuries and illnesses
- First aid only injuries
- Loss of property
- Loss of prestige

OSHA Recordable Incident or Accident {1904.7(b)(1)(i)]: A work-related injury or illness must be recorded if it results in one or more of the following:

Examples:

- Death
- Days away from work
- Restricted work or transfer to another job
- Medical treatment beyond first aid
- Loss of consciousness
- A significant injury or illness diagnosed by a physician or other licensed health care professional

Near Miss: An unintended situation that did not result in a negative impact. Anything that doesn't meet the definition of an "Event" should be categorized as a near miss.

Examples:

- A glove tear that did not result in a potential exposure
- Wearing jewelry into a containment lab

Categories:

- Lab Process Failure
- Facility Process Failure
- PPE/Equipment Failure

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Mishaps, Lessons Learned & Success Stories – June 2013 Report

SUCCESS STORIES

1. A female NBACC employee found herself locked in a men's containment side change room with no communication and no one else in the suite. Since her clothes were located in the female side change room, she realized that she was in a very difficult situation and had to conduct a personal risk assessment. Her options were :

    a. In order to maintain modesty, she could leave containment without a proper body shower in her containment scrubs and enter the common hallway to regain access to the women's change room.

    b. Take a personal shower in the men's room, don a towel, and discretely make her way through the common hallway back into the women's change room.

    c. Continue to call for help until found.

    The employee chose option B. She risked significant embarrassment for herself rather than failing to comply with proper exit procedures and potentially a Form 3 submission to CDC. She was given a Spot Award for her good decision.

EVENTS:

BY THE NUMBERS:

- OSHA Injuries: 0
- Two First Aid Only injuries: (1, 2)

1. **FIRST AID SUMMARY:** 05/03/2013; A BNBI employee noticed a cut on their knuckle while they were in the suit room; they had previously been in BSL-4 containment. The employee washed the wound and exited the suite. The CMA concluded that there was no potential exposure, and there were no restrictions from this injury.

    The RO contacted the CDC in Atlanta, GA.

    ROOT CAUSE: The cause of the small laceration was never determined.

    CORRECTIVE ACTIONS: NA

2. **FIRST AID SUMMARY:** 05/10/2013; A BNBI employee fell while attempting to sit in a chair at the Annex. The employee was evaluated by the CMA for bruising. There was no medical treatment beyond first aid and the employee was released to return to work without restrictions.

   ROOT CAUSE: The chair was light weight and on wheels. In addition, the flooring in room [redacted] is tile and the chair rolls easily across the surface. Consequently, the chair can move away easily from a very light touch. The chair slipped away from the employee before the employee could sit down.

   CORRECTIVE ACTIONS: A rubber mat was procured and installed under the chair to increase the friction between the floor and chair.

   LESSONS LEARNED: Many of the routine tasks completed every day pose unsuspecting risks to staff that might be focusing their attention elsewhere. The simple act of sitting in a chair or walking on stairs can result in a time-lost accident. Developing strong safety habits such as grasping a chair before sitting, or holding a handrail while walking on stairs, may seem silly but can prevent serious injury. It's important to remember that it isn't the number of times a task is completed without incident that matters. It's prevention of the onetime things don't go as planned that counts.

NEAR MISSES

BY THE NUMBERS:

- Four Lab Process Failures: (1,3, 4,and 6)
- Two PPE Failure: (2 and 5)
- One Facility Process Failure: (7)

1. **LAB PROCESS FAILURE: 05/07/2013**; A BNBI employee accidentally spilled infectious material in the incubator as well as on the leg of their BSL-4 suit (approximately 20 mL). Although the material was in day 2 post-infection, there were no suit breaches or losses of positive pressure to the suit. The CMA concluded that there was no potential exposure.

   The RO contacted the CDC in Atlanta, GA.

   ROOT CAUSE: The employee's suit cuff struck some plates that were in the incubator causing the spill.

   CORRECTIVE ACTIONS: Plates need to be stacked in such as way that employees can reach into the incubators without disturbing other plates or causing a spill.

   LESSONS LEARNED: The use of PPE frequently results in the impairment of at least one of your senses and/or motor skills. As a result, adjustments need to be made to how you complete simple everyday tasks. In this case, the BSL-4 suit eliminates the sense of touch in your arms while significantly increasing the arm diameter. This results in a situation where something can be dislodged without realizing it.

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2. **PPE/EQUIPMENT FAILURE SUMMARY:** 05/13/2013; A BSC suddenly shut off in a BSL-3 animal procedure (b) (7)(F) No infectious materials were in use at the time of the failure. This was the second time that the breaker had shut off on this BSC.

   ROOT CAUSE: An initial investigation by [redacted] technician did not reveal any obvious malfunctions. However, further investigation by the NBACC electrician found that the BSC breaker circuitry was wired incorrectly. The BSC blower, lights and outlet were incorrectly wired to the 5 amp breaker instead of the 10 amp breaker. This caused the circuit breaker to trip shutting off the BSC blower motor at one half the usual amperage. This was a manufacturer's error. It is unknown if other BSCs are wired incorrectly like this one.

   CORRECTIVE ACTIONS:

   1. The instrument was tagged out of service for several days while [redacted] and NBACC FMO investigated the problem.
   2. Comparative Medicine staff could not use the BSC during this time and had to use an alternate BSC in a different room for procedures.
   3. The NBACC electrician rewired the BSC to the proper 10 amp circuit breaker and placed the BSC back into service.
   4. Further investigations and corrective actions are ongoing.

   LESSONS LEARNED: Diagnosing the true root cause from an event (i.e. a single data point) can be difficult since an anomaly cannot be distinguished from a pattern. As additional information is gathered and patterns start to emerge, the real underlying issue can be identified. When reviewing an event, be sure to gather as much information as possible and take a second look to determine potential less obvious causes. In this case, a pattern was identified since it was the second time the BSC shut off unexpectedly leading to a more in-depth investigation.

3. **LAB PROCESS FAILURE SUMMARY:** 05/14/2013; Two BNBI employees did not don required RPE during hazardous procedures (homogenization) with low infectious dose agents. This near miss did not have any adverse outcomes for people, the environment or the company and it was good of the staff to report it.

   The reason that RPE is used in this situation is different than the reason RPE is usually used. That is, RPE is used as a precaution during homogenization procedures in case the homogenizer fails and the BSC fails. It is a tertiary level of protection. There would have to be at least failures of 2 other systems for a hazard to exist that could be mitigated by the RPE.

   ROOT CAUSE: The research staff did not associate the use of RPE with the homogenizer, which is a process that increases the risk of an aerosolization. In addition, it is not clear how familiar the research staff was with the content of the project Biosafety and Biosecurity Risk Assessment.

   CORRECTIVE ACTIONS: The staff were retrained on the requirements and recommendations of the project Biosafety and Biosecurity Risk assessment.

   A re-evaluation of the use of RPE may be warranted in this case.

   LESSONS LEARNED: Staff are frequently asked to read SOP's and risk assessments prior to performing work. While reading the "what to do" is important, staff should not underestimate

the importance of understanding the "why" it's important to do something a certain way. This increased level of understanding helps to re-enforce the action and helps staff comply with requirements as conditions vary.

4. **LAB PROCESS FAILURE SUMMARY:** 05/17/2013; A BNBI employee reported a spill of infectious material in a BSL-4 incubator. There were no suit breaches during the spill. This was the second such event in two weeks.

   ROOT CAUSE: The employee's BSL-4 suit wrist cuff accidentally struck one of the plates within the incubator causing the spill. The reason the employee's suit cuff hit one of the plates was that there were too many plates stacked too high for the employee to see into the incubator. There were too many plates in the incubator because there are not enough incubators to support the requirements of the project.

   CORRECTIVE ACTIONS:

   1. A new shelving configuration for CO_2 incubators will be evaluated for the BSL-4.
   2. The opening of (b) (7)(F) side will allow for reshuffling of refrigerators, freezers, and incubators throughout (b) (7)(F) side. This will allow for 4 incubators in (b) (7)(F) and 4 incubators in (b) (7)(F) to support (b) (7)(F) projects with limited movement of plates between rooms.
   3. A new sample layout for 96 well plates has been tested which reduces the number plates by half as compared to the first half of project (b) (7)(F)
   4. New labels will be researched which will go on the sides of the plates rather than the lids.

   LESSONS LEARNED: Establishing an efficient layout for a work environment can greatly impact the safety and efficiency of a process. In this case, a review of the layout for the 96 well plate reduced the number of plates by 50%, leaving more room for the staff member to operate.

5. **PPE FAILURE SUMMARY:** 05/20/2013; A BNBI employee noticed a small air leak in their BSL-4 suit (Sperian #57) while taking a chemical shower (bubbling). No water or disinfectant entered the suit. The employee had been working with a BSL-4 agent in the BSC prior to the suit shower. The CMA concluded that there was no potential exposure.

   The RO contacted the CDC in Atlanta, GA.

   ROOT CAUSE: PPE failure (in clear visor area).

   CORRECTIVE ACTIONS: The suit was repaired and placed back into service.

   LESSON LEARNED: Staff are encouraged to be always vigilant with inspecting PPE prior to and during use. It should not be assumed that any PPE "fresh from the box" is good to use or that PPE cannot degrade during use. Frequently reassessing PPE, is the best way to help ensure you are receiving the proper levels of protection.

6. **LAB PROCESS FAILURE SUMMARY:** 05/24/2013; Two BNBI employees reported being exposed to a 1:10 dilution of chlorine bleach on their arms and hands when their gloves were overtopped during a dunk tank operation. There were no burns or other injuries reported from these events.

ROOT CAUSE: Each employee did not notice how high the volume of liquid was in the dunk tank which led to the gloves being accidentally filled with solution. The volume of liquid was too high in the dunk tank because four gallons of bleach were added in order to bring the level of free chlorine up to 5000 ppm.

CORRECTIVE ACTIONS:

The Health & Safety team are working with project staff to evaluate options to minimize the use of the dunk tanks.

Proposed Options:

1. A bucket with holes in it and a weight could be used to keep bagged materials at the bottom of the dunk tank so that an adequate decon time can be attained. A heat sealer could be used to ensure that the bags do not leak.

2. Any process involving the movement of materials through more than one dunk tank have the option of being moved through an airlock and the use of 22-021-SOP, Airlock Operations. It will save time, money and, in light of recent events, appears to be safer.

Staff should be aware of the amount of liquid in the dunk tanks.

LESSON LEARNED: Staff need to maintain a sense of operational awareness to prevent going outside of their safety envelop without realizing it. Whether it's reaching too far into a dunk tank or reaching too far while on a ladder, situational awareness of things like liquid levels or centers of gravity can be critically important for a safe work environment.

7. **FACILITY PROCESS FAILURE SUMMARY:** 05/17/2013; A BSL-3 third floor outer change room door was noticed as being ajar and was immediately reported. The handle/lock was not functioning properly and would not latch, resulting in the door not closing fully. Facilities were contacted and the mortise lock was replaced the same day. An access report of staff using the change room was prepared and the determination was made that there were no unauthorized attempts at entering the suite during the time the lock was not functioning properly. This is a success because staff are being vigilant and noticing things out of the ordinary as they walk by, and it is a near miss because the change room door was not properly secured upon staff exit.

   ROOT CAUSE: The mortise lock on the door malfunctioned thus preventing the door from latching correctly.

   CORRECTIVE ACTIONS: The facility operations team changed out the mortise lock and verified proper operations.

   LESSONS LEARNED: Ventilation controls can make laboratory doors very susceptible to not closing correctly. Staff should be aware of all lab doors as they exit – pulling them physically shut as each area is exited.. Maintaining a situational awareness of your surroundings allows staff to identify when something looks wrong and promptly report it.

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Definitions:

Event: An unintended situation that resulted in a negative impact.

Examples:

- A glove tear that resulted in a potential exposure
- OSHA recordable injuries and illnesses
- First aid only injuries
- Loss of property
- Loss of prestige

OSHA Recordable Incident or Accident [1904.7(b)(1)(i)]: A work-related injury or illness must be recorded if it results in one or more of the following:

Examples:

- Death
- Days away from work
- Restricted work or transfer to another job
- Medical treatment beyond first aid
- Loss of consciousness
- A significant injury or illness diagnosed by a physician or other licensed healthcare professional

Near Miss: An unintended situation that did not result in a negative impact. Anything that does not meet the definition of an "Event" should be categorized as a near miss.

Examples:

- A glove tear that did not result in a potential exposure
- Wearing jewelry into a containment lab

Categories:

- Lab Process Failure
- Facility Process Failure
- PPE/Equipment Failure

Mishaps, Lessons Learned & Success Stories – July 2013 Report

SUCCESS STORIES

1. While implanting microchips into 50 guinea pigs, the technicians performing the task felt uncomfortable with the normal route of injection due to the small size of the animals and the appropriate restraint method. The normal way of injecting a microchip is to tent the animal's skin up and inject the chip from tail to head, with a second technician restraining the animal with two hands: one on the tail, and one on the head. Because of the age of the animals they were much smaller than usual, and the restraining technician's hand was in direct line of the syringe that was being used on the animal.

   After doing two injections in the "normal" orientation, the technicians stopped and reevaluated the situation and figured out that if you turn the guinea pig around and aim in the opposite direction the syringe would be further away from the restrainer's hand thus adding a safety improvement to their work. The new way of injecting from head to tail provided a level of comfort for the technicians since the restrainer's hand was now further away from the 14 gauge needle and they continued with their work using that method for the remaining 48 guinea pigs. All future animals will have the chips implanted using the new method.

2. A technician questioned the medical surveillance requirements for entry into a room where a class 3B laser was to be operated. The questioning revealed that another technician did not have adequate medical surveillance in place, which allowed for scheduling changes to be made to accommodate the other technician.

3. A BNBI employee reported the following:

   " I just wanted to drop you a quick note and say that I really appreciate the CPR/First Aid course that's been offered the past two years at NBACC. I think sometimes we focus too much on superficial workplace fringe benefits (holiday parties, socials, whatever), but this is really something I am grateful for. In my opinion, this really fosters safety 'cohesiveness' here at NBACC, by getting you to work with co-workers you maybe wouldn't have otherwise. This breaks down that potential awkward barrier if/when something ***does*** happen, that causes people (myself potentially included) to hesitate or freeze, maybe due to fear of getting it wrong, or not wanting to 'be the hero'. I think getting everyone on the same page through programs like this is also a great way to build workplace morale.

   I've been packing and readying for a week long road/camping trip the past few days, and while I certainly planned to look over my first aid kit, I wouldn't have likely done much more than throw some fresh Tums, Aspirin, and bug spray in it. Last night I went home, pulled it out of the cupboard

and really scrutinized the contents. The course also made me realize that I'm lacking a dedicated kit for my car."

EVENTS:

BY THE NUMBERS:

- None

NEAR MISSES

BY THE NUMBERS:

- Eight Lab Process Failures: (1, 3, 4, 5, 8, 10, 11, 12)
- Two PPE/Equipment Failures: (6, 7)
- One Facility Process Failure: (2)
- One Biosecurity Failure: (9)

1. **LAB PROCESS FAILURE SUMMARY:** 06/03/2013; A staff member ran a load of waste using an autoclave that had past its quarterly preventative maintenance (PM) date (Without a quarterly PM, the sterilization cycle is not accepted as being valid). The staff member realized the mistake prior to opening the outer autoclave door and posted a sign on the autoclave stating that a biological indicator needed to be run. Later, [redacted] technician opened the autoclave from the clean side hallway. . The technician closed the outer door immediately when he saw that the autoclave was full. The PM was done and the autoclave load was repeated. The CMA concluded that there was no potential exposure.

   ROOT CAUSE: The autoclave was not taken out of service when it past its PM date allowing a waste load to be mistakenly run prior to the PM.

   CORRECTIVE ACTIONS: In the future, all autoclaves will be locked out if they are past their scheduled PM cycle to ensure that the autoclave cannot be used.

   LESSONS LEARNED: The staff member used a sign to notify others of a potential hazard but did not fully explain the hazard or outline what others needed to do in order to protect themselves from the hazard. When using signs to communicate with others, staff members need to be sure that the sign is effective in conveying the intended message. Things to be considered when using a sign are:

   - Is it visible – Does it stand out or is it just part of the background? Is the sign big enough to be easy seen/read?
   - Is the message clear – Does the sign clearly state what the intended action is? Could the message be misinterpreted by others?
   - Is there a better way – Signs fall into the category of "administrative controls" and should be considered the last line of defense compared to elimination of the hazard or engineering controls.

2. **FACILITY PROCESS FAILURE SUMMARY:** 06/04/2013; A chemical fume hood (CFH) failed and lost its inward air flow during the manipulation of a toxin. There were 5 people in the room at the time of the failure. The staff did not leave the room during the failure but they verified that the CFH did not reverse air flow.

   ROOT CAUSE: The CFH (and several other fans throughout the building) were impacted overnight due to an electrical failure in a BAS component. During the ensuing investigation of the electrical failure, the BAS was reset, which caused a second fan failure to occur. This second fan failure occurred during normal operating hours while people were working in the lab. The first electrical event was suspected of causing the same type of fan failure; however, it was without consequence since no one was working in the lab at the time.

   The RO contacted the CDC in Atlanta, GA.

   CORRECTIVE ACTIONS: The Facilities staff were reminded not to test electrical systems without warning the people in the lab first.

   LESSONS LEARNED: The NBACC laboratory has highly integrated control systems which can react in unintended ways when changes are not fully thought through. Facility staff should use extra caution when working with or around control systems.

3. **LAB PROCESS FAILURE SUMMARY:** 06/04/2013; An NBACC client with unescorted access to some areas of the building left chemicals on the loading dock without proper secondary containment. The chemicals were noticed by a NBACC staff member who notified the client which lead to the chemicals being put into proper containment.

   ROOT CAUSE: The client indicated that they did not understand the requirement.

   CORRECTIVE ACTIONS: The preferred methods for chemical handling were explained to the client.

4. **LAB PROCESS FAILURE SUMMARY:** 06/05/2013; An NBACC client was escorted into a BSL-2 laboratory without proper approval (escorted laboratorian form). Access was granted minutes afterward.

   ROOT CAUSE: Limited information is immediately available to staff performing escort duties and the client assumed that they had access already.

   CORRECTIVE ACTIONS: The process for granting access to individuals to laboratory spaces is being evaluated to identify a better system for communicating information to staff members performing escorting activities.

   LESSONS LEARNED: Throughout the day, staff members are frequently tasked with performing multiple tasks. They should ensure that all of the information necessary to perform the various aspects of these tasks is readily available.

5. **LAB PROCESS FAILURE SUMMARY:** 06/11/2013; A BNBI employee reported a sharp pressure from a set of sharp forceps while working inside a BSC with forensic casework. There were no breaks in the inner or outer sets of gloves and no break in the skin. The site was washed and the incident reported to NBACC Health and Safety.

   ROOT CAUSE: The employee is left handed and had to pass the forceps over their right hand to move them out of the BSC. In the middle of this process, the phone rang and distracted the individual enough that they poked their hand with the tips of the forceps.

6. **PPE FAILURE SUMMARY:** 06/12/2013; A BNBI employee noticed a small air leak in their BSL-4 suit (Sperian #21) while taking a chemical shower (bubbling). No water or disinfectant entered the suit. The employee had been doing routine chores prior to the suit shower. The CMA concluded that there was no potential exposure.

   The RO contacted the CDC in Atlanta, GA.

   ROOT CAUSE: PPE failure (in clear visor area).

   CORRECTIVE ACTIONS: The suit has been repaired and put back into service.

7. **EQUIPMENT FAILURE SUMMARY:** 06/12/2013; While using a syringe pump system to develop emulsions, a BNBI employee experienced a spill of less than 1 ml of attenuated virus onto the floor of the BSC when the tubing came loose from the barb of the luer lock. The spill was reported to NBACC Health and Safety and cleaned up according to standard protocol. The CMA concluded that there was no potential for exposure.

   ROOT CAUSE: The viscosity of the virus stock used in the lab was much greater that the water used to test the procedure outside of the lab. This resulted in higher pressure inside the tube.

   CORRECTIVE ACTIONS: Staff modified the process to eliminate the need for the tubing.

   LESSONS LEARNED: Establishing a mock up for new processes using less hazardous materials in a less hazardous environment can be extremely effective in establishing safe procedures and conducting staff training. However, care should be taken to ensure that the mock up truly represents the actual scenario.

8. **LAB PROCESS FAILURE SUMMARY:** 06/13/2013; An NBACC client entered a BSL-3 laboratory without removing a gold chain (piece of jewelry). The chain was disinfected with appropriate disinfectant and removed from the suite.

   ROOT CAUSE: The client and the escort did not remember to remove the gold chain.

   CORRECTIVE ACTIONS: The escort and the client were retrained on entry requirements.

   LESSONS LEARNED: Both an increase in operational activities and work with new staff members represent error precursors. Be especially vigilant for procedural errors during these times.

   When staff members are serving as escorts, they are taking on the responsibility of communicating requirements for entry with the person being escorted. Whether it's a clothing requirement for entering a laboratory or a no electronics requirement for entering a secure area, escorts need to take extra time to ensure entry requirements are being followed by everyone (including themselves).

9. **BIOSECURITY FAILURE SUMMARY:** 06/19/2013; A BNBI employee reported (to the RO) that a freezer had been left unlocked in the BSL-4.

   ROOT CAUSE: The last staff member accessing the freezer forgot to lock the freezer when done.

   CORRECTIVE ACTIONS: Room access records were used in conjunction with video footage to confirm that no one accessed the freezer during the period when it was unlocked.

10. **LAB PROCESS FAILURE SUMMARY:** 06/20/2013; A BNBI employee entered an airlock and removed a cart of equipment after a VHP decon had been performed, but before the biological indicators had completed

their 24 hour incubation. While the card reader was posted "Do Not Enter", the individual misunderstood the information communicated to them by FMO that the **suite** was cleared for entry as meaning the **airlock** was cleared (the **suite** is cleared for entry and work once the airlock is negative for any residual VHP). After moving the cart to a cell-culture lab, the individual realized the error and placed the cart back into the airlock. As a precaution, NBACC Health and Safety mopped the laboratory corridor with 1:10 bleach and wiped down all door handles and surfaces encountered. The CMA was contacted and concurred there was no potential for exposure.

The biological indicators were read the next morning at 8:30 am and the airlock was determined to be successfully decontaminated.

ROOT CAUSE: The staff member was in a hurry to complete the task they had set for the morning and failed to maintain a situational awareness of the activities that were being conducted.

CORRECTIVE ACTIONS: As a precaution, NBACC Health and Safety mopped the laboratory corridor with 1:10 bleach and wiped down all door handles and surfaces encountered. The process for managing card readers during VHP decons has been modified to re-lockout them out after the retrieval of the biological indicators.

LESSONS LEARNED:

When staff are hurried and feeling pressured by deliverables it can be difficult to maintain the proper situational awareness that is needed to maintain a safe work environment. Staff should recognize these pressures exist and realize incidents tend to happen more frequently under these circumstances. If staff are finding themselves hurried, they should take a personal "time out" to gather their thoughts and ensure situational awareness is maintained. If needed, staff should not hesitate to discuss the situation with their manager or safety staff.

11. **LAB PROCESS FAILURE SUMMARY:** 06/21/2013; A BNBI employee reported a spill of approximately 50 µl of extracted DNA onto the benchtop in BSL-3. There were three parafilm wrapped microfuge tubes (snap caps) wedged into the bottom of a 50 ml conical tube used as secondary containment. The employee was unable to reach into the conical tube to free the microfuge tubes so they gently tapped the conical to release the other tubes when they noticed liquid coming out. The material had not been sterility tested for the absence of infectious materials so it was considered infectious. The CMA concluded that there was no potential exposure.

    ROOT CAUSE: The conical tube should have been manipulated in the BSC.

    CORRECTIVE ACTIONS: The individual was reminded to use a BSC for all sample manipulation.

    LESSONS LEARNED: Staff should fully think through the possible results of action so that they can ensure that the proper precautions are taken. In this example, the tapping of the conical tube resulted in the microfuge tubes being upside down introducing a leak hazard.

12. **LAB PROCESS FAILURE SUMMARY:** 06/28/2013; A BNBI employee working in the BSL-4 reported dropping a conical tube on the floor as it was being temporarily moved from the freezer to make room for another sample. The tube contained about 20 ml of virus sample, frozen solid. The individual reported their hands were wet with MicroChem when they selected the sample to be moved, and it slipped and dropped to the floor. Upon retrieving the tube, they noticed a crack in the tube, but no leakage of the frozen material. The tube was immediately placed in the BSC in a larger screw capped tube. NBACC

Health and Safety was contacted and it was determined this did not constitute a spill. The floor was mopped with 1:20 MicroChem as a precaution.

ROOT CAUSE: Gloves were slippery with disinfectant.

CORRECTIVE ACTIONS: N/A

LESSONS LEARNED: The use of PPE during work activities can introduce additional hazards into the work environment. In this case the use of gloves combined with the use of disinfectant resulted in a new hazard (i.e. slippery work surface) to the work environment.

Definitions:

Event: An unintended situation that resulted in a negative impact.

Examples:

- A glove tear that resulted in a potential exposure
- OSHA recordable injuries and illnesses
- First aid only injuries
- Loss of property
- Loss of prestige

OSHA Recordable Incident or Accident {1904.7(b)(1)(i)]: A work-related injury or illness must be recorded if it results in one or more of the following:

Examples:

- Death
- Days away from work
- Restricted work or transfer to another job
- Medical treatment beyond first aid
- Loss of consciousness
- A significant injury or illness diagnosed by a physician or other licensed healthcare professional

Near Miss: An unintended situation that did not result in a negative impact. Anything that doesn't meet the definition of an "Event" should be categorized as a near miss.

Examples:

- A glove tear that did not result in a potential exposure
- Wearing jewelry into a containment lab

Categories:

- Lab Process Failure
- Facility Process Failure
- PPE/Equipment Failure

Mishaps, Lessons Learned & Success Stories – August 2013 Report

SUCCESS STORIES

Recently, Pacific Northwest National Laboratory published a lessons learned story related to lithium batteries (see attached).

EVENTS:

BY THE NUMBERS:

- One OSHA Injury: (#3)
- Two First Aid Only injuries: (#1, 2)

1. **FIRST AID SUMMARY:** 07/08/2013; a BNBI employee found a small cut on their hand from an unknown origin. Although the incident happened at work, it also might have occurred during the lunch hour (which is not work time). Although the injury was not attributable to work, the employee was restricted from the lab for two days.

   ROOT CAUSE: Unknown.

   CORRECTIVE ACTIONS: N/A

   LESSONS LEARNED: Always be aware of your hands and the placement of your hands in order to avoid injury. Although this employee didn't notice how their hand was injured, they identified an injury before entering the lab which prevented them from having a potential exposure if PPE had failed.

2. **FIRST AID SUMMARY:** 07/15/2013; An NBACC employee sustained an injury to their ribs from repetitive motion (pipetting) after 10 consecutive hours of work in a containment lab. No restrictions.

   ROOT CAUSE: The employee reported that they felt the need to keep working to meet deliverables, even though they had discovered they were working with a difficult sample.

   CORRECTIVE ACTIONS:

   1. Remind staff member of the need to take breaks during long repetitive tasks.
   2. Recommend employing or cross-training more staff in Immunology/Toxicology group for casework.
   3. Recommend using multichannel pipets, and large bore pipets, when possible.

LESSONS LEARNED: Over the past several months, there have been numerous staff injuries resulting from repetitive motion. In the past month alone, two NBACC staff suffered repetitive motion injuries. Staff need to recognize repetitive motion situations and take actions to prevent injury (e.g. taking a short break, changing the work area set up). While it may seem like it is beneficial to work an additional period of time "just to finish the job" or "to meet a deliverable deadline", it has been repeatedly demonstrated that this can lead to injury. The bottom line is that this approach does not benefit anyone. . Safety objectives should be met before the mission objectives.

Each individual staff member should advocate for their own safe, efficient, effective work pace and to stick with it. Measures to help prevent repetitive motion injuries should be considered for every task. Managers should also be aware of staff activities and provide opportunities for staff breaks. Changes in operations (example, from multichannel to single pipette due to the nature of the sample) should be factored into the time an activity will take, and expectations adjusted accordingly

3. **OSHA RECORDABLE SUMMARY:** 07/15/2013; An NBACC employee sustained an injury in their arm and elbow from repetitive motion (pipeting) for over 12 hours of work in a containment lab. Four restricted days.

ROOT CAUSE: The employee reported that they felt the need to keep working to meet deliverables, even though they had discovered they were working with a difficult sample.

CORRECTIVE ACTIONS:

1. Remind staff member of the need to take breaks during long repetitive tasks.
2. Recommend employing or cross-training more staff in Immunology/Toxicology group for casework.
3. Recommend using multichannel pipets, and large bore pipets, when possible.

LESSONS LEARNED: Over the past several months, there have been numerous staff injuries resulting from repetitive motion. In the past month alone, two NBACC staff suffered repetitive motion injuries. Staff need to recognize repetitive motion situations and take actions to prevent injury (e.g. taking a short break, changing the work area set up). While it may seem like it is beneficial to work an additional period of time "just to finish the job" or "to meet a deliverable deadline", it has been repeatedly demonstrated that this can lead to injury. The bottom line is that this approach does not benefit anyone. . Safety objectives should be met before the mission objectives.

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NEAR MISSES

BY THE NUMBERS:

- Two Lab Process Failures: (#2, 3)

- One PPE/Equipment Failures: (#1)

1. **EQUIPMENT FAILURE SUMMARY:** 07/05/2013; a sterile glass flask was found to have shattered during autoclaving. The flask was in secondary containment and the cap was loosely on (to allow steam to escape) and imperfections in the glass were not noticed prior to autoclaving. The autoclave was carefully cleaned of any glass shards. The person who found the flask did not load the autoclave.

   ROOT CAUSE: Unknown cause.

   CORRECTIVE ACTIONS: N/A

   LESSONS LEARNED: Even when processes and procedures are followed correctly, many of the everyday tasks completed at NBACC can still represent a hazard. Contingency steps, such as the use of secondary containment, can help to minimize the impact when things don't go as planned. In this case, the use of secondary containment simplified the clean up and greatly decreased the risk of working with broken glass.

   If you are in a position to use an autoclave, remember to carefully inspect all glass to be autoclaved for any cracks or breaks and ensure that caps are loosely placed on the flask. Although rare, glass can shatter or crack during autoclaving. Autoclaving glass containers in a secondary container can help contain glass shards inside the autoclave.

2. **LAB PROCESS FAILURE SUMMARY:** 07/26/2013; A BNBI employee was working alone with unguarded, high energy machinery in an industrial space. No injuries resulted but a stop work order was issued.

   ROOT CAUSE: This investigation is ongoing.

   CORRECTIVE ACTIONS:

3. **LAB PROCESS FAILURE SUMMARY:** 07/26/2013; A BNBI employee was working in a designated welding area but did not put up appropriate signage or restrict access to the area.

   ROOT CAUSE: The employee forgot to put up the chain barrier and sign that restricts access and warns other staff not to enter.

   CORRECTIVE ACTIONS: The employee was reminded on the need for the chain barrier and sign.

   LESSONS LEARNED: Developing safe routines and habits are easy ways to do the right thing on tasks that happen every day. Complacency is natural for all workers, even seasoned ones, and the use of standard routines/habits are a good way of helping to maintain a safe work environment.

Pacific Northwest
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Lithium batteries can cause fires when shipped or carried in luggage

Date Published: June 19, 2013 | Contact: HDI POC - Shipping & Transportation | Read Comments (0)

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What you need to know to avoid danger

Summary

Since 1991, the Federal Aviation Administration has recorded 121 incidents involving lithium batteries that caused fires aboard aircraft. Many fires occurred when batteries were packed in luggage without protecting the bare terminals. When an object like a tool, a set of keys or wiring bridges the terminals, a short circuit may result, contributing to overheating or fire. **Lessons Learned:** Proper packaging is one of the most critical measures a passenger or shipper can take to prevent incidents and enhance safety. Read the attached article, provided by Oak Ridge National Laboratory, with its list of actions passengers and air cargo shippers can take to make sure batteries will not overheat or cause fires during travel or shipping. See also the attached Quick Chart with requirements for lithium batteries aboard a plane. The HDI workflow Transport Equipment, Materials or Specimens includes PNNL shipping requirements.

If you have questions about this article or have a lesson to share, please contact the Operating Experience / Lessons Learned Program Manager, Patti Ammonet at (b) (6)

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- Days away from work
- Restricted work or transfer to another job
- Medical treatment beyond first aid
- Loss of consciousness
- A significant injury or illness diagnosed by a physician or other licensed healthcare professional

Near Miss: An unintended situation that did not result in a negative impact. Anything that doesn't meet the definition of an "Event" should be categorized as a near miss.

Examples:

- A glove tear that did not result in a potential exposure
- Wearing jewelry into a containment lab

Categories:

- Lab Process Failure
- Facility Process Failure
- PPE/Equipment Failure

BLUE - Safely Transporting Lithium Batteries by Passenger or Cargo Aircraft - What You Need To Know

Lesson ID: 2013-UTB-ORNL-0002 **Date:** 5/9/2013

Statement: If you are planning a trip on an airplane, you probably will take your laptop, cell phone, camera, GPS tracking devices or other lithium battery-powered devices as these items are still safe to fly. But rechargeable lithium batteries (also called lithium ion, or secondary lithium batteries); non-rechargeable lithium batteries (also called lithium metal, or primary lithium batteries); and lithium battery-powered devices in your checked luggage or in carry-on baggage pose risks of overheating and fire when regulations and proper packaging are not followed.

At ORNL, if you are shipping equipment by air that may contain batteries, you should contact the ORNL Transportation Specialists prior to making the shipping request. Shipments of this nature could be considered hazardous cargo under DOT and FAA regulations.

Bottom line: Proper packaging of lithium batteries is one of the most critical measures that you as a passenger or you as a shipper can take to prevent incidents and enhance safety.

Discussion: As of March 13, 2012, 121 air incidents involving batteries have been recorded by the Federal Aviation Administration (FAA) since 1991. Many of the fires reported by the FAA were due to unprotected battery terminal contact points coming into contact with each other, metal objects (coins, jewelry) or other objects. Some of the FAA reported fires were caused by passengers that did not secure on/off switches on items such as battery-powered curling irons, power drills, etc. that were packaged in both carry-on and in checked baggage. In-flight fires were also caused by overheated laptop batteries.
See photo attached.

Last year a United Parcel Service plane crashed in Dubai and reports stated that lithium batteries were blamed for the fatal crash that killed both pilots. A report by the UAE's civil aviation authority stated that the Boeing 747 was carrying flammable batteries that were "distributed throughout the cargo decks" while "lithium ion battery packs" should have been singled out and handled as hazardous cargo.

Analysis: Secondary or lithium ion batteries are found in laptop computers, tablets, smartphones and so on are made using electrically charged lithium (ions) in a flammable liquid electrolyte. Primary batteries, the nonrechargeable type used in watches and small devices, contain lithium metal, which burns when exposed to air. Unlike standard alkaline batteries, most lithium batteries manufactured today contain a flammable electrolyte and have a higher energy density. They can overheat and ignite under certain conditions and, once ignited, can be difficult to

extinguish. For example, a tool, a set of keys, or wiring could bridge the battery terminals, creating a short circuit. Additionally, damaged batteries may lead to short-circuiting or contribute to a fire through the release of stored energy or may release hazardous or corrosive substances. Packaging batteries to protect terminals, especially from metallic objects, reduces risk in transportation and increases safety. Thus proper packaging is one of the most critical measures that a passenger or shipper can take to prevent incidents and enhance safety. See the attached safe travel "Quick chart" requirements for lithium batteries on board a plane.

New Department of Transportation regulations are in place to protect against battery generated fires on aircraft. DOT's rule on carrying lithium batteries during air travel, which took effect January 1, 2008, prohibits loose (spare) lithium batteries in checked baggage, i.e., large suitcases handed to the airline. Portable electronic devices packed within checked baggage, may contain correctly packaged batteries.

In carry-on baggage, certain types of lithium batteries may be packed, such as those used in cell phones and most laptop computers, provided you take measures to protect (cover) terminals. In the passenger compartment, flight crews can better monitor safety conditions to prevent an incident, and can access fire extinguishers if an incident occurs.

For ORNL air cargo shipments, lithium battery shipments by cargo air may need to be declared, packaged and labeled properly. The regulations governing the shipment of lithium ion or lithium metal batteries are fairly complex and these items, as well as any electronic devices with batteries should be declared when preparing shipping requests. Whether you are shipping a single battery, a palletized load of batteries, or a battery-powered device, the safety of your package, and of the people who handle it along the way, depends on compliance with these regulations.

Actions:

Passenger Aircraft:

1. Pack spare batteries in carry-on baggage. In the passenger compartment, flight crews can better monitor safety conditions to prevent an incident, and can access fire extinguishers, if an incident does occur.

2. Keep spare batteries in the original retail packaging to prevent unintentional activation or short-circuiting.

3. For loose batteries, place at least two full wraps of electrical tape across the battery's contacts to isolate terminals. Isolating terminals prevents short circuiting.

4. If original packaging is not available, effectively insulate battery terminals by isolating spare batteries from contact with other batteries and metal. Place each battery in its own protective case, plastic bag, or package. Do not permit a loose battery to come in contact with metal objects, such as coins, keys, or jewelry.

5. If you must carry battery-powered devices in your checked baggage you must take steps to prevent inadvertent activation. Cordless power tools, for instance, should be packed in a protective case, with trigger lock engaged.

6. For power tools with removeable battery packs, remove the battery and, place at least two full wraps of electrical tape across the battery's contacts since many power tools may not have a lockable trigger.

7. Only charge batteries that you are certain are rechargeable! Non-rechargeable batteries are not designed for re-charging, and become hazards if they are placed in a battery charger.

8. If you have charged a non-rechargeable battery, do NOT bring it on board an aircraft.

9. Only use chargers designed for your type of batteries. If unsure about compatibility, contact the product manufacturer.

10. Take steps to prevent crushing, puncturing, or putting a high degree of pressure on the battery, as this can cause an internal short-circuit, resulting in overheating.

ORNL Air Cargo:

1. If you are shipping equipment from ORNL that contain batteries (excluding alkaline and nickel cadmium), whether installed or not, you should contact the ORNL Transportation Specialist prior to shipping the item(s).

2. Be diligent in providing the Transportation SMEs with an itemized list of the items to be shipped and identify any electronic devices and any installed or spare batteries.

Damaged or defective lithium batteries or devices containing lithium batteries (including those being returned to the manufacturer) are forbidden for transportation by aircraft.

Originating Organization or Contracting Company: UT-Battelle, LLC / Oak Ridge National Laboratory

Contact: Teresa Cochran; (b) (6) [redacted]

Classifier: David Hamrin **Reviewer:** Teresa Cochran

Keywords: BATTERIES, BATTERY, LITHIUM, CARGO, aircraft

Hazard(s): Fire / Smoke / NFPA

ISM Code(s): Develop / Implement Controls

Work Function(s): Packaging & Transportation

References: SafeTravel.dot.gov; www.faa.gov; www.ntsb.gov; U.S. Department of Transportation (DOT) Pipeline and Hazardous Materials Safety Administration; DOT Docket No. PHMSA-2007-27493; Notice No. 07-02 Advisory Guidance: Transportation of Batteries and Battery-Powered Devices by Airline Passengers and Crew Members

Priority Descriptor: Blue / Information

Attachments:
2013-UTB-ORNL-0003.jpg see attached "Picture.jpg"
SafeTravel_QuickChart.pdf see attached "Chart.pdf"

Effective January 1, 2008			
	Type Of Battery/Batteries	**In Checked Baggage**	**In Carry-On Baggage:**
	**Lithium Metal Battery,** Installed in a device (up to 2 grams lithium)	Permitted [1]	Permitted
	**Spare Lithium Metal Battery**, not installed In a device (up to 2 grams lithium)	Forbidden	Permitted [2]
	**Lithium Metal Battery**, **spare** or installed (over 2 grams lithium)	Forbidden	Forbidden
	**Lithium-Ion Battery**, installed in a device (up to8 grams **equivalent lithium content**)	Permitted [1]	Permitted
	**Spare Lithium-Ion Battery**, not installed in a device (up to 8 grams **equivalent lithium content**)	Forbidden	Permitted [2]
	Up to 2 **Spare Lithium-Ion Batteries**, not installed in a device (between 8 and 25 grams aggregate **equivalent lithium content**)	Forbidden	Permitted [2]
	One **Lithium-Ion Battery**, installed in a device (between 8 and 25 grams **equivalent lithium content**)	Permitted [1]	Permitted

1. In **checked baggage**, ensure that devices remain switched off, either by built-in switch/trigger locks, by taping the activation switch in the "off" position, or by other appropriate measures.
2. Be sure to take protective measures to prevent against short-circuits.

http://safetravel.dot.gov/quick_chart.html

Mishaps, Lessons Learned & Success Stories – September 2013 Report

SUCCESS STORIES

1. Recently, a new SpectraMax Paradigm microplate reader was setup in the BSL-4 (room (b) (7)(F) While working with the plate reader, an employee noticed that the position of the stage after a run places the infected plate where a person's air hose could catch hold on the stage. This could potentially dislodge the plate and spill it onto the ground resulting in a spill outside primary containment and a Form 3 to be filled out. The runs on this plate reader can take up to 8 minutes so a person could setup a run and be working on other tasks during the run while not paying attention to the reader the full time potentially causing this chain of events to occur. The employee rearranged the plate reader on the table so that the stage comes out in a manner which will not interfere with house air supply hoses.

EVENTS:

BY THE NUMBERS:

- One OSHA Injury: (#3)
- Four First Aid Only injuries: (#1, 2, 4, 5)

1. **FIRST AID SUMMARY:** 08/14/2013; a BNBI employee reported to Corp OHS for wrist pain. The employee was evaluated and returned to work without restrictions.

   ROOT CAUSE: The injury was attributed to repetitive motion from typing at their workstation.

   CORRECTIVE ACTIONS: An ergonomic assessment was performed on 19 August 2013 and several recommendations were made to improve support of the employee's wrists while typing.

   LESSONS LEARNED: BNBI has experienced several repetitive motion injuries in the past several months. Staff should take the time to recognize what repetitive motion activities they conduct in their own work day and have them reviewed for ways to prevent injury. The H&S staff are available to assist with these evaluations.

2. **FIRST AID SUMMARY:** 08/15/2013; An NBACC subcontractor sustained a laceration injury to the underside of their forearm. First aid was applied and the subcontractor did not seek medical care.

   ROOT CAUSE: The laceration was caused by the sharp point of a zip-tie.

   CORRECTIVE ACTIONS: N/A

3. **OSHA RECORDABLE SUMMARY:** 08/16/2013; An NBACC employee sustained a laceration injury to their forehead while working in the BSL-4 airlock (in BSL-0 mode) The employee was struck by the half inch

brass quick connect located on the end of a BSL-4 breathing air line. The airline had been coiled up on top of the breathing air pipes due to large equipment being moved back into the suite. The employee jumped/stretched to pull the airline down from the breathing air pipes, and the quick connect piece whipped around, striking the employee above the eyebrow. The wound was treated (stitches) at CorpOHS and the employee was returned to work with three days of restrictions from containment work.

ROOT CAUSE: The employee did not use a ladder or stepstool to retrieve an item that was out of reach, which would have allowed full control during the retrieval of the airline

CORRECTIVE ACTIONS: N/A

LESSONS LEARNED: Making sure you have the right tool for the job is critical to the prevention of accidents and injuries. While a "shortcut" may not seem like a big deal, they frequently lead to un-intended consequences.

4. **FIRST AID SUMMARY:** 08/16/2013; a BNBI employee reported to Corp OHS for elbow pain. The employee was evaluated and returned to work without restrictions.

   ROOT CAUSE: The injury was attributed to repetitive motion from typing at their workstation while leaning on their elbow.

   CORRECTIVE ACTIONS: An ergonomic assessment was performed on 19 August 2013 and several recommendations were made to improve support of their seated position while typing.

   LESSONS LEARNED: See item #1.

5. **FIRST AID SUMMARY:** 08/19/2013; a BNBI employee scraped their knuckles on a file drawer. They sustained a minor scrape and did not seek medical attention beyond first aid.

   ROOT CAUSE: The employee was working to clean out a file drawer and misjudged the location of the upper drawer.

   CORRECTIVE ACTIONS: N/A

NEAR MISSES

BY THE NUMBERS:

- Four Lab Process Failures: (#2, 3, 4, 5)
- Three PPE/Equipment Failures: (#1, 6, 8)

1. **PPE FAILURE SUMMARY:** 08/03/2013; A BNBI employee working in BSL-3 noticed a glove tear in their inner glove while processing unknown samples in the BSC. The tear was noted when employee went to change their outer gloves. There was no injury and no potential exposure. CDC was not notified as this was not BSAT work.

   ROOT CAUSE: The event was attributed to opening hundreds of Sarstedt tubes for sample aliquotting. The glove was most likely pinched at some point.

CORRECTIVE ACTIONS: N/A

LESSONS LEARNED: Many of the tasks performed by staff can result in "wear and tear" of the PPE used to help keep them safe. Because an individual's hands are the primary method for conducting work, gloves are the type of PPE that can be the most susceptible to damage. Staff should consider how the task they are performing can negatively impact their PPE. More specifically, if gloves are at risk of damage, staff should take breaks to inspect and change out gloves during long work periods, especially if the work involves many manipulations that could cause mechanical stress on the PPE.

2. **LAB PROCESS FAILURE SUMMARY:** 08/13/2013; While working in the BSL-4 laboratory, a BNBI employee noticed that a BSL-4 suit "pigtail" airhose was split but air was still being supplied to the suit. The CMA was notified and the incident was ruled no potential exposure. The RO was also notified as well as CDC.

   ROOT CAUSE: The event was most likely due to hose memory and eventual kinking in the hose until it gave way to a split.

   CORRECTIVE ACTIONS: All "pigtail" hoses were replaced with new hose material by FMO staff.

   LESSONS LEARNED: Many of the tasks performed by staff can result in "wear and tear" of the PPE used to help keep them safe. In this case, routine movements while in the suit causes the breathing air hose to bend and flex eventually resulting in a weak spot. Staff should consider how the use of their PPE can result in wear and tear, and then factor this information into their pre-use inspections of the PPE.

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3. **LAB PROCESS FAILURE SUMMARY:** 08/14/2013; A NBACC visitor brought dry powder samples of a risk group 1 biological agent into the NBACC through the personnel entrance and without etiologic agent registration. No staff were at risk from this action. The samples were split in a BSL-2 laboratory Class II BSC, when they should have been worked with in a Class III glovebox. Environmental sampling in the laboratory showed the Class II BSC to be contaminated with the material but no other areas inside the laboratory were. The original samples remained in the BSL-2 laboratory and the split samples were returned to the visitor.

   ROOT CAUSE: There were several time points involving several people when the sequence of events with this agent should have been stopped by a NBACC staff member exercising a stop work order. However, at the time it was not recognized by staff that the work was deviating from NBACC policies.

   CORRECTIVE ACTIONS:

   a. The contaminated BSC was VHP deconned.

   b. Staff were retrained on 22-013-SOP, Primary Containment and the use of Class III gloveboxes as the proper containment devices for powdered material.

   LESSONS LEARNED:

   a. Visitors are not authorized to direct the laboratory or operational activities of NBACC staff. Any attempts by visitors to direct the activities of BNBI staff should be referred to the appropriate Leadership Team member.

   b. All staff, from Leadership Team members to technical staff, should be ready to exercise the stop work authority when activities seem wrong or outside of NBACC policy.

c. Powdered materials are to be manipulated in a Class III glovebox per 22-013-SOP, Primary Containment.

4. **LAB PROCESS FAILURE SUMMARY:** 08/20/2013; A BNBI employee noticed that a BSL-4 copper breathing air supply line in the [redacted] interstitial space was cracked and leaking air. It was unclear how long the breathing air supply line had been breached. The leak did not affect the operation of the BSL-4 breathing air system and no staff were at risk from this event.

   ROOT CAUSE: The event was most likely caused when a liquid nitrogen tank struck the breathing air line during transport.

   CORRECTIVE ACTIONS: The breathing air supply line was valved off and repaired. Steel bumpers were installed to protect utility lines along the liquid nitrogen tank pathway.

   LESSONS LEARNED: The configuration of an individual's work space has the potential to introduce hazards that should be accounted for in everyday activities. In this situation, the (b) (7)(F) space has limited maneuverability for equipment. Recognition of these limitations can lead to a process change (e.g. using two staff to move equipment instead of one) or a work place change (e.g. addition of bumpers to protect sensitive items).

5. **BIOSECURITY FAILURE:** (established procedures not followed): 08/20/2013; Technical staff created [redacted] BSAT inventory records under a PI of whom they are not designees. This created new inventory in a PI's holdings that were not authorized by the PI.

   ROOT CAUSE: Limited understanding of the [redacted] system combined with a miscommunication between technical staff prompted selection of wrong PI during [redacted] entry of new vials.

   CORRECTIVE ACTIONS: The staff members were given refresher training that designees should only create/manipulate records under the PI they are a designee for, and only with the knowledge/permission of the PI.

6. **PPE FAILURE SUMMARY:** 08/27/2013; A BNBI employee noticed a hole in their BSL-4 suit (#53). The CMA was notified and the incident was ruled no potential exposure. The RO and CDC were also notified.

   ROOT CAUSE: PPE failure

   CORRECTIVE ACTIONS: The Sperian suit was repaired and placed back into service.

7. **LAB PROCESS FAILURE SUMMARY:** 08/27/2013; A BNBI employee spilled a small amount (100mL) of bleach onto the front of a refrigerator, the floor and the front of their scrubs while in BSL-2.

   ROOT CAUSE: The employee bumped the bleach bottle while it was on the edge of the sink with the bottle cap loosely tightened.

   CORRECTIVE ACTIONS: The bleach was cleaned up and the employee changed their scrubs.

   LESSONS LEARNED: The configuration of an individual's work space has the potential to introduce hazards that should be accounted for in everyday activities. In some cases, the configuration is somewhat fixed (see # 4) but in others, the configuration is up to the individual staff members. Whether it is a laboratory as in this situation or a staff member's desk, where items are placed can either increase of decrease the potential for an event. Placement of containers back away from the edge of the benches and sinks as well as tightening down bottle caps when not in use can reduce the potential for spills. Similarly, the

ergonomically correct placement of the keyboard on your desk can reduce the potential for a repetitive motion injury.

8. **PPE FAILURE SUMMARY:** 08/30/2013; A BNBI employee noticed a hole in their BSL-4 suit (#54). The CMA was notified and the incident was ruled no potential exposure. The RO and CDC were also notified.

   ROOT CAUSE: PPE failure

   CORRECTIVE ACTIONS: The Sperian suit was repaired and placed back into service.

Definitions:

Event: An unintended situation that resulted in a negative impact.

Examples:

- A glove tear that resulted in a potential exposure
- OSHA recordable injuries and illnesses
- First aid only injuries
- Loss of property
- Loss of prestige

OSHA Recordable Incident or Accident {1904.7(b)(1)(i)]: A work-related injury or illness must be recorded if it results in one or more of the following:

Examples:

- Death
- Days away from work
- Restricted work or transfer to another job
- Medical treatment beyond first aid
- Loss of consciousness
- A significant injury or illness diagnosed by a physician or other licensed healthcare professional

Near Miss: An unintended situation that did not result in a negative impact. Anything that doesn't meet the definition of an "Event" should be categorized as a near miss.

Examples:

- A glove tear that did not result in a potential exposure
- Wearing jewelry into a containment lab

Categories:

- Lab Process Failure
- Facility Process Failure
- PPE/Equipment Failure

Mishaps, Lessons Learned & Success Stories – October 2013 Report

EVENTS:

BY THE NUMBERS:

- One OSHA Injury (#1)
- Zero First Aid Only Injuries

1. **OSHA RECORDABLE SUMMARY:** 09/03/2013; After receiving an occupationally required vaccine, a BNBI employee reported to CorpOHS with a severe headache and pain at the injection site. The employee was evaluated and returned to work without restrictions after one missed day of work attributed to the immunization.

   ROOT CAUSE: Side effects to an occupationally required immunization.

   CORRECTIVE ACTIONS: N/A

NEAR MISSES:

BY THE NUMBERS:

- Three Lab Process Failures: (#2, 3, 5)
- Three PPE/Equipment Failures: (#1, 4, 7)
- One Biosecurity Incident (#6)

1. **PPE FAILURE SUMMARY:** 09/03/2013; A BNBI employee noticed a ½ inch tear in the seam of their BSL-4 suit while they were in the chemical shower (Dover #48). The CMA was notified and the incident was ruled no potential exposure. The RO was also notified and reported the incident to the CDC.

   ROOT CAUSE: PPE Failure. The suit had been in service for about one year, which is considered near the end of its service life.

   CORRECTIVE ACTIONS: The suit was taken out of service and retired.

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2. **LAB PROCESS FAILURE SUMMARY:** 09/17/2013; A bag of BSL-2 waste was left in an autoclave, unsterilized, since 23 August 2013. Additionally, the bag was overfilled with waste, and was not placed in secondary containment. While a sterilization cycle was not run, the autoclaves remain in a heated

standby mode. This residual heat resulted in the autoclave bag degrading and allowed its contents to leak into the autoclave chamber.

ROOT CAUSE: This failure was the result of three independent failures: an overfull waste bag, waste placed in autoclave without a secondary container, and the autoclave sterilization cycle not being initiated.

CORRECTIVE ACTIONS: The waste was placed in a new autoclave bag, placed into secondary containment (Nalgene tub), and sterilized.

Environmental Operations (EO) staff informed the Laboratory Space Manager (LSM) responsible for the waste to remind staff of the following:

- Do not overfill waste bags;
- Use secondary containment (Nalgene tub); and
- Autoclave infectious waste as soon as possible.

LESSONS LEARNED: Recent near misses have highlighted that proper handling of waste is essential to ensure the safety of staff and equipment. When simple process steps are overlooked, such as taping the ends of batteries or using secondary containment, a hazardous situation can be created. To prevent this from happening, staff needs to ensure that containers are: 1. Compatible with the waste (i.e. won't react or degrade integrity); 2. Filled correctly (i.e. not overfilled and closed correctly); and 3. Protected from damage. In addition, individuals responsible for a waste stream should ensure that each stage of the management process is followed through to prevent unexpected situations from developing (e.g. container degrading over time).

3. **LAB PROCESS FAILURE SUMMARY:** 09/18/2013; A BNBI employee reported four bulging (pressurized) containers of chemical waste in a BSL-3 satellite waste accumulation point within a chemical fume hood. The caps of the containers did not allow for off gassing or for pressure release during reactions.

   ROOT CAUSE: The liquid waste had been treated with bleach for decontamination purposes and some chlorine off gassing was an expected reaction. However, the caps on the bottles had been tightened down so that no gas could escape in the fume hood, creating a dangerous situation. The chemical decon instructions provided to lab staff did not provide explicit instruction for allowing the containers to off-gas prior to fully tightening the lids.

   CORRECTIVE ACTIONS: A chemical spill plan was developed and EO staff pierced the containers with a $1/16^{th}$ inch drill bit and released the pressure. The contents of the containers were transferred to other containers with vented caps.

   LESSONS LEARNED: When considering new and/or unique processes, it is important to identify all of the hazards that will be involved and to design mitigation steps into the process. In this case, the bleach was added to the solution for the purpose of decontaminating the waste through a chemical reaction. However, the off-gassing hazard associated with the reaction was not accounted for in the process and a hazard situation resulted.

4. **PPE FAILURE SUMMARY:** 09/20/2013; A BNBI employee experienced wet scrubs as they exited from the chemical shower (BSL-4 suit #57). After further investigation and testing, the leak was determined to have

most likely occurred at the valve for the flow control, which was found to be cracked. The CMA was notified and the incident was ruled no potential exposure. The RO was also notified.

ROOT CAUSE: PPE failure.

CORRECTIVE ACTIONS: The Sperian suit was taken out of service and retired.

LESSONS LEARNED: N/A

5. **LAB PROCESS FAILURE SUMMARY:** 09/24/2013; A BNBI employee reported that the top two layers of used batteries that had been stacked, shrink wrapped, and palletized fell over while it was being loaded into the HMMO box truck. These were uninterruptable power supply units for computer servers that required the use of a pallet jack to move. Each UPS weighs ~ 126 lbs.

   ROOT CAUSE: The bed of the HMMO truck sits lower than other trucks using the loading dock. When fully extended, the loading dock ramp is not flush with the back of the truck and angles down creating an incline. Further, the loading dock ramp is still slightly above the truck bed. As the pallet jack travelled down the incline, the tips stuck the bed of the truck causing the pallet jack to come to an abrupt stop. This sudden stop resulted in the UPS units on the top of the stack to tumble over.

   CORRECTIVE ACTIONS: The batteries inside the UPS units are self contained so no spill resulted. The UPS units were restacked onto the pallet once inside the HMMO truck.

   LESSONS LEARNED: Using the right tool for the job is critical to maintaining a safe work environment. Substituting something that doesn't fit correctly can create an unexpected hazard that isn't accounted for in the work planning. In this case, the HMMO truck did not "fit" the loading dock. The dock ramp was lowered to the point that it created an incline that the pallet jack could not traverse.

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6. **BIOSECURITY INCIDENT SUMMARY:** 09/26/2013; A BNBI employee did not sign in on the BSAT room entry tracking form as required when accessing (b) (7)(F) BSL-2 BSAT registered laboratories on the second floor.

   ROOT CAUSE: There was a lack of understanding of the purpose/importance for the entry tracking form on the part of the employee.

   CORRECTIVE ACTIONS: The LSM sent a reminder email to staff with access to those labs that signing in is required each time you enter the room, because (b) (7)(F) (b)(7)(F) The Federal Regulations require that we track all entries to BSAT registered areas, and the paper form is what we have to track entry into (b) (7)(F) labs. (b) (7)(F), (b) (5)

   LESSONS LEARNED: Operation of BSAT laboratories is a highly regulated activity with extensive, federally-mandated record keeping requirements. Many of the requirements in our SOP's are directly tied to meeting these requirements. While it can be cumbersome to complete the many checklists and forms we use at NBACC (such as signing in repeatedly when accessing these labs), employees must still comply with procedures designed to maintain compliance with regulations.

7. **PPE FAILURE SUMMARY:** 09/27/2013; While in the BSL-4, a BNBI employee reported an outer glove tear (canners gloves) near where the outer glove is taped to the suit. The inner glove remained intact. The employee had just finished collecting samples and was cleaning the BSC. The employee decontaminated

their glove and suit cuff and exited the suite. The CMA was notified and the incident was ruled no potential exposure. The RO was also notified.

ROOT CAUSE: PPE failure.

CORRECTIVE ACTIONS: The gloves were immediately changed out.

LESSONS LEARNED: N/A

Definitions:

Event: An unintended situation that resulted in a negative impact.

Examples:

- A glove tear that resulted in a potential exposure
- OSHA recordable injuries and illnesses
- First aid only injuries
- Loss of property
- Loss of prestige

OSHA Recordable Incident or Accident {1904.7(b)(1)(i)]: A work-related injury or illness must be recorded if it results in one or more of the following:

Examples:

- Death
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- Restricted work or transfer to another job
- Medical treatment beyond first aid
- Loss of consciousness
- A significant injury or illness diagnosed by a physician or other licensed healthcare professional

Near Miss: An unintended situation that did not result in a negative impact. Anything that doesn't meet the definition of an "Event" should be categorized as a near miss.

Examples:

- A glove tear that did not result in a potential exposure
- Wearing jewelry into a containment lab

Categories:

- Lab Process Failure
- Facility Process Failure
- PPE/Equipment Failure

Mishaps, Lessons Learned & Success Stories – November 2013 Report

SUCCESS STORIES

1. A steam condensate leak was discovered in a BSL-3 autoclave cabinet. The corrective actions developed following Facility Process Failure #1 (see below) allowed for the more rapid discovery of the leak and a much faster response and repair.

2. The Facilities Management Office received a new Dayton scissor lift, rated for 1700lbs, which will be used to safely move 60HP motors weighing 800lbs each. Two staff members were tasked to unpack and inspect the unit. The staff decided to go over the bolts and fasteners that had been installed by the manufacturer. During this last-minute check, the staff members found that the bolts and wheels were loose which could have resulted in a wheel falling off during use. To correct the manufacturer's error, the staff tightened the four nuts and bolts on each wheel. Although the unit came assembled from the manufacturer, this incident is a reminder that taking the time to double check equipment used in dangerous operations is vital. The vigilance of the two staff members prevented what could have been a very dangerous incident.

3. A BNBI employee reported that they had received a letter at the Annex that met the criteria for a suspicious package. The letter in question was bulky, did not have a return address, and the letter was addressed to "Bnbi." The employee called the Health and Safety Office for guidance. All procedures were followed per the Emergency Operations Plan (b) (7)(F) . The package was screened for explosives and powdered infectious material. Neither was found in the package. The Health and Safety Office advised the company responsible for mailing the package to place return addresses on their postage and to correctly label the recipient. If staff discover a suspicious package at the Annex, they should contact the NBACC Emergency Manager. A list of the NBACC Emergency Managers can be found in the reception area and on all bulletin boards at the Annex. If staff discover a suspicious package at NBACC, call (b) (7)(F) .

EVENTS:

BY THE NUMBERS:

- One OSHA Injury: (#1)
- Four First Aid Only injuries (#2,3,4, 5)

1. **OSHA RECORDABLE SUMMARY:** 10/15/2013; A BNBI employee hit their head on a ½ inch airline hose connector while in the BSL-4 suit room. The employee was evaluated and only needed first aid; however they were restricted from the labs until the wound healed. The result was one restricted day.

ROOT CAUSE: The employee did not see that the hose connector was hanging down lower than usual.

CORRECTIVE ACTIONS: N/A

LESSONS LEARNED: Status of the work environment, both the "as found" and "as left" conditions can have an impact on overall staff safety. Staff should try to leave a work area as clean/orderly (i.e. as safe) as possible remembering that the next person to use the space may not immediately recognize every hazard. When entering a space, staff should scan for changes in conditions that could present unexpected hazards. In this case, an airline had not been placed on the hanger as high as normal resulting in a hazard that was not normally present (or expected).

2. **FIRST AID SUMMARY:** 10/04/2013; A BNBI employee hit their head on a shelf within a non-containment side change room. The employee was not injured during this event.

   ROOT CAUSE: Human error.

   CORRECTIVE ACTIONS: The bottom shelf was removed by FMO to prevent this accident from happening again.

3. **FIRST AID SUMMARY:** 10/07/2013; A BNBI employee reopened an existing wound on their finger while replacing screws on a network card panel in a copy room. A band aid was applied. There were no restrictions and no lost days.

   ROOT CAUSE: The employee underestimated the sharpness of the screw end.

   CORRECTIVE ACTIONS: N/A

4. **FIRST AID SUMMARY:** 10/10/2013; A BNBI employee cut their hand while using a plastic fork to cut out the bruised part of an apple. The fork broke under the strain and the employee's hand struck the broken edge of the prong. The employee was restricted from BSL-3 work for one day. This injury is technically not an occupational injury because it took place when the employee was at lunch, which is defined by OSHA as being an activity that is not work related.

   ROOT CAUSE: The employee used the wrong tool for the job causing an injury as plastic forks are not intended for cutting.

   CORRECTIVE ACTIONS: N/A

   LESSONS LEARNED: Even seemingly routine tasks during lunch can cause an injury; take the time to find the right tool for the job—even cutting an apple.

5. **FIRST AID SUMMARY:** 10/30/2013; A BNBI employee scraped their knuckle on the floor of the (b) (7)(F) (b) (7)(F) BSL-3 containment lab while preparing for a VHP decontamination. This task does not require the use of gloves and the employee was not wearing them at the time. The CMA was notified and determined that there was no risk of exposure for the following reasons: 1) There were no spills of (b) (3) (B) in the suite, 2) there were no positive results from the monthly [redacted] sampling in the suite, and 3) the floors are mopped weekly with bleach.

   ROOT CAUSE: The employee underestimated the abrasive quality of the flooring.

   CORRECTIVE ACTIONS: The employee showered out of the suite after notifying the DHS Command Center. Health and Safety took a photograph of the injury and sent it to the CMA for evaluation and

disposition. While not required, the employee stated that in the future they would consider wearing gloves for this part of the prep work.

LESSONS LEARNED: N/A

NEAR MISSES

BY THE NUMBERS:

- Seven Lab Process Failures (#2,3,4,5,6,7)
- One Facility Failure (#1)
- Two PPE Failures (#8, 9)

1. **FACILITY PROCESS FAILURE SUMMARY:** 10/07/2013; Approximately one gallon of liquid was found on the floor of the clean side of an autoclave cabinet after the autoclave had failed to process a full cycle of BSL-3 waste.

   ROOT CAUSE: The liquid on the floor was the result of a leak in the steam condensate pressure switch. The cause of the cycle failure was a clogged heat exchanger.

   CORRECTIVE ACTIONS: At the time of the spill it was assumed that the liquid on the floor might be contaminated effluent from the failed cycle. For this reason:

   - The spill was cleaned up by two Health and Safety and one EO staff members dressed in appropriate PPE. All biohazard spill procedures were followed.
   - The heat exchanger had to be flushed with clean water so that the autoclave would complete its cycle. The cycle passed during the next try.
   - It is recommended that either FMO or EO staff visually inspect the autoclave cabinets once per day to check for leaks.
   - Further training was conducted for EO staff and (b) (7)(F), (b) (6) contractor on what to do if they find leaks in any system of the autoclave.

   LESSONS LEARNED: N/A

1. **LAB PROCESS FAILURE SUMMARY:** 10/09/2013; A BNBI employee found a water bath that had been left on with no water in it inside the BSL-4. A rack had been left in the water bath but had not melted. The last notation on the water bath log was March 2013 and the unit had been calibrated in June 2013. The log had no other use notations on it after those dates. In addition, the thermometer had been crushed and cracked.

   ROOT CAUSE: It cannot be determined what caused the crushed thermometer although there are some logical possibilities (i.e. close proximity to a tool box). The water bath was left on and these instruments have no fail safe or automatic shut off. This incident is an example of a failure to properly fill out forms and follow procedures (i.e. routine checks of equipment).

CORRECTIVE ACTIONS: The thermometer was replaced and the tool box was moved to a more suitable location. The BSL-4 staff were also reminded to make notations on the water bath log after each use and to turn off the water bath after each use.

LESSONS LEARNED: While it can seem tedious, checklists and establishment of routines are intended to monitor for and prevent the types of situations identified in this summary. If staff feels that a checklist or procedure is not adding value, it should be brought up to the LSM or their manager for evaluation.

2. **LAB PROCESS FAILURE SUMMARY:** 10/09/2013; A BNBI employee nearly fell off of the loading dock while attempting to maneuver a 350lb liquid nitrogen tank around the confocal microscope table. The table is stored flat and takes up approximately 35ft^2 of the loading dock reducing the downward sloping concrete deck that is 10 ft wide to 4 feet 5 inches wide. This requires the workers to maneuver each LN2 tank around the obstacle approaching the lip of the loading dock.

   ROOT CAUSE: This is the only suitable place to store the confocal microscope table (with the exception of off-site storage).

   CORRECTIVE ACTIONS:

   - A request was made to EO and FMO to move the confocal microscope table as soon as possible. In the interim, it may be safer to have two people move LN2 tanks around the table.
   - An alternate storage location was established for the LN2 tanks until the table is relocated.

   LESSONS LEARNED: The NBACC facility has very limited space for storage of equipment that is not in use. Staff should evaluate to potential for future use of equipment and work with the property custodian so that un-needed equipment can be disposed of. This will help to maintain a work space that is free of un-intended hazards.

3. **LAB PROCESS FAILURE SUMMARY:** 10/09/2013; A BNBI employee dropped five agar plates of a BSL-3 agent onto the floor as they transferred them from an incubator to the BSC. The employee immediately picked up the plates and put them into the BSC. They did not hold their breath and evacuate the room. The plates had been incubating for one day and, at the time of the spill, the employee was not wearing respiratory protection. The CMA was notified and the incident was ruled a potential exposure per CDC guidance. The RO was also notified and submitted a Form 3 to the CDC.

   ROOT CAUSE: The stack of agar plates were taped together but the tape came loose during the transfer of the plates into a secondary container prior to their movement to the BSC. In addition, during a spill of infectious material, the staff member did not hold their breath and exit the room immediately.

   CORRECTIVE ACTIONS:

   - The spill was more thoroughly cleaned up by the employee and EO staff (floors were mopped).
   - The CMA placed the employee on a fever watch and administered post exposure prophylaxis (PEP).
   - A taping and secondary containment policy that spans all Bacteriology procedures was put into place immediately.
   - Staff were retrained on what the procedures are after a spill.

LESSONS LEARNED: As a result of this incident:

- Health and Safety will reassess the requirement to use RPE for activities using low dose infectious agents.
- All spills of bacteriological material will be immediately followed with strain identification and an E-Test antibiotic resistance assay to determine which clinically significant antibiotics to use as PEP.

4. **LAB PROCESS FAILURE SUMMARY:** 10/10/2013; A BNBI employee noticed that the lid of a 96 well plate infected with a BSL-4 agent came off for a brief time when a stack of plates was being moved. The plate was partially uncovered for approximately two seconds while outside of the BSC.

   ROOT CAUSE: There was tape on the lid of one plate which stuck to the bottom of another plate when they were stacked. When they were moved, the top of the lid came off briefly. The plates were black and tape was used to mark the plates.

   CORRECTIVE ACTIONS:

   - An email was sent out reminding the BSL-4 staff of the risk.
   - The BSL-4 Manager established a better marking system for 96 well plates so that they can be read more easily from the top.
   - White Sharpie markers were ordered to allow labeling on the sides of the black plates.

   LESSONS LEARNED: N/A

5. **LAB PROCESS FAILURE SUMMARY:** 10/18/2013; A BNBI employee entered two BSL-2 rooms without an approved escorted laboratorian form.

   ROOT CAUSE: The escort did not ensure that an escorted laboratorian form had been approved for the new hire's entry. Staff should be constantly looking for ways to simplify procedures and not to add complexity at this stage in our operational maturity.

   CORRECTIVE ACTIONS: All of the LSMs were reminded to check for proper access rights for new personnel who enter their laboratories.

   LESSONS LEARNED: Escorts are accountable to know and understand the access privileges of visitors no matter what part of the buildings they are visiting. All escorted personnel are provided with access cards listing areas that they have escorted access to, escorts should be checking access cards prior to escorting to ensure escorted personnel have access.

6. **LAB PROCESS FAILURE SUMMARY:** 10/22/2013; A BNBI employee noticed that they did not remove their necklace prior to entering BSL-4. They noticed this oversight when they exited the BSL-4 chemical shower. They notified the control room immediately.

   ROOT CAUSE: Oversight

   CORRECTIVE ACTIONS: The necklace was sprayed with Bleach-Rite with a contact time of 15 minutes. It was then removed from the suite through the personal shower. It was later determined that simply rinsing off the necklace during their personal shower would have been sufficient per the revised BSL-4 Manual.

LESSONS LEARNED: N/A

7. **PPE FAILURE SUMMARY:** 10/29/2013; A BNBI employee noticed a glove tear of their outer glove (Canners) while inside the BSL-4 as they were about to enter the chemical shower. The CMA was notified and stated that it was not a potential exposure.

   ROOT CAUSE: PPE failure. It is unknown how the glove failed.

   CORRECTIVE ACTIONS: The employee showered out of the suite after calling the control room to report the glove tear. They also filled the inner glove with water and found no breaches of the inner glove.

   LESSONS LEARNED: N/A

8. **PPE FAILURE SUMMARY:** 10/31/2013; A BNBI employee noticed a pin hole leak in their outer glove (Canners) while working in the BSL-4 (inventorying frozen vials). The employee noticed the leak (near the wrist) in the chemical shower. The CMA was notified and determined that it was not a potential exposure.

   ROOT CAUSE: PPE failure. It is unknown how the glove failed.

   CORRECTIVE ACTIONS: The employee showered out of the suite after calling the Control Room to report the glove tear.

   LESSONS LEARNED: N/A

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- Lab Process Failure
- Facility Process Failure
- PPE/Equipment Failure

Mishaps, Lessons Learned & Success Stories – December 2013 Report

SUCCESS STORIES

1. Several individuals have recently noticed and questioned the labeling on new bottles of Clorox bleach supplied to the laboratories indicating that the bleach is now more concentrated. In the past, NBACC has used "Clorox Commercial Solutions Clorox Bleach" that had an advertised concentration of sodium hypochlorite at 6.15%, and a range of 6.0-7.35%. The standard 1:10 dilution of bleach ensured enough active ingredient was present (minimum 5000 ppm sodium hypochlorite). NBACC recently became aware that this product is no longer available, and is being replaced with a bleach solution named "Clorox Germicidal Bleach". This new solution has an advertised concentration of sodium hypochlorite of 8.25%, and staff wanted to know if this would affect the dilution ratio if 1 part bleach: 9 parts water. NBACC Health and Safety Office looked at the specifications of the new product, noticed the range of sodium hypochlorite is listed as 5-12%, and recommended that the standard dilution of 1:10 be continued. The additional sodium hypochlorite present in a standard dilution of the 8.25% bleach will not adversely affect the disinfection process, and the continued use of the standard dilution of 1:10 will ensure that even if a batch of bleach is received at the lower end of the range enough active ingredient will be present to ensure disinfection.

It should also be noted that while the increased concentration of sodium hypochlorite in the bleach does not trigger any changes for the use of the bleach as a disinfectant, some groups (i.e. Immunology/Toxinology) use bleach as a reagent, and the increased concentration may need to be taken into account within scientific protocol

EVENTS:

BY THE NUMBERS:

- One First Aid Only injuries (#1)

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1. **FIRST AID SUMMARY:** 11/4/2013; A BNBI employee noticed an abrasion on the underside of their forearm while they were in the BSL-3 personal shower. The employee could not recall when they had sustained the laceration during the workday or at home. A Health and Safety Staff member went into containment to look for any indication that the abrasion may have occurred inside containment (e.g. PPE damage, blood stains, etc) and no evidence was observed. Although there was no indication where the injury occurred, it could not be positively determined not to have occurred inside containment.

   The employee was referred to the CMA and was provided a copy of the (b) (3) (B) since they had been working with [redacted] prior to the discovery of the laceration. The employee returned to work without restrictions.

   The incident was determined by the CMA to be a negligible risk of exposure since the laceration might have happened in BSL-3 containment. The RO was notified and the incident was reported to the CDC. A Form 3 was submitted to the CDC.

   ROOT CAUSE: Unknown

   CORRECTIVE ACTIONS: N/A

   LESSONS LEARNED: N/A

NEAR MISSES

BY THE NUMBERS:

- One Lab Process Failures (#1)
- One Facility Failure (#2)
- Two PPE Failures (#3 & #4)
- One Equipment Failure (#5)

1. **LAB PROCESS FAILURE SUMMARY:** 11/04/2013; A BNBI employee noticed that they did not remove their earrings prior to entering BSL-3 containment. They noticed this oversight prior to entering the suite on the containment side change room

   ROOT CAUSE: "Attention Issues" (from 20-151 Appendix F). The employee reported that they rarely wear jewelry into work but on this day, they wore both a ring and earrings. They removed the ring but not the earrings. The employee was escorting someone into the suite at the time and reported that this task distracted them from their usual routine.

   CORRECTIVE ACTIONS: The earrings are expensive and would have been damaged by bleach. Therefore a risk assessment was conducted by Health and Safety to determine an alternate disinfectant. As a result of

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the risk assessment, the earrings were disinfected with a solution of 70% EtOH and removed from the suite through the personal shower.

LESSONS LEARNED: Establishment of routines for straight forward, everyday tasks can be an excellent way to help ensure that the tasks are completed correctly. However, when the routine is disrupted, staff need to be aware of the impact this can have. In this case, the staff member was entering the BSL-3 laboratory (i.e. a routine task) but was also wearing jewelry (i.e. a non-routine task) and escorting another individual (i.e. a second non-routine task). This mixture of routine and non-routine tasks resulted in a simple step being overlooked. Staff should try to recognize non-routine activities and double check that they are not introducing error precursors into their day.

2. **FACILITY PROCESS FAILURE SUMMARY:** 11/7/2013; A BNBI employee found the presence of mold on several box filters for air handling (b) (7)(F) . The box filters are the second of four (4) filtration layers for the AHU that provide the supply air for the BSL-3 laboratories (dust stop, pre-filter, 65% filters, and 95% filters). The mold was found on the outside of the cardboard filter frame. There were no indications that the mold penetrated the pre-filter and no mold was detected on either the 65% or 95% filters.

   ROOT CAUSE: "Reliability Issues from 20-151 Appendix F (maintenance and repair)" The current practice is to replace filters based on the change in differential pressure across the filter. The differential pressure gauge indicated that the filters were within tolerance and did not need to be changed out. The filters had last been changed out on January 4, 2013. Mold growth on a filter is highly unusual due to the large volume of airflow through the area and a direct root cause could not be determined.

   CORRECTIVE ACTIONS:

   - The filters were removed and placed into biohazard bags by FMO and Health and Safety staff while wearing PPE and RPE. The bags were discarded and the bins were disinfected with 1:10 dilution of bleach.
   - The filters on the other AHU's were inspected for similar issues (none were found).
   - The filters will be visually checked on a more frequent basis to monitor for an on-going mold issue.
   - Facility staff will monitor the other AHU filters to see if the problem is broader.

   LESSONS LEARNED: Staff should remember to always maintain awareness of their surroundings as unexpected conditions can arise to present new hazards. In this event, there was no reason to anticipate or suspect mold to be present on the filters. Staff members were able to recognize the new hazard and initiate corrective actions.

3. **PPE FAILURE SUMMARY:** 11/13/2013; A BNBI employee ripped both outer glove (neoprene) and inner glove during a decontamination preparation in the BSL-4. All glove tear procedures were followed; The employee never lost pressure to their positive pressure suit. The CMA determined that there was no potential exposure. The RO notified the CDC of the incident.

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ROOT CAUSE: The cause of the ripped glove could not be determined. Most likely "Reliability Issues from 20-151 Appendix F (maintenance and repair)"

CORRECTIVE ACTIONS: N/A

LESSONS LEARNED: N/A

4. **PPE FAILURE SUMMARY:** 11/25/2013; A BNBI employee reported that a rubber sleeve covering a small hose clamp on a BSL-4 suit airline slipped down the hose and partially blocked the airline quick connector. The result of this was that the employee could not completely connect their suit to the supplied air lines in the BSL-4. The employee was able to provide air to their suit by manually holding the connection in place. When the employee noticed that they could not properly connect to the supplied air lines, they stopped work, put away their materials and proceeded to exit the BSL-4 via the chemical shower.

   ROOT CAUSE: It is most likely that over time, MicroChem worked its way under the rubber collar allowing the sleeve to eventually work its way over the connection as the employee connected/disconnected to airlines. "Operational Issues from 20-151 Appendix F (Person-Machine interface)"

   CORRECTIVE ACTIONS: Inspection of the suit after the event showed that the sleeve remained tight enough on the airline that it could not be easily moved by hand and had to be cut for removal. The design of the BSL-4 suit relies on the sleeve to cover the sharp presented by the hose clamp. Sleeves on other suits were inspected with no issues identified. BSL-4 workers were instructed to monitor for potential issues as they inspect their suits and use the airlines.

   LESSONS LEARNED: Being able to calmly think through unexpected situations is important to maintaining a safe work environment. In this event, when it was discovered that they could not completely connect their suit to the airline, the staff member remained calm and determined that they could receive sufficient air supply by manually holding the airline in place. This allowed them to secure the work area and exit the BSL-4 using normal protocols.

5. **EQUIPMENT FAILURE SUMMARY:** 11/26/2013; A BNBI employee reported that the LN2 freezer was in alarm and was not receiving LN2 from the supply tanks.

   ROOT CAUSE: The battery on the LN2 freezer was found to be "bad" and out of date. This prevented the solenoid on the LN2 freezer fill line from opening. The batteries are only rated for 3 years of operation. "Reliability Issues from 20-151 Appendix F (Person-Machine interface)"

   CORRECTIVE ACTIONS:

   - FMO and [redacted] will coordinate to purchase a new battery for the unit.
   - The stocks of materials in the freezer were a mix of cells and infectious materials. They were moved into an alternate LN2 freezer located in [redacted] side of the BSL-4 (in construction mode) and a BSL-2 sign was placed on the door.

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- The LSM was informed about the need to have SMEs who know the contents of the freezer so that there is less confusion if they have to be moved.

Several related issues were also identified as a result of this near miss related to inventory, LN2 supply, and back up freezer capacity.

LESSONS LEARNED: The NBACC utilizes a wide variety of equipment both in and out of the laboratories and each item may have unique maintenance requirements that need to be identified in order to ensure that the equipment operates properly over its lifespan. In this event, it was discovered that the LN2 freezer contained an internal battery that is critical to continuous operations. This battery was not placed on a maintenance schedule and thus it ran to "failure mode". Whenever equipment is brought on line, it needs to be carefully reviewed for any required maintenance requirements which should be capture in routine PM's.

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Definitions:

Event: An unintended situation that resulted in a negative impact.

Examples:

- A glove tear that resulted in a potential exposure
- OSHA recordable injuries and illnesses
- First aid only injuries
- Loss of property
- Loss of prestige

OSHA Recordable Incident or Accident {1904.7(b)(1)(i)]: A work-related injury or illness must be recorded if it results in one or more of the following:

Examples:

- Death
- Days away from work
- Restricted work or transfer to another job
- Medical treatment beyond first aid
- Loss of consciousness
- A significant injury or illness diagnosed by a physician or other licensed healthcare professional

Near Miss: An unintended situation that did not result in a negative impact. Anything that doesn't meet the definition of an "Event" should be categorized as a near miss.

Examples:

- A glove tear that did not result in a potential exposure
- Wearing jewelry into a containment lab

Categories:

- Lab Process Failure

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- Facility Process Failure
- PPE/Equipment Failure

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