Lessons Learned & Success Stories – October to December 2023

The NBACC Mishaps, Lessons Learned and Success Stories Summary serves to reinforce a strong culture of safety and accountability by promoting consistent reporting of mishaps, establishing strong lines of communication with the safety department, supporting a learning environment by allowing others to learn from reported events, and tangibly demonstrating NBACC Leadership's commitment to safety, accident prevention, and continuous improvement.

LESSONS LEARNED:

1. Whether disposing of vials, unpacking a shipment, or performing various laboratory functions, thoroughly communicating, documenting, and verifying is always beneficial! In the rare case when items have been misplaced or are unaccounted for, having accurate documentation is critical for investigations and can narrow down the extent and origin of the issue. Additionally, openly communicating with Health and Safety about all suspected spills or injuries is essential to keeping NBACC a safe environment for everyone.

2. "Slow is smooth and smooth is fast". When you are extremely busy or pressing up to a deadline, it is human nature to want to move faster. This is often when mistakes are made, or accidents can occur. Try to remain cognizant of this and remind yourself that it is better to slow down and pay attention to the small details. It is better to do it right (or more safely) the first time. Remember who won the race in that old story about the tortoise and the hare.

3. Finger cuts are common workplace injuries and are sometimes unavoidable accidents. However, precautions can be taken to reduce the risk of cuts in the workplace. One such precaution is using heavy work gloves or cut resistant gloves in situations where an open blade is present. Additionally, use the proper tool that is appropriate for the job; just because the tool may work for a particular situation does not mean that it is the appropriate or best tool for the job.

EVENT SUMMARIES:

1. **FIRST AID SUMMARY (CUTS)**: In all the following incidents, personnel reported to the Competent Medical Authority (CMA), first aid was applied as necessary, and laboratory restrictions were placed if needed.
    - 09/06/2023; A staff member was going through items in a filing cabinet and scraped the corner of their right ring finger on one of the inner brackets of the cabinet.
    - 09/20/2023; A staff member cut their left thumb on the edge of a phone locker in the lobby while attempting to retrieve their phone.
    - 10/03/2023; A staff member working in a BSL-2 laboratory smashed their hand when the door they were holding closed quicker than expected.
    - 10/19/2023; A staff member scraped their left wrist on the armrest of their office chair when they attempted to brace themselves after losing balance.
    - 11/06/2023; A staff member was walking through the mezzanine when they scraped their

upper left arm on a sharp edge of a plastic zip tie. The zip tie was later evaluated by a member of Health and Safety and the edge was trimmed down to reduce the potential for future injuries.

- 11/16/2023; A staff member was working with metal in an interstitial area when they noticed a cut on the palm of their left hand. The origin of the cut was unknown. During their discussion with Health and Safety, the staff member was encouraged to consider the use of utility gloves when working in the interstitial space.
- 11/20/2023; A staff member tested positive for COVID-19 within 5 days of being in close contact with another staff member who tested positive. Full contract tracing per CDC guidance was conducted by the CMA, and all affected staff members were informed and asked to monitor any symptoms. The positive staff member was placed on home isolation, and their workstation was disinfected.
- 11/20/2023; A staff member was moving a storage cabinet in an interstitial space when their right thumb became pinched between the cabinet and a pipe hanger bracket.

NEAR MISS SUMMARIES:

2. **LAB PROCESS FAILURE SUMMARY:** 09/08/2023; Staff members noticed a white mouse in an atrium kitchen area outside of the vivarium. The staff members were able to safely place the mouse in the appropriate caging and take it into the vivarium for further evaluation by the Attending Veterinarian. The staff members immediately notified senior Comparative Medicine (CM) leadership and Health and Safety. An inventory was conducted for all mice currently housed in the vivarium and no mice were discovered missing. Additionally, no mice were housed in any other area of the facility. It is strongly believed that the mouse was part of a shipment that had arrived three days prior to the incident and had inadvertently escaped. During unpacking of that shipment, a member of CM noted that the shipment was short one mouse after checking the packing slip and performing a thorough investigation of the box. The Facility Manager, Principal Investigator (PI), and Veterinarians were informed of the discrepancy during this time and the vendor was notified. There were no bites or scratches reported by personnel involved in the capture of the mouse. An IACUC investigation into the incident was conducted.

3. **SPILL SUMMARY**: 09/10/2023; A staff member working in the BSC of a BSL-4 laboratory was grabbing a closed tube containing a Risk Group (RG) 4 agent standard when the tube slipped out of their hand and onto the floor. The staff member immediately inspected the tube for any damage or cracks and once it was determined to be intact, they returned it to the BSC. While reporting the spill to Health and Safety, the individual was instructed to place towels with a 5% solution of a detergent disinfectant over the area where the tube landed for the appropriate decon time as a precaution. The staff member confirmed that they were connected to air, that the suit passed its initial pressure decay test prior to suite entry, and that there were no open materials in the BSC at the time of the spill. The CMA ruled there was no potential exposure.

4. **LAB PROCESS FAILURE SUMMARY**: 09/18/2023; A staff member working in a BSL-3 laboratory was preparing to use a hard-sided container and noticed there was an absorbent pad at the bottom of the container. When the staff member removed the absorbent material, they found an unopened vial of an RG 2 agent. The staff member immediately informed the Responsible Official (RO) and Laboratory Space Manager (LSM) and was able to use the vial's identification number to trace it back to the "owner" PI. Documentation showed that the vial had been destroyed on 8/24/2023. During the investigation, the PI explained that staff were destroying a large volume of samples that day and all the vials were checked via identification number against a list when they were removed from the freezer in a storage room and placed into a sealed bag. A transport container was used to

carry the bag of vials to a laboratory for destruction. Once in the laboratory, the bag was removed from the transport container and a staff member counted the vials by moving them from the sealed bag into the now-empty transport container as another staff member checked the identification numbers on their list. During this time, it is believed that the vial slid under the absorbent material and was not noticed by staff completing the destruction of material. Upon its discovery, the vial was inspected for signs of damage or leaks and, after it was confirmed to be intact, disposed of the same day. Following the incident, the PI and the RO met to discuss ways to improve the destruction process and decided that going forward, staff will not re-use absorbent material in the transport containers. Instead, they will discard the material at the end of the transport and decon the inside of the bin. In addition, the group will perform a final check step by reading off the vials' identification number as a witness cross-checks the numbers using a printed list as the vials are destroyed.

5. **SPILL SUMMARY:** 09/28/2023; A staff member working in a BSL-3 laboratory reported that a vial of an RG 3 agent was leaking within its sealed bag. The staff member and a colleague had retrieved the frozen vial from a long-term stock in a -80° freezer. The vial was removed from a cryobox and immediately placed into a sealed bag before being transported to another laboratory in the suite. While walking in the suite hallway, the individual was holding the vial (still within the sealed bag) in their cupped hands and slowly rubbing it back and forth to initiate defrosting when they noticed a small amount of opaque liquid at the bottom of the bag. They placed the bag in the BSC and notified Health and Safety. There is a small possibility the liquid at the bottom of the bag was melted frost from the vials, but disinfectant had already been sprayed into the bag, making it impossible to recover it and verify this. Due to the opacity of the liquid, it is believed that the liquid was agent. The Biosafety Officer (BSO) requested staff members disinfect the surfaces touched on the way from the freezer room to the laboratory as an extra measure of safety. Environmental sampling of the cryobox and its contents was negative. All staff members' PPE remained intact, and their respiratory protection functioned normally. The CMA ruled there was no potential exposure.

6. **LAB EQUIPMENT FAILURE SUMMARY:** 10/17/2023; A staff member working in a BSL-2 laboratory reported that a Class II type A2 BSC shut off while instrumentation in the cabinet was running. The staff member loaded a plate into an instrument inside the BSC and started a purification run. During the run, the staff member then left the room to gather supplies from another BSL-2 laboratory. When the staff member returned to the first lab, they opened the door and noticed that the room seemed abnormally quiet and the visual indicator on the BSC was not moving. They did not enter the laboratory. Instead, the staff member called the Command Center from the buffer corridor and requested to speak to Health and Safety. After meeting with members of Health and Safety to discuss steps for transferring the plate to another laboratory and waiting 30 mins for potential aerosols to settle, the staff member was provided with a PAPR (APF 1000), PPE made of synthetic flashspun high-density polyethylene fibers, and booties so they could re-enter the laboratory. Once inside the laboratory, the staff member donned double gloves and sleeves and sealed the plate before removing it from the instrument. The staff member then double bagged the plate and surface deconned the outside of the bag. Following completion of the disinfectant contact time, the plate was transferred to a neighboring lab. Once the plate was transferred, members of Health and Safety donned equivalent PPE and began decontaminating the laboratory. Given that the instrument was not a closed system, and that the toxin is manipulated within the equipment, the potential for aerosol generation could not be ruled out. Therefore, surfaces in the laboratory including benchtops, equipment, and the inside and outside of the BSC were saturated with a freshly prepared 10% bleach solution for at least 10 minutes, followed by isopropyl alcohol (IPA). The waste from the room was bagged and taped for autoclaving and the floor of the laboratory was mopped as the Health and Safety members exited the room. The BSC was marked out of service until it could be evaluated by Facilities Maintenance Operations (FMO). During their investigation, FMO determined

that the cause of the shut off was due to the BSC not being placed in a "learning mode" for a sufficient amount of time following the replacement of a new component. The cabinet was recertified and put back in service. The CMA ruled no potential exposure.

7. **SPILL SUMMARY:** 10/16/2023; A staff member working in the Class II type A2 BSC of a BSL-4 laboratory was removing a paraformaldehyde solution from 96-well plates containing cells potentially infected with a RG 4 agent (following the appropriate contact time for fixation) when they noticed that the plastic container being used to store the paraformaldehyde waste was leaking from the bottom. Roughly 50 mL of paraformaldehyde waste leaked onto the platform of the BSC. One of the two staff members in the room called the Control Room Operator (CRO) and requested a callback from Health and Safety. While relaying information about the incident to a member of Health and Safety, the staff member noted that they both were hooked up to air when the spill occurred and that neither of them had experienced any issues with their PPE. After confirming that the gloves on their BSL-4 suits were compatible with the paraformaldehyde waste, the Health and Safety member advised the staff members to use absorbent mat pads to absorb and clean the spill. All the items that were removed from the BSC were sprayed with a detergent disinfectant solution for the required contact time prior to removal and the staff members were instructed to dispose of the outer gloves of their BSL-4 suits after exiting the suite. During the investigation, the leak was attributed to incompatibility between the paraformaldehyde and the plastic container. Moving forward, the group will use compatible, shoebox-style sharps containers when removing the waste. The CMA ruled no potential exposure.

8. **SPILL SUMMARY: 10/19/2023**; A staff member reported a spill of an unknown sample inside the BSC of a BSL-3 laboratory. The employee was using a multi-channel, repeater pipette to dispense the sample into a 96-well plate. Since the repeater pipette is only used for a specific task, the staff member believed that the pipette was set to dispense 100 µL into each of the 96 wells, however the parameters were not set, and the pipette dispensed the entire 10 mL of sample into the first row of wells. The entirety of the spill was contained to the working surface of the BSC. The staff member held their breath and exited the room to call the Command Center and request to speak to Health & Safety. During their call with the Health and Safety member, the staff member noted that the BSC and their respiratory protection were both functioning normally for the duration of their time in the lab. The staff member also noted that their gloves remained intact and were not contaminated. After reporting the incident, the staff member was permitted to re-enter the room and clean up the spill following appropriate spill cleanup procedures. Though the sample was unknown, it was strongly believed to be an RG 1 agent. The staff member noted that the work instruction for the process did not include steps for setting the repeater pipette but following this incident the document was updated. The CMA ruled no potential exposure.

9. **LAB EQUIPMENT FAILURE SUMMARY:** 11/15/2023; A staff member working in a BSL-3 laboratory was retrieving swinging cannisters from an ultracentrifuge following the completion of a run when the staff member and a colleague noticed that one metal latch on each of the two cannisters were unlatched. The staff members immediately held their breath, left the room, and called the Command Center to request a callback from Health and Safety. After relaying the events to the Health and Safety member, the staff members noted that each cannister contained six 50 mL conical tubes of a RG 3 agent and that the run ended more than 2 minutes before they opened the centrifuge. Since the integrity of the tubes inside the cannisters was in question, the Health and Safety member instructed the staff members to don an APF 1000 PAPR to retrieve the cannisters from the centrifuge and once the cannisters and tubes were inside of a BSC, confirm that they remained intact and that if there were no leaks, the staff members could return to wearing their usual APF 25 PAPRs. The staff members called shortly afterwards and confirmed that there were no

issues with the conical tubes. The staff member that loaded the cannisters pointed out that, prior to the run, they did not notice issues with the cannisters or the latches but following the run, the latch on one of the cannisters appeared to be working correctly while the latch on the other cannister was visibly bent and would no longer lock. The cannisters were placed out of service. The staff member offered a number of improvements to the maintenance and storage of the cannisters that could reduce the likelihood of a repeat event which included regularly replacing the cannister lids, evaluating the impact of bleach on the metal latches and storing the cannisters with the lids unlatched to avoid potentially weakening the latching mechanism from prolonged tension. Health and Safety is working with the staff member to evaluate the cannisters.

OTHER OCCURENCES:

1. **REPORTED EVENTS:** In all of the following, personnel reported the events to Health and Safety, and they were tracked for trending purposes.

    - A staff member working in the BSC of a BSL-3 laboratory spilled roughly 500 µl of an RG 3 agent on the 'working area' of the BSC while preparing frozen stocks. The staff member immediately cleaned the spill using bleach and when reporting the event to Health and Safety, confirmed that their PPE remained intact and that there were no issues with their respiratory protection.
    - A staff member doing chores in the BSL-4 suite reported that a glass slide holder drying on a rack above a sink fell and broke. There was no work being conducted in the room during or prior to the holder falling and all of the glass was contained within the sink. The staff member called the Control Room Operator who happened to be a member of Health and Safety. After verifying that none of the glass compromised their PPE, the staff member was advised to use tongs from the spill kit in the hall to gather the broken glass and place it into a nearby sharps container.
    - A staff member was cleaning a BSL-3 laboratory when they noticed an inlet HEPA filter sitting on top of a stacked set of incubators. The label on the HEPA filter read, "installed July 6, 2023" and is used to provide product protection of items inside the incubator. The staff member reported the filter to members of Health and Safety and noted that the incubators had been calibrated on the date listed on the HEPA filter. Upon further investigation, it was determined that there was a miscommunication between the LSM and calibration technician on the status of the incubator at the time of calibration and both agreed that the incubators' HEPA filter would be changed out later; however, neither individual followed-up to ensure the filter was replaced. A new filter was installed on the day of the discovery and the old filter was evaluated by the calibration technician and found to be intact, in good condition and within its expiration date. In their discussion with a member of Health and Safety, the calibration technician confirmed that the delayed filter change-out did not affect the calibration of the incubator. Moving forward, the calibration technician will review their calibration spreadsheets at the end of each month to ensure that items have not been missed.
    - A staff member working in a BSL-3 laboratory called to report that tubes of an inactivated RG 3 agent appeared to have leaked inside a bag. Prior to receipt of the samples, the sender had informed the group that it was possible that some of the tubes had leaked after being shipped (based on feedback from other institutes that received similar samples). The staff member received the double-bagged tubes in the BSL-3 suite, and upon further inspection noted that there appeared to be moisture inside the inner-most bag and the label of the tubes seemed wet. Additionally, the staff member realized that one of the tubes had a listed

volume of 1 mL but appeared to contain roughly 300 µL of sample. They placed the bag inside of the BSC and reported the incident to their supervisor and the on-call Health and Safety member. The tubes were surface deconned inside of the BSC, placed in a new bag, and put away by the staff member. At no point did the staff member open the bag containing the tube outside of the BSC. The volume discrepancies were documented and reported to the sender.

- A staff member doing chores in the BSL-4 suite reported finding a pipette tip of unknown origin under a laboratory sink. Using a towel soaked in a solution of a detergent disinfectant, the staff member retrieved the tip from the floor and placed it into a sharps container. The staff member then contacted the Control Room Operator (CRO) and requested to speak to a member of Health and Safety. After reporting the incident, the staff member noticed a second tip directly outside of the laboratory in the suite hallway. Neither tip appeared to contain liquid. They discarded the second tip in the same manner as the first tip. During the investigation of the incident, it was noted that work had taken place in the laboratory two weeks prior. Health and Safety contacted the last staff member that worked in the room, and they confirmed that there were no spills of tips during their time working in the BSC, but that it was possible that the tips spilled after they were decontaminated from the BSC and being moved from the sink colander into a sharps container. Further, the staff member stated that it was difficult to see their feet when their suit was fully inflated and therefore possible that they kicked the second tip as they exited the laboratory.
- A staff member working in the BSC of a BSL-3 laboratory was working with an RG 3 agent when they bumped an unopened box of pipette tips out of the BSC and onto the floor. The two staff members in the laboratory held their breath, exited the room, and called the Command Center to request to speak to a member of Health and Safety. The individuals were advised to wait outside of the room for 30 minutes before reentering to decontaminate the intact tip box and the area where it landed. Both individuals also confirmed that there were no PPE malfunctions and there were no spills prior to the tip box exiting the BSC.

Note: It should be assumed that staff are wearing a PAPR (minimum APF 25) in events taking place in the BSL-3 laboratories unless otherwise stated.

Document Definitions:

Event Summaries – Any OSHA recordable mishap or first aid injury or illness.

Near Miss Summaries – Any mishap that requires a potential exposure ruling from the Competent Medical Authority (CMA), represented a CDC Form 3 submission, or a potentially serious accident or incident that could have resulted in personal injury, illness, death, and damage to property or the environment, but did not occur due to one or more factors.

Other Occurrences – Mishaps that do not fit into the other two categories.

This work was funded under Agreement No. HSHQDC-15-C-00064 awarded to Battelle National Biodefense Institute by the Department of Homeland Security (DHS) Science and Technology (S&T) Directorate for the management and operation of the National Biodefense Analysis and Countermeasures Center (NBACC), a Federally Funded Research and Development Center. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of DHS or the U.S. Government. The DHS does not endorse any products or commercial services mentioned in this presentation. In no event shall the DHS, BNBI or NBACC have any responsibility or liability for any use, misuse, inability to use, or reliance upon the information contained herein. In addition, no warranty of fitness for a

particular purpose, merchantability, accuracy or adequacy is provided regarding the contents of this document.

All research was conducted in compliance with the Animal Welfare Act and other federal statutes and regulations relating to animals and experiments involving animals and adheres to principles stated in the Guide for the Care and Use of Laboratory Animals, and approved by both the NBACC Institutional Animal Care and Use Committee and, when applicable, the DHS Compliance and Assurance Program Office. The facility where this research was conducted is fully accredited by AAALAC International and maintains a Public Health Service (PHS) Humane Care and Use of Laboratory Animals (Policy) assurance.