Risk Assessment

| Task To Be Assessed: | **100L Autoclaves – Use, Cleaning, Servicing, and Maintenance** |
| --- | --- |
| Assessor Name: | **Brad Wilde** |
| Reference Number: | N/A |
| Number Of People Exposed: | **<30** | Assessment Date: | **31/03/23** |
| People Exposed (Staff / Student / Visitor): | Staff, Authorised Students and Service Engineers |
| Department: | **Biology** | Location Of Activity: | **Tech Hub + Biosciences** |
| Activity Description:(Please give a description of the activity you are risk-assessing, including times, number of people, and current controls where applicable) | Sterilisation of waste, equipment, and reagents.Cleaning autoclaves, along with maintenance schedule and servicing.  |

Hazard Checklist – use this to identify the hazards to be considered:

| **Situational** | **Tick** | **Physical / Chemical** | **Tick** | **Environmental** | **Tick** |
| --- | --- | --- | --- | --- | --- |
| Slip, trip, fall | **✓** | Harmful substances | **✓** | Temperature | **✓** |
| Fall from height |  | Electrical (shock, burns, fire, arcing, explosion etc) | **✓** | Weather |  |
| Lone Working |  | Biological agents | **✓** | Extreme locations (mountains, mud flats etc) |  |
| Manual Handling | **✓** | Fire |  |  |  |
|  |  | Machinery (entanglement, incorrect setup etc) | **✓** |  |  |
|  |  | Use of sharps |  |  |  |
|  |  | Vehicle movements |  |  |  |

N.B. The above list is not exhaustive and additional options can be found in the Risk Assessment Guidance for Biology (Appendix A) and Media (Appendix B)

| **HAZARD** | **PERSONS AT RISK** | **HOW IS PERSON AT RISK** | **CONTROL MEASURES** | **RISK FACTOR\*** |
| --- | --- | --- | --- | --- |
| **L** | **C** | **R** |
| Slip hazard.  | Authorised staff/student. | Autoclave waste can contain liquid. If removed too hastily spillages occur. | Drain waste into the autoclave tray before moving onto waste trolley. Mop up water from floor following removal of waste from autoclave. Ensure floor is dry.Post wet floor signage at site to notify people of recent spill.Always wear appropriate PPE. | 1 | 3 | 3 |
| Lifting of heavy and bulky materials. | Authorised staff/student. | Manual handling injuries. | Do not over fill bags, this can make them too heavy. No more than 2/3 full.Transport bags/bottles/bins etc. on laboratory trolleys. | 1 | 3 | 3 |
| Burn hazards from steam, hot metal, autoclaved items. | Authorised staff/students. | Potential for burns. | Wear appropriate PPE. For unloading, HEAT RESISTANT GLOVES, EN 388, EN 407, Categories III. FULL FACE SHIELD, Heat resistant apron.  Slowly release doors. A safety lock on the autoclave prevents opening of the lid until the temperature has cooled to 50°C or below and the pressure has reduced to 0 bar, preventing burns from metal baskets and the release of steam. Do not stand over the autoclaves when opening the doors after an autoclave run.Items that have been autoclaved, especially liquids, can still be of a higher temperature. PPE must always be worn, and caution taken when removing items from autoclave. | 1 | 3 | 3 |
| Biological hazard from wastes left for autoclaving.Failed autoclave cycles.Improper handling of waste. | Authorised staff/students. | Potential for infection.Injury by needles and other sharps protruding through the autoclave waste bags | All contaminated sharps shall go to sharps bins with the lids locked.Store waste in appropriate coloured waste bags that would differentiate clinical waste from non-clinical waste.Handle items carefully, with appropriate PPE detailed above and further detailed in experimental RA/COSHH forms.Once autoclave bags are 2/3 full or 5 days has past, whichever comes first, tape closed, and store in designated waste bins. This waste will then be autoclaved on a regular schedule.Apply autoclave tape to all items being autoclaved to confirm and identify processed items.Slow and steady movements when loading/unloading, to reduce chance of spillages.All contaminated sharps are contained in sharps bins with the lids locked. All media plates double bagged in autoclave bags.Periodically clean the internal and external surfaces of the autoclave and waste containers with appropriate disinfectant. An eye wash station, hand wash basin and first aid kit are accessible in case of exposure.Store autoclave waste at point of use for no longer than 5 working days.Cycle parameters validated via internal monitoring system and recorded via tactrol printer for reference. Receipts of sterilisation kept within folder next to autoclaves.Failed cycles would be assessed and cycle repeated to ensure sterilisation on autoclave content prior to any further processing. If a repeat failure occurs, Priorclave contacted for assistance and specialist engineer visit. | 1 | 3 | 3 |
| Chemical Exposure. | Authorised staff/students. | Exposure to chemicals and toxic fumes can lead to potential injuriesFor chemical effects, see specific SDS for chemical being autoclaved | Wear appropriate PPE detailed above and further detailed in experimental RA/COSHH forms.Slow and steady movements when loading/unloading, to reduce chance of spillages.Solvents, corrosives, bleaches MUST NOT BE AUTOCLAVED. These will break the machine. See specific SDS forms or consult lab technicians. If the wrong materials (e.g., plastics) are put in the autoclave, these can melt posing a hazard. Generally, polypropylene and polycarbonate are OK, but polyethylene may not be autoclavable. If in doubt, test a small sample first inside a container that you know is safe to autoclave.An eye wash station, hand wash basin and first aid kit are accessible in case of exposure. | 1 | 4 | 4 |
| Explosion of liquids in bottles. | Authorised staff/students. | Chemical exposure upon opening autoclave.Burns. | All users must have attended training before using the autoclave and be deemed competent. This covers the correct loading and use of the machine, and selection of autoclaving cycle etc. Guidance SOP is kept next to the machine.NEVER exceed 2/3 the volume of a glass flask or bottle with your solutions.If you choose to use a lid, ensure it is unscrewed to allow sufficient ventilation.Never overload the autoclave. Always wear appropriate PPE, according to the COSHH and Risk Assessments for your specific compounds being autoclaved.Use the correct sterilisation cycle depending on your substances.  | 1 | 4 | 4 |
| Equipment malfunction. | Authorised staff/students. | Explosion.Water leakage can lead to slip, and electric shock.Health hazards to users. | Automatic safety cut outs if fault occurs or there is an error in the cycle.All machines are PAT tested, serviced and insurance inspected annually in line with PSSR, 2002 Regulations.Regularly monitor leakage from the machine. Follow spillage guidelines. If leakage occurs regularly, service of the autoclave needed. If the instrument is in defect in some way - turn off the device. Report the defects or faults to the technicians and get it checked immediately. | 1 | 5 | 5 |
| Contamination of reagents/non waste items. | Authorised staff/students. | Experimental loss.Exposure to microorganisms. | Dedicated “WASTE AUTOCLAVE” TOP LOADING and labelled WASTE ONLY.All non-waste ‘clean’ items autoclave using FRONT LOADING autoclave. | 1 | 3 | 3 |
| Contamination of domestic waste stream. | Staff / Students / Local community | Potential for infection. | All Hazard Group I biological agent cultures, plates, contaminated wastes are autoclaved at 121°C for 20 minutes.Prior to any autoclaved Class I biological waste entering the domestic waste stream for disposal, cycle validated and confirmed successful via parameter printout. Hazard Group II biological agents are again autoclaved at 121°C for 20 minutes.Once autoclaved all Hazard Group II waste is disposed of via external contractor via our hazardous waste stream. NEVER USE DOMESTIC WASTE STREAM FOR HAZARD GROUP II ORGANISMS.Biological waste stream flowchart developed and posted throughout biotech labs for reference. | 1 | 5 | 5 |
| Inappropriate use of autoclave. | Lab technicians / students. | Health hazards to users. | All users must have attended training and are authorized before using the autoclave. This covers the correct loading and use of the machine, and selection of autoclaving cycle etc. SOP on record for authorised personnel. | 1 | 5 | 5 |
| Cleaning and maintenance. | Authorised Staff + Service Engineers. | Exposure to content.Equipment failure. | Cleaned after every use. Monthly intense clean in place.No abrasive or chemically aggressive cleaners to be used on the pressure vessel.Monthly seal check in place to ensure no damage has occurred to sealing faces. Clean and lubricate sealing faces using high melting point lubricant.Monthly locking arm checks in place, ensuring lubricated and free from dirt. Monthly cycle check in place to ensure cycle function and parameters being met. Report or defects or faults and rectify immediately. Records kept of all preventative maintenance checks. | 1 | 5 | 5 |

\*Risk Factor / Residual Risk Factor (R) = Likelihood (L) x Consequence (C). Refer to Risk Matrix on final page.

| **ADDITIONAL CONTROL MEASURES** | **RESIDUAL RISK FACTOR\*** | Action / by whom? | Action / by when |
| --- | --- | --- | --- |
| L | C | R |
| N/A | - | - | - | - | - |

\*Risk Factor / Residual Risk Factor (R) = Likelihood (L) x Consequence (C). Refer to Risk Matrix on final page.

|  |  |
| --- | --- |
| Assessment conclusion:(i.e. have all foreseeable hazards been identified and control measures put in place to ensure that the risk is as low as reasonably practicable, provided all additional control measures identified have been put in place?) | Yes |
| Assessor Signature: | B. Wilde |
| Line Manager / Competent Person: |  | Signature: |  |
| Review Date: |  |

Risk Calculations and Action Level

| **Table 1: Risk Matrix** |
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| **MONITOR****ACTION****URGENT****STOP** | **CONSEQUENCE** |
| **Insignificant** | **Minor** | **Moderate** | **Major** | **Critical** |
| **1** | **2** | **3** | **4** | **5** |
| **L****I****K****E****L****I****H****O****O****D** | **Rare** | **1** | 1NO ACTION | 2NO ACTION | 3MONITOR | 4MONITOR | 5MONITOR |
| **Unlikely** | **2** | 2NO ACTION | 4MONITOR | 6MONITOR | 8ACTION | 10ACTION |
| **Possible** | **3** | 3MONITOR | 6MONITOR | 9ACTION | 12ACTION | 15URGENTACTION |
| **Likely** | **4** | 4MONITOR | 8ACTION | 12ACTION | 16URGENTACTION | 20STOP |
| **Almost Certain** | **5** | 5MONITOR | 10ACTION | 15URGENTACTION | 20STOP | 25STOP |

| **Table 2: Likelihood** |
| --- |
| Rare | 1 | This will probably never happen. |
| Unlikely | 2 | Do not expect it to happen / recur but it is possible it may do so. |
| Possible | 3 | Might happen or recur occasionally. |
| Likely | 4 | Will probably happen / recur but it is not a persistent issue. |
| Almost Certain | 5 | Will undoubtedly happen / recur, possibly frequently. |

| **Table 3: Consequence** |
| --- |
| Insignificant | 1 | No or minimal injury / insignificant damage to equipment or property. |
| Minor | 2 | Minor damage to property or minor injury or illness requiring minimal intervention. |
| Moderate | 3 | Injury requiring medical assistance and could result in time off work; damage to property requiring repair. |
| Major | 4 | Major injury or damage to property, leading to prolonged time off work, increased time in hospital, and likely prosecution. |
| Critical | 5 | Incident leading to multiple permanent injuries, irreversible health effects, or death. Permanent loss of facility, or prosecution. |

| **Table 4: Risk Factor / Residual Risk Factor:** |
| --- |
| NO ACTION | 1-2 | No further action, but ensure controls are maintained and reviewed. |
| MONITOR | 3-6 | Look to improve at next review or if there is a significant change. |
| ACTION | 8-12 | Improve within a specified timescale |
| URGENT ACTION | 15-16 | Take immediate action and stop activity if necessary; maintain existing controls rigorously. |
| STOP | 20-25 | Stop activity immediately. |