

AVOIDING THE PRODUCTION OF BIOLOGICAL AEROSOLS

World-wide, there are many documented cases of laboratory-acquired infections resulting from the production and inhalation of infectious aerosols. If adequate precautions are not taken, aerosol production can occur when using laboratory equipment, even when the equipment is used properly and under normal conditions. This SOP covers procedures that should be used to avoid the production of bioaerosols.

Centrifuge Operations

When microorganisms are not adequately contained within a centrifuge, aerosols can escape during the high-speed spin process. This may occur when spinning uncapped samples, or when a leak, spill, or breakage of the tube occurs. Minimize the risk of aerosol production when centrifuging by observing the following precautions:

- Use unbreakable tubes (i.e., not glass).
- Avoid overfilling the tubes.
- Use centrifuge tubes with o-ring screw caps.
- Ensure that the centrifuge is properly balanced.
- Use outer, sealable safety cups and load/unload them only in a biological safety cabinet.
- Do not open the lid during or immediately after operation. Allow the centrifuge to come to a complete stop and wait at least 10 minutes before opening. This allows time for aerosols to settle if leakage or breakage occurred during the centrifugation run.
- Never exceed the specified speed limitations of the rotor as listed in the owner's manual.
- Decontaminate the inside and outside of the cups or buckets before and after use and inspect seals and o-rings regularly for deterioration. Replace as needed.
- When possible, install the centrifuge in an enclosed, specially ventilated area that discharges air from the space through a HEPA filter.

Mixing Operations

Sonicators, shakers, and homogenizers can generate aerosols during operation. Minimize the risk of aerosol production when mixing by observing the following precautions:

- Operate mixing equipment in a biological safety cabinet.
- Use heavy-duty screw caps that include an O-ring.

- Use sealed vessels during mixing and due to the buildup of pressure, wait 30 minutes before opening to allow the aerosol cloud to settle.
- Open mixing vessels inside of a biological safety cabinet.
- Check the condition of the mixing equipment routinely for deterioration.
- Disinfect all surfaces of mixing devices before and after use.
- If manual tissue grinders are used, surround the tube with absorbent material.
- **Do not** use domestic (kitchen) homogenizers/blenders.

Vacuum and Aspirating Equipment

Minimize the risk of generating aerosols during vacuum and aspiration operations by observing the following precautions:

- Use non-breakable equipment (i.e., not glass) when possible or use plastic coated glass.
- Ensure that vacuum equipment is fitted with a HEPA filter.
- Place a disinfectant in the overflow flask of the aspirating equipment.

Needles and Syringes

Minimize the risk of aerosol production while using needles and syringes by observing the following precautions:

- When possible perform all operations involving infectious agents with needles and syringes in a biological safety cabinet.
- Discharge air from the syringe before inserting it in to a stopper.
- Fill syringes carefully. Avoid frothing or introducing air bubbles.
- Wrap the needle and stopper in a cotton ball or pad moistened with an appropriate disinfectant when removing the needle from the rubber-stoppered bottle.
- Expel excess liquid and air bubbles from the syringe vertically into a cotton ball moistened with an appropriate disinfectant or into a small bottle containing cotton.
- **Do not** use syringes to mix infectious liquids.

Pipettes

Minimize the risk of aerosol production while using pipettes by observing the following precautions:

- Use cotton-plugged pipettes.
- Gently expel the contents of the pipette close to the surface of the liquid or allow it to flow down the side of the container.
- Do not mix the contents of a container by alternating suction and blowing with a pipette.
- Use TD pipettes instead of TC pipettes. The last drops from a TD pipette do not need to be expelled or blown-out to get an accurate measurement.

- Submerge used non-disposable pipettes into a horizontal tray of disinfectant solution immediately after use.
- Place the discard container for contaminated disposable pipettes within the biological safety cabinet, not outside of it.

Transfer Loops

Minimize the risk of aerosol production while using transfer loops by observing the following precautions:

- Substitute an enclosed micro-incinerator for an open flame burner.
- Use disposable inoculating tools.