Minimizing Aerosol Exposure

SafetyNet #: 21

Inhalation of aerosols is a common cause of chronic exposure to toxic chemicals and radioisotopes and of workplace-acquired infections. Aerosols do not have to be inhaled directly to produce their effects. The droplets dry up within a few seconds and, depending on their size, settle on surfaces in the work area or enter into the ventilation system. It is the smaller particles, with diameters less than 5 micrometers that can easily enter the lungs. Listed below are examples of laboratory equipment and procedures that generate aerosols and precautions you can take to minimize exposure.

- **Mouth Pipetting**
  This may lead to accidental ingestion of a fluid or create an aerosol cloud above the liquid surface, which can be inhaled through the mouth. Do **not** mouth pipet. Use only mechanical pipetting aids and clean them regularly.

- **Mixing Solutions**
  The formation of bubbles during mixing spreads droplets effectively. Experiments with bacteria have shown that the use of a vortex mixer rather than vigorous stirring can eliminate aerosols from the source.

- **Using Needles and Syringes**
  Do not pressurize the contents of the bottle when withdrawing a solution from a bottle through a rubber septum. Discharge air from the syringe before inserting it. Wrap a cotton ball soaked in 70% alcohol or other appropriate solution around the needle when removing it from the bottle. Aerosols can also be produced when a needle separates from a syringe during use or a plunger separates from a syringe barrel. Needle-locking syringes or syringe-needle units are recommended. Discard used needles and syringes into a properly labeled, hard-walled sharps container. Never clip used needles because this produces aerosols.

- **Centrifugation**
  This can be a problem with tabletop centrifuges that have poorly sealed test tubes or Eppendorf tubes. When spinning hazardous material, the centrifuge should be placed in a fume hood or biosafety cabinet (whichever is appropriate) during operation and decontaminated after use. With larger centrifuges, sealed rotors and/or tubes should be used and opened in a fume hood or biosafety cabinet after use. The rotor/tube seals or O-rings should be inspected before each run and replaced as needed.

- **Blending and Sonicating**
  Tissue specimens are often homogenized in a blender. This is one of the most potent sources of aerosols in the laboratory. The contents should be allowed to settle for at least 5
minutes after blending. Remove the blender cover in a fume hood or biosafety cabinet. Sonicators should be used with similar precautions.

- **Flaming**
  Use a safety incineration device to heat-sterilize inoculating loops, tubes or flasks. Gently manipulate loops, tubes or flasks, making no sudden movements. If the loop or lip of the tube or flask is wet, an aerosol may be created when flamed. Wiping the tube or flask with 70% alcohol, vacuuming the droplets, or using pre-sterilized plastic loops is an alternative.

- **Opening Sealed Ampoules**
  Snapping an ampoule may release a cloud of lyophilized organisms or volatile chemical substances into the air. If the tube is under vacuum, the glass ampoule should be cracked gently by applying a heated rod to a file mark on the ampoule neck and allowing the pressure to equalize before completely opening. Osmium tetroxide ampoules should be opened under water.

- **Cleaning Cages**
  Infected animals often shed pathogens in their feces and urine. The litter and bedding are particularly hazardous when dry because the light weight spores may be aerosolized a considerable distance. Some cages must be autoclaved prior to cleaning if required by the Biological Use Authorization or Animal Care Protocol. When cleaning animal cages, use a spray bottle filled with water or disinfectant to wet down the litter prior to dumping. Discard litter as gently as possible into a receptacle and seal the receptacle immediately. If available, use an animal bedding dump station.

- **Spills**
  All spilled materials considered potentially infectious must be disinfected thoroughly. Adequate PPE should be worn during disinfecting and all used cleanup material should be disposed as biohazardous waste. Care should be taken to avoid generation of aerosols. If a large spill occurs, contact the Principal Investigator, or call 911. Notify EH&S at 530-752-1493. For more information on spill cleaning, see SafetyNet #13 [1] "Guidelines for Spill Control" or SafetyNet #127 [2] "Biological or Biohazardous Spill Response," or SafetyNet #37 [3] "Radioactive Spills, Splashes, and Decontamination."

Aerosol Transmissible Diseases are covered under Title 8 of the California Code of Regulations in section 5199. Each laboratory that works with any of the agents specified in Appendix D [4] must develop a Biosafety Plan. The Biosafety Plan must include the regulatory required information so that a useful training document for laboratory employees and students may be created. This Biosafety Plan must describe the procedures and measures to minimize research laboratory employee exposure to Aerosol Transmitted Pathogens – Laboratory (ATPs-L).

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**More information**