# MICRO AND NANOTECHNOLOGY LABORATORY (MNTL)

## BioNanotechnology Laboratories (BioNano Labs)

## Standard Operating Procedures (SOPs)

The MNTL BioNano Laboratories are classified as Biosafety Level 2 (BSL2) Laboratories. There are no BSL3 classified laboratories at MNTL and no active radioactive work is permitted, however, some types of completely sealed radioactive materials maybe used by obtaining a permit from the lab director. All research work at MNTL BioNano Labs must be performed at BSL2 or at a lower level.

All laboratory personnel and others whose work requires them to enter the BioNano Labs must understand the biological and other hazards with which they will come in contact through their normal work in the labs, and be trained in appropriate safety precautions and procedures. Personnel are required to know, understand, and follow standard practices and procedures described here and at the website of the Division of Research Safety. Training in laboratory safety will be provided and competence in safe technique must be demonstrated before work is allowed with hazardous agents or toxins.

## 1. General Biological Laboratory Areas

These areas are suitable for experiments involving agents of no known or minimally potential hazard to laboratory personnel and the environment. Work is generally conducted on open bench tops. Special containment equipment is not required or generally used. Laboratory personnel have specific training in the procedures conducted in the laboratory and are supervised by a scientist with general training in microbiology or a related science. All standard Personal Protective Equipment (PPE) requirements described in the BSL2 laboratories still apply to these areas. The following standard and special practices apply to agents assigned to general biological laboratories.

### 1.1 Standard Microbiological Practices

1. Laboratory doors are kept closed when experiments are in progress.
2. Work surfaces are decontaminated daily and after any spill of bio-hazardous material.
3. All contaminated liquid or solid wastes are decontaminated before being disposed of or otherwise handled.
4. Mechanical pipetting devices are used; mouth pipetting is prohibited.
5. Eating, drinking, smoking, storing of food, and applying cosmetics or contact lenses are not permitted in the work area.
6. Persons must wash their hands before and after they handle bio-hazardous materials and when they enter and leave the laboratory.
7. All procedures must be carefully performed to minimize the creation of aerosols.

### 1.2 Laboratory Gowning (Clothing) Requirements

1. Wearing of laboratory coats, closed-toed shoes, goggles/safety glasses, and gloves are required.
2. Do not touch laboratory exit door knobs or telephones with gloved hands.
3. Before leaving laboratory, remove and discard gloves, and wash hands with antiseptic soap.

### 1.3 Special Practices

1. Contaminated materials that are to be decontaminated in the autoclave, located at MNTL BioNano Lab, are placed in a durable leak-proof container, which is lined with an orange autoclavable biohazard bag and covered before being removed from the laboratory.

### 1.4 Containment Equipment

1. Special containment equipment is generally not required for manipulations of agents assigned to general biological laboratories.

## 2. Biosafety Level 2 (BSL2) Laboratories

Biosafety Level 2 laboratories are similar to general biological laboratories and are suitable for work involving agents that represent a moderate hazard for personnel and the environment. Biosafety Level 2 laboratories differ from general biological laboratories in that:

1. BSL2 laboratory personnel have specific training in handling pathogenic agents and are directed by the principle investigator. Access to the BSL2 laboratories is restricted to trained users only and is limited when work is being conducted. No unauthorized guests are allowed.
2. All BSL2 laboratory users and lab key holders are responsible for knowing the appropriate procedures described within this SOP and also biosafety fact sheets of Biological Safety Division of DRS (http://www.ehs.uiuc.edu/bss/factsheets/index.aspx?tbID=fs).
3. Certain procedures in which bio-hazardous aerosols are created need to be conducted in certified biological safety cabinets or other physical containment equipment.
4. The following standard and special practices, safety equipment, and facilities apply to agents assigned to Biosafety Level 2:

### 2.1 Standard Microbiological Practices

1. Access to the BSL2 laboratory is limited or restricted by the supervisor when work with bio-hazardous agents is in progress. Laboratory doors are kept closed when experiments are in progress. Do not leave doors propped open.
2. Work surfaces are decontaminated at least once a day and after any spill of bio-hazardous material.
3. All contaminated liquid or solid waste is decontaminated before disposal.
4. Mechanical pipetting devices are used; mouth pipetting is prohibited.
5. Eating, drinking, smoking, chewing gum or tobacco, and applying cosmetics or contact lenses are NOT permitted in the laboratory.
6. Persons must wash their hands before and after handling bio-hazardous agents and when entering and leaving the laboratory.
7. All procedures are performed carefully to minimize the creation of aerosols.
8. Serological procedures with inactivated antigens known or shown to be free of residual infectivity can be performed on the open bench.
9. Bench top work is done on absorbent paper, which is disposed of using approved biological waste procedures.

## 2.2 Laboratory Gowning (clothing) Requirements

1. Designated BSL2 laboratory coats and MNTL-provided gloves must be worn in the BSL2 laboratory. Laboratory clothing or gloves must not be worn in non-laboratory areas such as corridors or galleys. Lab coats must stay in the lab where they are used in.
2. Minimal Personal Protective Equipment requirements are: a lab coat, gloves, goggles, shoes and pants
3. No shorts, sandals, or open-toed shoes are allowed in the laboratories.
4. Potentially problematic accessories such as excessive face make-up and dangling jewelry are not allowed in the laboratories.
5. Long hair must be pulled back so that it is not obstructing the eyesight of the user and so that no loose hair can contaminate the work area.

## 2.3 Material Transport and Handling

1. Transport carts are never to be used inside BSL2 laboratories. Contaminated materials leaving the labs must be double bagged and carried on carts kept outside the laboratories.
2. Small items such as chips, wafers can be transported in and out of the lab in specially designated leak-proof and air-tight transportation containers approved by MNTL. These transportation containers must be kept in their designated clean areas within the labs and when they need to go out of the labs their exterior must be disinfected (spray of 10% bleach followed by 70% ethanol or an alternate disinfectant).
3. Corridors must not be used for transportation of exposed chemicals or infectious materials. Transportation between the labs can occur via the corridors only if the BSL2 material is secured as above.

## 2.4 Special Practices

1. Contaminated materials that are to be decontaminated away from the BSL2 laboratory are placed in a durable, leak-proof container, which is closed before being removed from the laboratory. This must be a biohazard bag with a biohazard label.
2. Access to the BSL2 laboratory is limited by the laboratory supervisor when experiments are being conducted. In general, persons who are at increased risk of acquiring infection or for whom infection may be unusually hazardous are not allowed in the BSL2 laboratory. Persons at increased risk may include children, pregnant women, and individuals who are immunodeficient or immunosuppressed. The supervisor has the final responsibility for assessing each individual circumstance and determining who may enter or work in the area.
3. The BSL2 laboratory supervisor will assure that only persons who have been advised of the potential hazard and who meet any specific entry requirements enter the BSL2 laboratories.
4. When bio-hazardous materials are present in the laboratory, a hazard warning sign incorporating the universal biohazard symbol is posted on all laboratory access doors and on such other items (i.e., equipment, containers, and materials) as appropriate to indicate the presence of bio-hazardous agents. The hazard warning sign should list the name of the laboratory supervisor or other responsible person(s), and indicate any special requirements for entering the area (immunization, respirators, etc.).
6. An insect and rodent control program is in effect.
7. All wastes from laboratories must be appropriately decontaminated before being disposed.
8. If activities of lesser biohazard potential are conducted in the laboratory concurrently with activities requiring Biosafety Level 2, all activities will be conducted at Biosafety Level 2.
9. Gloves will be worn for all procedures requiring the handling of biohazardous materials and once they are used or soiled, they will all be disposed of as biohazardous waste.

10. Serological procedures with inactivated antigens shown to be free of residual infectivity can be performed on the open bench.
11. All spills, accidents, and overt or potential exposures to bio-hazardous materials must be immediately reported to the laboratory supervisor. A written record will be prepared and maintained. Appropriate medical evaluation, surveillance, and treatment will also be provided.
12. Serum specimens may be collected periodically depending on the agents handled or the function of the facility.
13. All work involving human derived materials including blood, tissues, primary cells and other human bodily samples must be reported to the laboratory supervisor prior to being transported or used in the MNTL labs. A special set of rules apply for these types of work and access to the laboratories will be evaluated per case basis by the laboratory supervisor.
14. A safety and operations document identifying known and potential hazards and which specifies practices and procedures to minimize or eliminate such risks is available on the inside face of the lab doors. Personnel are advised of special hazards and are required to follow standard practices and procedures.

## 2.5 Containment equipment

1. Biological safety cabinets (Class II) or other appropriate personal protective or physical containment devices such as full face shields and respirators are used whenever:
   a. Procedures with a high potential for creating bio-hazardous aerosols are conducted. These may include centrifuging, grinding, blending, vigorous shaking or mixing, sonic disruption, and opening containers of bio-hazardous materials whose internal pressures may be different from ambient pressures, and procedures using animal/human derived tissue and bodily fluid samples.
   b. High concentrations or large volumes of bio-hazardous agents are used. Such materials may be centrifuged in the open laboratory if sealed heads or centrifuge safety cups are used and if they are opened only in a biological safety cabinet.
2. Contaminated sharps such as needles, glass slides, cover glasses and chips or wafer pieces must be put in the orange sharps bio-hazardous waste disposal containers.
3. Uncontaminated sharps must be put in the white broken glass containers. If it is questionable, the sharps must be treated as if contaminated and put into the orange sharps bio-hazardous waste container.

## 2.6 Spills

1. Small amounts (50 milliliters or less) of less concentrated bio-hazardous spill can be cleaned by the user with gloved hands. Notify the other lab users present in the lab of the spill. Use a spray disinfectant such as Staphene or a solution of 10% bleach in water on the spill and place a sheet of absorbent paper (Kim-Wipes) on the spill. Leave the disinfectant for 15 minutes then clean the surface with absorbent paper again and discard it in regular waste. Remaining bleach residues can be removed with 70% ethanol wipes. Discard all your gloves in bio-hazardous waste and wash your hands.
2. If the amount of spill is high or the agents are highly concentrated and there is a potential risk for aerosolization, spray the spill with 10% (or full strength) bleach quickly, notify others in the lab, leave and call MNTL staff immediately. Emergency contacts are listed on the lab door posts. Air circulation might need to be stopped and also whole room disinfection may need to be performed. MNTL staff will make the judgment and appropriate decontamination.
3. Contaminated instruments can be sterilized either by autoclaving (preferred) or by chemical disinfection such as 10% bleach or Staphene sprays (minimal contact time 10 minutes) and the bleach residues can be removed with 70% ethanol wipe.

## 2. 7 Bio-hazardous waste disposal:

1. For the treatment of biohazardous materials prior to their disposal, please review the "biosafety fact sheets" located at DRS's web site (http://www.ehs.uiuc.edu/bss/factsheets/index.aspx?tbID=fs).
2. When the orange bio-hazardous waste bag is 2/3 full, change it. Tie the top of the bag and replace the old bag with a new one then transport the old full bag into the autoclave room. If there is a risk for leakage from the bag, then double bag the bio-hazardous waste. Once the autoclaving is complete and the orange biohazard bags are cool, double bag them with gray regular trash bags so that biohazard bag is completely covered and dispose them of in the regular trash after tying them.
3. Full sharp bio-hazardous waste boxes should be autoclaved and prepared for DRS pickup as described above.
4. For the disposal of mixed waste consisting of toxic chemicals and infectious materials please consult with DRS prior to initiation of the research.
5. Pathologicals waste such as large tissue or organ samples or whole animals need to be incinerated according to DRS regulations. Please consult with DRS or an MNTL staff prior to start of this type of research.

## 2. 8 Emergencies/Injuries:

1. For urgent Medical **Emergencies, Call 9-911** (from campus).
2. For other non-urgent medical concerns or accidents
    i. Students: visit McKinley Health Center
    ii. Faculty, Staff: go to occupational Health Sections of Carle or Provena Covenant Hospitals
3. Contact PI in-charge of the research or the contact person from the "Door Post" a.s.a.p.
4. All personal injuries must be logged into the accident log book by an MNTL staff.
5. If deemed necessary (life threatening injury or large scale spills exist) contact DRS (DRS-general: 244-9585, DRS-biosafety section: 333-2755, bss@uiuc.edu).
6. You may also send an email to mntl-bionano@ad.uiuc.edu for further clarification or suggestions.

## Where to Get More Information

Please visit the following web sites to obtain further information.

1. DRS (http://www.ehs.uiuc.edu/)
2. Biosafety in Microbiological and Biomedical Laboratories (BMBL) , 5th Edition (In Laboratory and http://www.cdc.gov/OD/ohs/biosfty/bmbl5/bmbl5toc.htm)
3. Email Mntl-BioNano@ad.uiuc.edu
4. CDC (http://www.cdc.gov)
5. American Biological Safety Association (ABSA, http://www.absa.org/resguides.html)