Training Course of Microbial Resources Information Management and Utilization for Developing Countries

BSL-3 Laboratory Facility and Management

Dr. Yiping Zhu
Oct. 19th 2017

Institute of Microbiology Chinese Academy of Sciences
Biosafety Level 3 Laboratory
Pathogens and BSL-3 laboratory

There are about 10 million microbe species have been identified in the world. Among those, only about 400 microbe species are known to be pathogenic to humans, and a little more than 100 species are high pathogenic that can cause very serious infectious diseases.

Nowadays, emerging and reemerging infectious diseases (SARS, Avian flu, Ebola, Zaka...) are big threat to human society. We need to learn how to deal with, and how to control the diseases.

A BSL-3 or BSL-4 laboratory is required when handling the high pathogenic microorganisms.
What does our BSL-3 Lab look like?
When you go into a BSL-3 Laboratory...

You will find out:

1. Biohazard Warning Signs
2. Access control
3. Personal Protection Equipment
4. Biosafety Cabinet
5. Biohazard Waste Containers
6. Ventilation System Equipments
BSL-3 Laboratories are designated for handling high pathogenic microbes that may cause serious or potentially lethal disease through the inhalation route of exposure.

P3 : Physical Containment level 3 Lab

3 Ps:

Protect people
Protect samples
Protect environment
Before we start to build the P3 Lab...

1. Environmental impact assessment
2. Seismic safety assessment
3. Project approval from government
When we design and build the P3 Lab...

GB19489-2008: Laboratories-General requirements for biosafety

GB50346-2011: Architectural and technical code for biosafety laboratories
BSL-3 Lab Design Requirements:

a. 2 door entry (interlock)
b. Solid easily cleanable surfaces (floor, walls, ceiling)
c. Coved floors
d. HEPA (high efficiency particulate air filter) filtered air supply and exhaust
e. Negative pressure and directed air flow
f. Sealed penetrations
g. Hands-free sink near exit door
h. Eyewasher and Shower
i. Pass through autoclave
j. Sewage reatment system
Before we start running the P3 Lab...

- Commissioning and pass the Third Party Inspection
- Capability accreditation by CNAS (China National Accreditation Service for Conformity Assessment)
- Laboratory qualification certification by The Ministry of Health
- The approval of handling high pathogenic microorganisms by Beijing Municipal Health Bureau
Dose a well constructed P3 Lab could ensure you safe?
Beside... the good practice and good management will do!

Ensure the Biosafety of a P3 laboratory
When we talk about the biosafety management...

- **Biosafety Management**
  - **Biosafety**: Protects people from dangerous hazards
  - **Biosecurity**: Protects hazards from dangerous people

- **Staff**
- **Biohazard materials**
- **Routine work**
- **Operation**
- **Facility**
- **Waste**
- **Access control**
- **Camera**
- **Police**

Control or mitigation of the biorisks
1. Staff management

- Risk awareness
- Safe operation skills
- Emergency responses

Training

- Quiz
- Operation examination
- Capability evaluation

Evaluation

- Regular health check
- Immunization
- Background serum saving
- Psychological observation
- Medical services and first aid

Health surveillance
**Heinrich's Law:** that in a workplace, for every accident that causes a major injury, there are 29 accidents that cause minor injuries and 300 accidents that cause no injuries.

**Why Continuous staff training is very important?**

1. **Know Rules**
2. **Follow Rules**
3. **Know Why**
4. **Automatic Acts**
## 2. Biohazard materials management

<table>
<thead>
<tr>
<th>Classifications</th>
<th>Level of Hazard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk Group 1</td>
<td>No or low individual and community risk.</td>
</tr>
<tr>
<td>Risk Group 2</td>
<td>Moderate individual risk, low community risk.</td>
</tr>
<tr>
<td>Risk Group 3</td>
<td>High individual risk, low community risk.</td>
</tr>
<tr>
<td>Risk Group 4</td>
<td>High individual and community risk.</td>
</tr>
</tbody>
</table>
Handling of biohazard materials

RECORD!!!
3. Operation management

- Risk assessment and control
- SOPs
- Operation practice
- Emergency response
4. Routine work management

- Supplies
- Clean
- Decontamination
- Emergency response
- Incident report
5. Facility equipment management

a. Daily inspection
b. Regular maintenance
c. Annual check and test
d. Annual maintenance
6. Waste management

Waste segregation

a. contaminated sharps
b. solid wastes
c. cultures, stocks
d. liquid wastes
e. animal carcasses

Waste decontamination

a. autoclave
b. chemical disinfectant
c. incineration
d. decontamination monitoring (autoclave tapes, biological indicators)
To Provide **Supports, Services and Safety** for Your Scientific Research

Thank you!

**Dr. Yiping Zhu**
13466626489, zhuyp@im.ac.cn