Bio-related Exposure Monitoring and Follow-up System at UCSF

Peili Zhu, MD, PhD, BSO
Environmental Health & Safety

University of California, San Francisco

Introduction

- UCSF is a leading biomedical research institution in US
- There are more than 600 laboratories at UCSF
- Total workforce is approximately 22,700
  - includes both University and Medical Center employees.

Introduction

- Laboratories at UCSF consist of:

- BSL1 laboratories (20%)
- BSL2 laboratories (80%)
- 7 BSL3 facilities
- 2 ABSL3 facilities
- Most laboratories work with research animals

Introduction

To achieve biological and medical research goals, many bio-hazardous materials are used in UCSF labs and animal facilities

For example

- RG2 infectious agents (*Influenza virus*, *Staphylococcus aureus*, *Poliovirus*, etc.)
- RG3 infectious agents (*MTB*, *Prions*, *Histoplasma*, etc.)
- Human related materials (*human tissues*, *blood*, *cells*, etc.)
- Recombinant DNA materials (*lentivirus*, *adenovirus*, *oncogenes*, etc.)
- Biological toxins (*Diphtheria toxin*, *Botulinum neurotoxin*, etc.)

Challenge

Working at bio-medical research laboratories carries potential risk of exposure to biohazardous materials

Identifying methods to monitor potential exposures to biohazardous materials is an ongoing challenge to Biosafety and Occupational Health Services (OHS) professionals.

Goal

- It is a priority for biosafety professional to design and implement a bio-related exposure monitoring and follow up system
- System must:
  - identify the root cause(s) for exposures
  - ensure measures taken will mitigate problems identified

Registration

- At UCSF, labs working with biohazardous materials must submit a Biological Use Authorization (BUA) application to the Institutional Biosafety Committee (IBC)
- IBC must approve BUA **before** research may begin

Registration

BUA application indicates if a study involves:

- Recombinant DNA materials or technology
- Infectious Agents (IA)
- Bloodborne Pathogens (BBP)
- Biological Toxins
- Select Agents
- Animal use involving any of the above biomaterials

Registration

BUA application includes the following information:

- Biohazardous materials
- Risk assessment
- Specific health surveillance program
- Biocontainment facility level
- Authorized users
- Training records

This information serves as a database to reference in the event of an exposure.

Health Surveillance Program

Campus research exposure protocols have been developed

- Provide more specific information for exposures to high risk agents.
- Examples: Hepatitis B and C, MTB, Polio virus, etc.

PI is required to generate a “Viral Vector/Gene/Construct Exposure Risk Assessment Summary” form

Both documents provide guidance to medical providers and researchers at the time of exposure.

Post-Exposure Procedures

In case of accidental exposure to hazard materials:

1)Stop work

2)Wash exposed area with water for 15 minutes

3)Call UCSF Exposure 24/7 Hotline immediately (to activate Occupational Health Services (OHS))

- **OHS provides medical assistance as needed**

4)Inform supervisor and Biosafety Officer (BSO)

Post-Exposure Procedures

- OHS informs UCSF Public Health Officer (PHO)

- BSO works with the PHO to follow up with laboratory staff to obtain detailed information and to conduct a risk assessment for each incident.

Exposure Follow-up

Information for each incident will include details regarding the biohazardous materials involved such as:

- rDNA materials
- infectious agents
- biological toxins
- human materials

Potential risk is also provided to OHS

- Risk assessment will help OHS to determine appropriate medical response

Exposure Follow-up

During the exposure follow up process, BSO works with laboratory to identify the root cause(s) for exposures and makes recommendations/changes to prevent future incidents

If non-compliance issue(s) are found, BSO works with laboratory to fix as soon as possible.

Exposure Follow-up

- A Semi-Annual Bio-related Exposure report is presented to IBC for review

- Significant incidents are reported to IBC immediately.

  - i.e. Exposure involving Risk Group 3 bioagent, macaque (Herpes B), rDNA, etc.
  - rDNA incidents are reported to NIH/OBA within 30 days

Exposure Follow-up

- IBC reviews incidents to ensure measures are taken by UCSF biosafety program to mitigate any problems identified including but not limited to:

  - Additional safety trainings
  - Development of or amendments to SOPs and/or post-exposure protocols
  - Amendments to PPE usage, safety equipment and facilities

Exposure Follow-up

Additional actions may include:

- In some situations, a Biosafety Update is generated regarding the incident and sent to research community
  - Details of incident
  - Details of actions taken
  - Details for any campus-wide safety/procedural updates

Lessons learned from these incidents are used to improve the UCSF biosafety program.

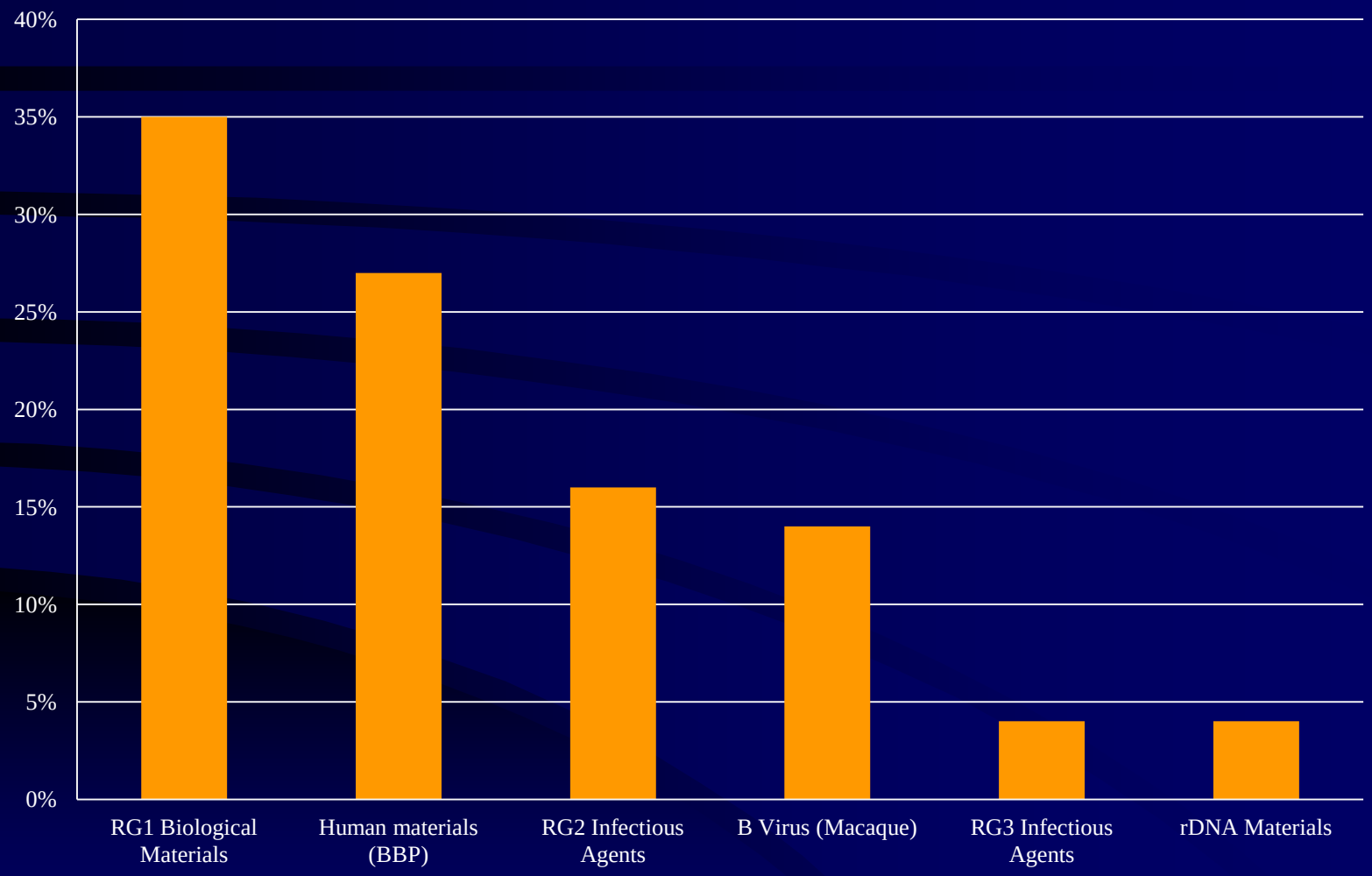
Results

There were 49 potential bio-related exposures at UCSF from 2013 to 2014.

Bio-hazardous materials involved included:

- RG1 biological materials (animal tissue, cells, fixed human materials, protein, pure DNAs, etc.) (17 cases)
- Human materials (13 cases)
- RG2 infectious agents (8 cases)
- rDNA materials (2 cases)
- RG3 infectious agents (2 cases)

Biological Materials Involved in Exposure



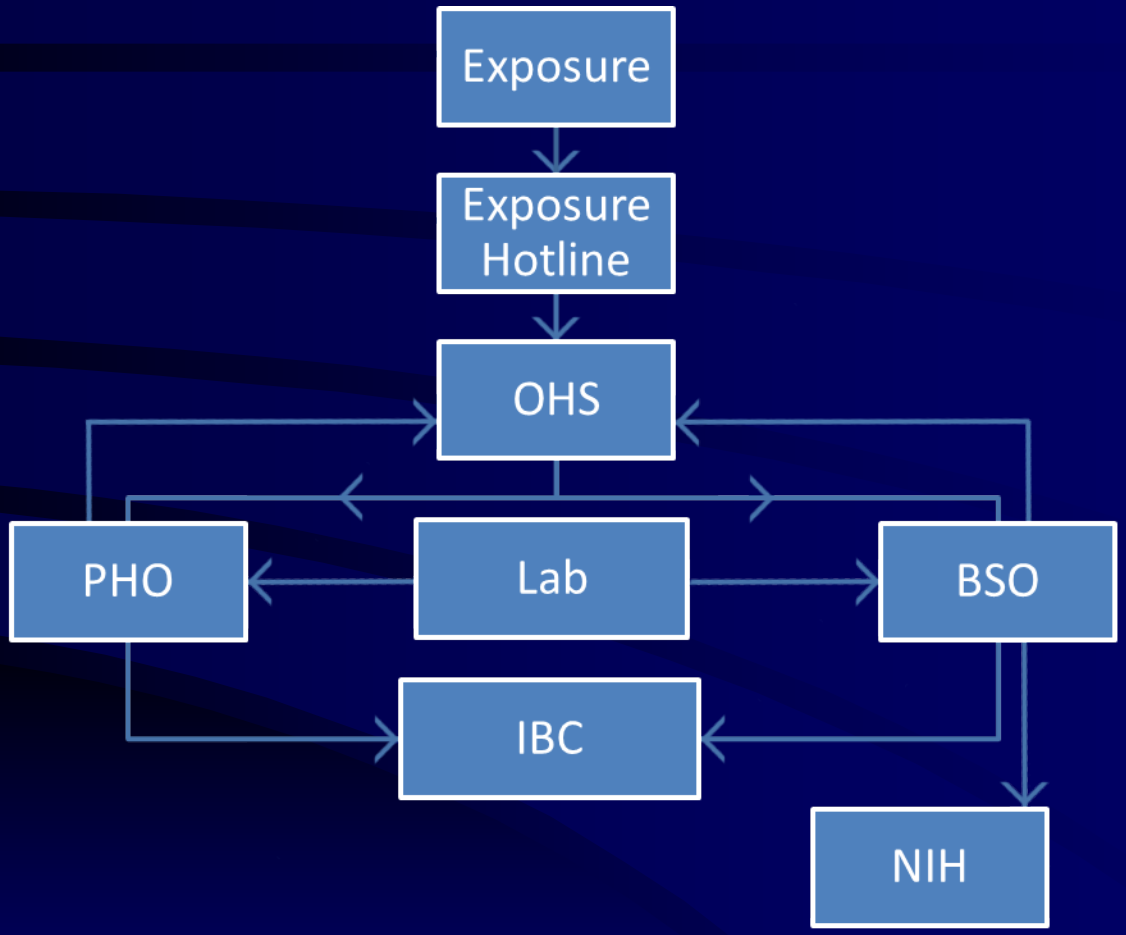
Exposure Types

- 78% related to sharp injuries (needle stick, scalpel, razor, glass pipette, cryostat blade cut, forceps, etc.)
- 12% related to splashes
- 6% related to scratches or bites from infected animals
- 4% related to potential aerosol transmission

Lessons learned from Bio-related Exposure

- Ensure all users (including visitors, students, volunteers, etc.) complete proper safety training(s) prior to working with biohazardous materials
- Employ anesthesia and restraint devices for manipulation of biohazardous materials on animals
- Wear eye protection when splash hazard exists
- Decrease sharps usage wherever possible
  - use safer sharp
  - use blunted needles for disrupting cells
  - use cut-resistant gloves and tongs when cleaning cryostat blades

Summary of Bio-related Exposure Follow-up



Conclusion

- By developing a “Bio-related exposure monitoring and follow-up system” at UCSF, BSOs work together with the PHO and OHS
  - Identify the root cause(s) for incidents
  - Ensure measures taken by UCSF biosafety program will mitigate any problems identified.
  - Ongoing and as needed assessment/reassessment of program

Acknowledgement

Biosafety Officer
Mei-Chuan Huang
Jonathan Koolpe
Sean Umamoto

Public Health Officer
Krista Lindstrom
Stephanie Mar

Occupational Health Services
Bob Kosnik