Building a Biosafety Program from Scratch

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Penn State Campuses
Penn State University Hershey Medical Center
College of Medicine
PSU/College of Medicine facts

- 1700 ongoing IRB approved protocols
- 300 Biosafety approved protocols
- 300 IACUC approved protocols
- 200 Basic Science Research faculty
- 350 Research labs
- Cancer Institute
- Hershey Center for Applied Research (HCAR)
- Central Animal Quarters (CAQ) and Animal Research Farm (ARF)
- Zebra Fish and Transgenic Mouse core
- 12 additional technical Research Core Facilities
- $100 M in research funding
- 11000 employees
Biosafety Structure
Redefined role of Biosafety

• Biosafety responsibilities were removed from the Department of Safety in 2010 and assigned to the newly formed Research Quality Assurance Office. (RQA)

• The intent was to create a model Biosafety program to ensure compliance with IBC Committee-approved protocols and SOPs, while increasing research lab oversight, training and approvals.
RQA Staff

- Biosafety Officer
- Human Research Trials Compliance Manager
- Assistant Biosafety Officer
- Clinical Trial Compliance Specialists
- Research Compliance Specialists
  - Administration of IACUC and IBC Committees
Research Quality Assurance Office

- Biosafety
- IACUC/IBC Administration
- Human Clinical Trial review
- FDA Submission
- IRB Audit
COM/HMC Process for review

- All work with biologicals in a research setting, or work with clinical biological products used for research, must be approved in the following order prior to the initiation of the project.
  - IBC/BSRD Committee (*Biosafety and Recombinant DNA*)
  - IRB
- Ancillary reviews via the electronic compliance protocol system, CATS (Central Automated Tracking System), to ensure all work is reviewed and approved by appropriate personnel in the RQA and IRB offices.
Ancillary Committee Review

- Biosafety: Review, Approval
- IACUC: Review, Approval
- IRB: Review, Approval
Biosafety Program Components

- Developed a unified complete lab survey and follow up visit based on the Biosafety Level of the approved agent
- Increased biosafety training and collaboration activities
- Provide timely ancillary reviews for all IRB, IACUC and IBC for grant approval and renewal
Biosafety Program Components

- Established a Lab equipment asset management program to insure quality of equipment in all funded and unfunded research labs as required by the CDC/NIH

- Creation of a home grown cyber-secure LabManager database system to centralize all research lab information for complete and easy access

- Liaison with the Chemical Safety Officer from the Department of Safety through the use of a unique ticket
IBC Requirements at COM

• The COM reviews and approves all biological materials as well as Recombinant DNA used on campus.

• Specific SOPs must also be included with each submission for review and approval

• The lab survey is scheduled to ensure all aspects of the approval are in place prior to start of project

• BSO voting member of IBC

• Reviews biological components of IACUC submissions
  – Monthly guest of IACUC for discussion and Biosafety update
Biosafety Approval required

- Unfixed human or non-human primate materials?
- Biological toxins or carcinogens?
- Infectious agents?
- Recombinant infectious agents?
- Recombinant retroviruses?
- Recombinant DNA?
- Recombinant DNA in animals?
- Biohazards in animals?
- Genetic manipulation in animals?
- Human embryonic or pluripotent stem cells
SOP requirements for all IBC approved protocols

• As always, specific procedures must be posted where work is being performed, as well as documented in the approved lab biosafety notebook

  – Procedure to follow in the event of an accidental spill
  – Procedure to follow in the event of an accidental exposure
  – Documentation of PI training for use of agent
Lab Survey
Formal Lab survey process

- **Survey and follow up**
  - Initial shared information with PI and all lab staff
  - Lab walk through and procedure review
  - Components of Biosafety level specific survey
    - Survey overview
  - Follow up of items found during survey
    - Sign off procedure
    - Informational Lab visits
Initial Lab Survey Components

- Snapshot of all PI Biosafety, IACUC and IRB approvals
- MTA forms and procedures
- NIH Guidelines for Recombinant and Synthetic DNA
- BMBL 5th edition
- NIH responsibility guideline from the NIH
- Lab specific/equipment specific emergency plan template
- IBC process flowchart
- Biosafety manual table of contents
- Approved agent SOP for cleanup and exposure
- Disinfection method overview
Lab Survey make up

• Listing of all Current IBC, IACUC AND IRB Approvals
• Approved SOPs
• All Agents filed under Biosafety approval
• Survey Questions based on Approved BSL #
  – Standard Microbiological Practices
  – Special Practices
  – Safety Equipment (Primary Barriers)
  – Laboratory Facilities (Secondary barriers)
Lab Survey Summary

- Survey Findings
- Training verification
- Signed summary after completion of survey findings
# Informational Lab Visit

<table>
<thead>
<tr>
<th>Inspection Items</th>
<th>Check</th>
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<tbody>
<tr>
<td>Biosafety Approval #</td>
<td></td>
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<tr>
<td>IACUC Approval #</td>
<td></td>
</tr>
<tr>
<td>IRB Approval #</td>
<td></td>
</tr>
<tr>
<td>Radiation use Approval</td>
<td></td>
</tr>
<tr>
<td>Placard Information accurate</td>
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</tr>
<tr>
<td>Biological inventory available?</td>
<td></td>
</tr>
<tr>
<td>Chemical Inventory available?</td>
<td></td>
</tr>
<tr>
<td>“Extremely Hazardous” Inventory available (if applicable)?</td>
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</tr>
<tr>
<td>SAA log book available?</td>
<td></td>
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<tr>
<td>SAA properly maintained?</td>
<td></td>
</tr>
<tr>
<td>PPE worn?</td>
<td></td>
</tr>
<tr>
<td>Controlled substances secure?</td>
<td></td>
</tr>
<tr>
<td>DEA License active</td>
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<tr>
<td>Lab Cleanliness</td>
<td></td>
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<tr>
<td>Door locking</td>
<td></td>
</tr>
<tr>
<td>Lab Specific Emergency Plan</td>
<td></td>
</tr>
<tr>
<td>Comments</td>
<td></td>
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</tbody>
</table>

**INFORMATIONAL LAB VISIT**

[Diagram illustrating the categories of inspection items: biological safety, chemical safety, radiation safety, and emergency plan.]
Biosafety Manual

• Lab Survey overview provided at the survey by the RQA office
• Specific lab Emergency Plan developed by individual lab
  – Include all emergency contact numbers
• Approved protocols
  – Biosafety
  – IACUC
  – IRB
• Approved SOPs
• Specific procedures for disinfection in case of a spill
• Lab staff training dates and updates
  – General Training
  – Blood Borne pathogen if required
  – Shipping Training
  – Lab specific training
Training
Training Initiatives

• RQA Monthly Lunchtime Lecture
  – Increased campus research collaboration
  – Update all staff on biosafety issues
  – Forum for questions on any RQA issue

• RQA Quarterly Regulatory Workshop
  – Federal, state or local issue regarding agent use and general biosafety in research lab.
Training Initiatives

- **Annual Spring Training**
  - Compliance overview (IBC, IACUC, IRB, MTA, Import)
  - Biosafety and CITI Biosafety
  - Centrifuge use and care
  - BSC and CFH operations
  - Autoclave use
  - Safety Lab Inspections/Chemical inventory
  - Security/Emergency Management
  - Freezer and Incubator care
  - Informational system training module
  - Pipette, vaporizer and balance overview
Asset Management
COM Laboratory Equipment Maintenance Program Description

- Duration > five years.
- Includes traditional equipment used in most basic science research laboratories.
- Cost for preventative maintenance (PM) services funded centrally.
- Each year, essential lab equipment receives PM and calibration or certification at no charge to the principal investigator (PI) or department.
- Program also includes an equipment inventory that has been used to form an asset management system (Lab Manager) for COM lab equipment.
<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Count</th>
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</thead>
<tbody>
<tr>
<td>Anesthesia Machines/Vaporizers</td>
<td>47</td>
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<tr>
<td>Autoclave, Large</td>
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<tr>
<td>Autoclave, Small</td>
<td>21</td>
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<tr>
<td>Balances</td>
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<td>Bedding Dispensers</td>
<td>2</td>
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<tr>
<td>Biosafety Cabinets</td>
<td>294</td>
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<tr>
<td>Centrifuges, Benchtop</td>
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<tr>
<td>Centrifuge, High Speed</td>
<td>29</td>
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<tr>
<td>Centrifuge, Microfuge</td>
<td>318</td>
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<tr>
<td>Chemical fume Hoods</td>
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<tr>
<td>DI Carbon Exchanges</td>
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<tr>
<td>Incubators</td>
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<tr>
<td>Micropipettes</td>
<td>2584</td>
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<tr>
<td>RO Operational Check</td>
<td>20</td>
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<tr>
<td>Ventilated Cage racks</td>
<td>174</td>
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<tr>
<td>Washers, Cage</td>
<td>2</td>
</tr>
<tr>
<td>Washers, Large Glassware</td>
<td>4</td>
</tr>
<tr>
<td>Washers, Tunnel</td>
<td>6</td>
</tr>
<tr>
<td>Ultra Low freezers</td>
<td>265</td>
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</table>
# Covered Equipment

<table>
<thead>
<tr>
<th><strong>Essential Equipment</strong></th>
<th><strong>Type of Annual Service</strong></th>
<th><strong>Paid By</strong></th>
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<tbody>
<tr>
<td>Biosafety Cabinet</td>
<td>PM with Certification</td>
<td>COM Admin</td>
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<tr>
<td>Fume Hood</td>
<td>PM with Certification</td>
<td>COM</td>
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<tr>
<td>Incubator</td>
<td>PM with Calibration</td>
<td>COM</td>
</tr>
<tr>
<td>Ultra-Low Temp Freezer</td>
<td>PM with Calibration</td>
<td>COM</td>
</tr>
<tr>
<td>Centrifuge</td>
<td>PM w/Calibration or Total Service</td>
<td>COM / PI</td>
</tr>
<tr>
<td>Small Autoclave</td>
<td>PM with Calibration</td>
<td>COM</td>
</tr>
<tr>
<td>Large Autoclave</td>
<td>PM with Total Service and Parts</td>
<td>COM</td>
</tr>
<tr>
<td>Pipettes</td>
<td>PM with Calibration</td>
<td>COM</td>
</tr>
<tr>
<td>Balances</td>
<td>PM with Calibration</td>
<td>COM</td>
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<tr>
<td>Glass Washers</td>
<td>PM</td>
<td>COM</td>
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<tr>
<td>Vaporizers</td>
<td>PM</td>
<td>COM</td>
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<tr>
<td>Deionized Water System</td>
<td>2 Carbon Tank Exchanges</td>
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<tr>
<td>Reverse Osmosis System</td>
<td>Operational Check</td>
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<tr>
<td>Ventilated Rack</td>
<td>PM</td>
<td>COM</td>
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Program Costs - Routine PMs Paid by COM Administration

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<tr>
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<tbody>
<tr>
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<td>Centrifuges</td>
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<td>CFH</td>
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<tr>
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<tr>
<td>Lg. Glass washers</td>
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<tr>
<td>Lg. Autoclave</td>
<td>140,000</td>
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<tr>
<td>Pipette</td>
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<tr>
<td>Sm. Autoclave</td>
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<td>180,000</td>
<td>180,000</td>
<td>180,000</td>
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<tr>
<td>Ventilated Racks</td>
<td>200,000</td>
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<td>200,000</td>
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<tr>
<td>Vaporizers</td>
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<tr>
<td>RO Systems</td>
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<tr>
<td>DO Systems</td>
<td>260,000</td>
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<td>260,000</td>
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</table>

Total Costs:
- 2012: 60,000
- 2013: 80,000
- 2015: 100,000
- 2016: 120,000

**Graph**
- Bar chart showing yearly charges for each equipment type.
Non Routine Service - PI cost overview

• The overall cost paid by PIs/Departments has decreased by 35% since program inception
• The decreased costs may be attributable to better-maintained equipment due to regular service, and increased training for lab personnel. While much of COM lab equipment is aging, RQA remains in contact with investigators to provide guidance on the potential for replacement of outdated equipment
• Replacement of older equipment by central administrative funding will be put in place over the next several years to further reduce PI operating costs
Summary of Costs per category

<table>
<thead>
<tr>
<th>Year</th>
<th>Admin Costs</th>
<th>PI Costs</th>
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<tbody>
<tr>
<td>2012</td>
<td>350,000</td>
<td>400,000</td>
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<tr>
<td>2013</td>
<td>400,000</td>
<td>450,000</td>
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<tr>
<td>2015</td>
<td>500,000</td>
<td>200,000</td>
</tr>
<tr>
<td>2016</td>
<td>250,000</td>
<td>300,000</td>
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</tbody>
</table>

Charges 2012 Charges 2013 Charges 2015 Charges 2016 Charges

Linear (Admin Costs) Linear (PI Costs)
LabManager

• The establishment of a concise data informational system for use in laboratory settings has become essential in all aspects of the research laboratory
  – LabManager is a database repository designed to maintain and consolidate all aspects of sound laboratory management in one useful tool.

• The system was developed mutually by the College of Medicine Research Quality Assurance (RQA) and Research IT teams
LabManager development

- The system was developed in several phases;
  - Placement of the standardized Biosafety Level Lab Survey in the specific lab associated with the survey
  - Loading of the established lab equipment inventory and service records directly to the specific laboratory for proper tracking
  - Updating and placement of a lab placard template to the specific lab area emphasizing the proper emergency lab contacts
  - The ultimate goal is the ability to link all appropriate lab compliance areas on a simple lab specific platform
LabManager capabilities

• LabManager has proven to be a practical resource and an effective Laboratory Management tool at all levels of the campus including:

• **College Administration** (develop reports and reference information on)
  – Capital equipment replacement schedules
  – Specific research being performed in college labs
  – Chemical and radiation use by specific labs and training compliance by all laboratory personnel

• **Principal investigators**
  – Seek out potential collaborators for research grant submissions
  – Assist in identifying items such as cell lines and research products that may be available internally rather than having to wait to obtain product from outside labs or companies
LabManager capabilities

• Provides proper documentation of:
  ▪ Laboratory approvals
  ▪ General lab safety, blood borne pathogen, CITI, lab specific, and biosafety training dates
  ▪ Preventative maintenance, certification and calibration records ensuring lab equipment is maintained according to established standards and specifications
  ▪ CDC, NIH, OSHA required lab specific emergency plans
  ▪ Specific agent and Biosafety level search capabilities
  ▪ IBC, IACUC,IRB DURC and Bio- Stewardship inventory
LabManager capabilities

- The ability to manage all laboratory information in an accurate and concise method

- Enhances university funding possibilities in a time where funding has been decreased at all levels.

- Allows the RQA staff to leverage resources to ensure safety and reduce institutional risk by providing a means efficiently track compliance and identify specific areas of improvement within all our campus research labs.
Lab Manager Summary

- System provides investigators and technical staff the ability to access their respective lab information including
  - Individual lab placards and emergency contacts
  - Inventory, location and service records of all basic laboratory equipment
  - Annual required lab surveys
  - Lab specific training dates
  - Lab specific SOPs
  - Approved IBC, IRB, and IACUC protocol numbers
  - Campus-wide equipment search mechanism to save the lab time and money when planning individual laboratory experiments.
LabManager Specific Lab View

College of Medicine – C4605A

**General Information**
- **Phone Number**: Unknown
- **Principal Investigator**: Raymond Schetz
- **Supervisor**: Raymond Schetz
- **Emergency Contact**: Raymond Schetz
- **Biohazard Level**: Unknown
- **Fire Extinguisher**: X

**Hazard Information**
- Flammable Liquids: ✗
- Corrosive Materials: ✗
- Toxic Chemicals: ✗
- Flammable Gas: ✗
- Cigarettes: ✗
- Compressed Gases: ✗
- Laser Light: ✗
- X-Ray Generator: ✗
- Electric Hazard: ✗
- Trisk Gen: ✗
- Ultraviolet Light: ✗
- Downhead Hazard: ✗

**Surveys**

**Equipment**

<table>
<thead>
<tr>
<th>Type</th>
<th>Brand</th>
<th>Model</th>
<th>Serial Number</th>
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<tbody>
<tr>
<td>Bench Top Condenser</td>
<td>HIVE MICROATIC</td>
<td>2015</td>
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<td>Raymond Schetz</td>
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PennState Health
Milton S. Hershey Medical Center

Inspired together
LabManager Equipment Search View
Acknowledgements

• Leslie J. Parent, MD
  - Vice Dean for Research and Graduate Studies
  - Associate Vice President for Health Sciences Research Co-Director
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  - Medicine and Microbiology & Immunology Penn State College of Medicine

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  - Associate Professor of Pharmacology
  - Penn State College of Medicine

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  - Chair, Biosafety and recombinant DNA Committee

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  - Research Compliance Specialist
  - Research Quality Assurance
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    - IRB protocol audit
- **Nicole Mathews**
  - Research Compliance Specialist
    - FDA Clinical Trials
- **Rachel Panas, M.S**
  - Research Compliance Specialist (IACUC, IBC, Radiation Safety)
- **Courtney Williamson**
  - Research Compliance Specialist (IACUC, IBC, Radiation Safety)
Words to live by in the Compliance World

Two of the greatest qualities of Life are:
Patience...

...and Wisdom