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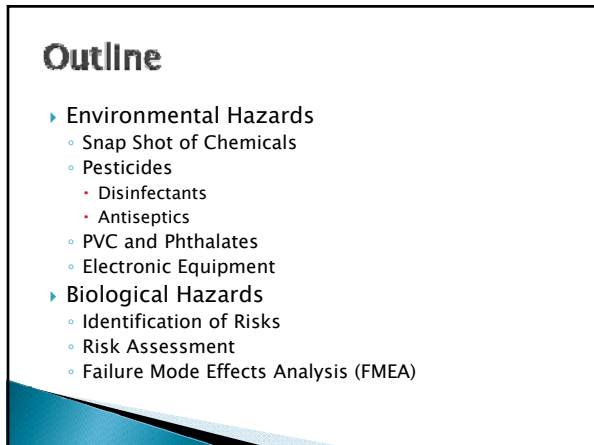
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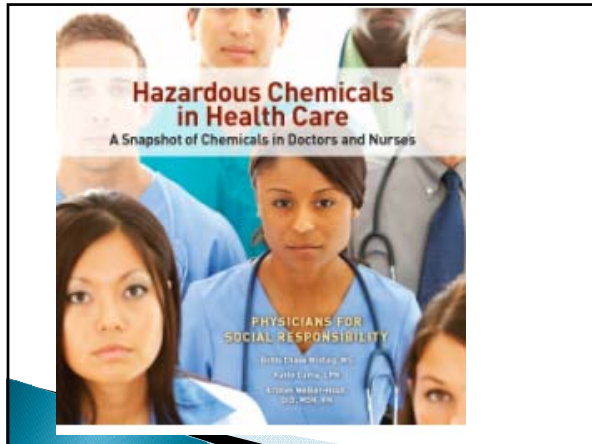
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### Hazardous Chemicals Participants

- ▶ Participants: 20 staff members - including laboratorians from 10 states: AK, CA, CN, ME, MA, MI, MS, NY, OR, WA
- ▶ Most practicing HCW - 2 retired
- ▶ Seven men- 13 women
- ▶ Ages 33-88 y/o
- ▶ 18 Caucasian, one African American, one Asian American

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### Chemicals (and Metabolites)

- ▶ Bisphenol A (BPA)- rigid plastic
- ▶ Mercury
- ▶ Perfluorinated compounds (PFCs)- protective coatings on carpets, paper, clothing
- ▶ Phthalates- soft plastics
- ▶ Polybrominated diphenylethers (PBDEs)- flame retardants
- ▶ Triclosan - antimicrobial agents

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## Hazardous Chemicals Results

**Each participant had at least 24 individual chemicals in their body, and two participants had a high of 39 chemicals detected.**

- Eighteen chemicals were detected in every single participant.
- All 20 participants had at least five of the six kinds of chemicals for which we tested, and thirteen of our participants had all six.
- All participants had bisphenol A, and some form of phthalates, PBDEs and PFCs.
- Thirteen participants had dimethyl phthalate metabolites, with nine above CDC's 95th percentile

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## Chemicals

- ▶ Pesticides
  - Disinfectants
  - Antiseptics
- ▶ PVC and Phthalates
- ▶ Fragrant Chemicals
- ▶ Mercury
- ▶ Flame Retardants
- ▶ Electronic Equipment

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## Quaternary Ammonium Disinfectants

- ▶ "Quats"
- ▶ Most common low level disinfectant
- ▶ Replaced toxic phenolic and chlorine (bleach)
- ▶ Can result in :
  - Dermatitis
  - Ocular irritation
  - Pulmonary irritation ( sensitization and asthma)

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### Application Methods

- ▶ Replace disinfectants with detergents in low risk areas.
- ▶ Replace Spray bottles with pour and wipe bottles
- ▶ Replace traditional mops with microfiber mops
- ▶ Floor burnishers and buffers should have an enclosed system with a filter to collect vapors
- ▶ Increase ventilation and air exchanges when buffing ( most at night when ventilation might be decreased).

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### Glutaraldehyde

- ▶ Colorless, oily liquid with a pungent odor used as a high level disinfectant
- ▶ The strength of glutaraldehyde and water solutions typically ranges from 1‰ to 50‰
- ▶ Trade names include Cidex®, Sonacide®, Sporicidin®, Hospex®, Omnicide®, Metricide®, and Wavicide®.

<http://www.cdc.gov/niosh/docs/2001-115/>

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### Exposure to Glutaraldehyde

- ▶ Cold sterilization of instruments
  - when glutaraldehyde solution is poured into or out of the sterilizing pans
  - when sterilized equipment is removed from the sterilizing pans
- ▶ Disinfection of histology/pathology laboratory table tops
- ▶ Mixing and activation of various glutaraldehyde solutions
- ▶ Tissue fixation in histology labs
- ▶ Development of x-rays

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### Health Effects Glutaraldehyde

- ▶ Throat and lung irritation
- ▶ Asthma and difficulty breathing
- ▶ Contact and/or allergic dermatitis
- ▶ Nasal irritation
- ▶ Sneezing
- ▶ Wheezing
- ▶ Burning eyes and conjunctivitis

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### Limiting Exposure to Glutaraldehyde

- ▶ Use local exhaust ventilation (capture velocity of at least 100 feet per minute) and at least 10 room air exchanges per hour.
- ▶ Keep baths under a fume hood where possible.
- ▶ Use only enough to perform the required disinfecting procedure.
- ▶ Avoid skin contact: use gloves and aprons made of nitrile or butyl rubber
- ▶ Wash gloved hands after handling
- ▶ Wear goggles and face shields when handling
- ▶ Seal or cover all containers holding solutions.
- ▶ Attend training classes in safety awareness about use of and exposure

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### Ethylene Oxide (ETO)

- ▶ Sterilant for items that can not be exposed to steam sterilization.
  - a colorless liquid below 51.7°F, or a gas that has an ether-like odor at concentrations above 700 parts per million (ppm)
  - flammable and highly reactive
- ▶ Permissible Exposure Limit (PEL) for EtO is 1 ppm for an 8hr time weighted average with a 5ppm excursion level

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### Health Effects Ethylene Oxide (ETO)

- ▶ Acute exposures
  - respiratory irritation and lung injury,
  - headache, nausea, vomiting, diarrhea,
  - shortness of breath, and cyanosis.
- ▶ Chronic exposure
  - cancer, reproductive effects,
  - mutagenic changes,
  - neurotoxicity, and sensitization.

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### Eliminate ETO

- ▶ Substitute other cold sterilants for EtO
- ▶ Do not occupy the sterilizer loading and mechanical rooms while operating the sterilizer unit
- ▶ avoid close contact with newly sterilized unaerated loads.
- ▶ Use appropriate PPE when changing cylinders including butyl apron, gloves, and a canister respirator.
- ▶ Use EtO detector systems and room monitors to signal any leakage of gas,
- ▶ use passive dosimeters for personal exposure monitoring.

<http://www.osha.gov/SLTC/etools/hospital/central/central.html>

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### Triclosan

- ▶ Chemical added to consumer products to reduce or prevent bacterial contamination
  - toys
  - Clothing
  - Furniture
  - Toothpaste
  - Cosmetics
- ▶ Active agent in hospital approved antimicrobial hand soaps

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### Is Triclosan Safe?

- ▶ Currently considered non hazardous to human per FDA
- ▶ Recent animal studies show concern
- ▶ FDA studying and plans to release report in Spring, 2011

<http://www.fda.gov/forconsumers/consumerupdates/ucm205999.htm>

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### PVC and Phthalates

- ▶ Aka: Plastic, vinyl
  - IV bags and tubing
  - Gloves
  - Curtains
  - flooring

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### PVC Chemicals

- ▶ **Dioxin**
  - a known human carcinogen,
  - can be formed during the manufacture of PVC, and during the incineration or burning of PVC products.
- ▶ **DEHP**
  - a phthalate used to soften PVC plastic that can leach from PVC medical devices

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### Minimize PVC/Phthalates Exposure

- ▶ gathering data through audits and letters to vendors
- ▶ identifying alternatives
- ▶ developing and implementing a PVC reduction plan
- ▶ establishing a PVC reduction policy.

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### Mercury

#### Healthcare

- ▶ Fever thermometers
- ▶ Wall blood pressure units
- ▶ Maloney or Hurst bougie
- ▶ Cantor tubes
- ▶ Lab equipment

#### Building

- ▶ Fluorescent light bulbs
- ▶ High intensity discharge lamps
- ▶ Thermostats
- ▶ Mercury switches
- ▶ Flow Meters
- ▶ Flame sensors
- ▶ Boiler Gauge

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### Eliminate Mercury

- ▶ Conduct a mercury audit
- ▶ Replace with alternate products
- ▶ Implement a "Mercury Free Purchasing Policy"
- ▶ Educate employees to risks
- ▶ Hold a mercury thermometer exchange

[http://www.noharm.org/lib/downloads/mercury/Making\\_Med\\_Mercury\\_Free\\_HCWH.pdf](http://www.noharm.org/lib/downloads/mercury/Making_Med_Mercury_Free_HCWH.pdf)

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### Electronic Equipment

- ▶ Chlorinated plastics in cable wiring
- ▶ Lead in cathode ray tube (CRT) monitors
- ▶ Brominated flame retardants in computers
- ▶ Mercury in LCD displays

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### Electronics

- ▶ Recycle old electronic in an environmentally and socially responsible way
- ▶ Purchase environmental preferred computers
- ▶ Implement “packaging take back” and “end of e-life” programs

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### Safety with Biologicals

How can we minimize our risk?

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### Recombinant DNA

- ▶ In the context of the *NIH Guidelines*, recombinant DNA molecules are defined as either:
  - molecules that are constructed outside living cells by joining natural or synthetic DNA segments to DNA molecules that can replicate in a living cell, or
  - molecules that result from the replication of those described in (i) above.

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### Infectious Agent

Infectious or pathogenic agents capable of causing disease in healthy humans, plants and animals including but not limited to:

- ▶ Bacteria
- ▶ Virus
- ▶ Fungi
- ▶ Parasites
- ▶ Rickettsia

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### Classification of Agents

- ▶ The Centers for Disease Control and Prevention (CDC) in the guideline, ***Classification of Etiologic Agents on the Basis of Hazard***, classify agents on a scale from Class 1 through Class 5.
- ▶ However, the NIH Guidelines cites the World Health Organization Risk Group Classification from Risk Group 1 to Risk Group 4.

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## Risk Assessment

- ▶ Once the investigator has decided on the agent or recombinant molecule, then he or she must conduct an assessment of risk. This assessment shall be based on the following:
  - Virulence/pathogenicity/infectious dose
  - Environmental stability
  - Route of spread, communicability
  - Quantity/concentration/volume used
  - Vaccine/Treatment availability
  - Allergenicity

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## Risk Assessment

### Routes of Exposure

- ▶ The assessment of risk will include common routes of exposure:
  - Parenteral Inoculation (needle stick)
  - Surface Contact (contaminated work area)
  - Ingestion (food in lab)
  - Inhalation (aerosol generating procedures)
  - Mucous Membrane (aerosol droplets in face)
- ▶ Public Health Agency of Canada PSDS
  - <http://www.phac-aspc.gc.ca/msds-ftss/msds84e.html>

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Public Health Agency of Canada  
www.publichealth.gc.ca

Home > Laboratory Biosafety and Biosecurity > Biosafety Programs and Resources > Pathogen Safety Data Sheets and Risk Assessment

Pathogen Safety Data Sheets and Risk Assessment

Please note that although the information, opinions, and recommendations contained in these documents are compiled from peer-reviewed literature sources believed to be reliable, PHAC accepts no responsibility for the accuracy, sufficiency, or reliability of the PSDSs, nor for any loss or injury resulting from the use of the information contained within them. Newly discovered hazards are frequent and this information may not be completely up to date.

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**Risk Assessment  
Experimental Procedures**

- ▶ Procedures performed to assess risk. This includes but is not limited to the following:
  - Handling of sharps
  - Aerosol generating procedures
  - Volume of culture used
  - Containment procedures
  - Transport of agents
  - Use of chemicals and radionuclides
  - Use of animals
  - Any open bench top work
  - Disposal of medical waste

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**Minimization of Risk**

- ▶ Once exposure determination has been completed, then ways to minimize risk are evaluated. This includes but is not limited to the following:
  - Work Practices/Engineering Controls
  - Personal Protective Equipment
  - Disinfection/Medical Waste Disposal
  - Medical Surveillance
  - Training (at the laboratory level)
- ▶ Review and determine appropriate measures-

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**FMEA  
Failure Mode Effects Analysis**

- ▶ Systematic, proactive method
  - evaluating a process to identify where and how it might fail, and
  - assess the relative impact of different failures in order to identify the parts of the process that are most in need of change.

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### Steps in an FMEA

- ▶ Failure modes (What could go wrong in each step of the process?)
- ▶ Failure causes (Why would the failure happen?)
- ▶ Failure effects (What would be the consequences of each failure?)
- ▶ Rank the failures by priority for actions



<http://www.ihl.org/ihl/workspace/tools/fmea/>

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