Reducing Exposure to Formaldehyde in a Medical School Gross Anatomy Lab

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Advantages

• Potential carcinogen
• Airborne concentrations >0.1ppm can cause irritation of the eyes, nose and throat
• Severity of irritations increases as concentration increases
• Dermal contact can cause sensitization
• Reproductive effects (such as menstrual disorders and pregnancy problems)
• Odor threshold - 0.027ppm

Disadvantages

• Kills many organisms to prevent spread of disease
• Destroys enzymes responsible for decomposition
• Hardens and fixes body tissues quickly for positioning of body
• Inexpensive

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Formaldemeter
February 1989

Formaldemeter
September 1990

Proposed Solutions

- Feb 1989: Discussion of using downdraft tables due to lower PEL
- Feb 1990: Proposed retrofit of existing tables
- Aug 1990: Air Handling Unit (AHU) modified

August 1991 – September 1993

- August 1991: Direct Reading Instrument
- September 1993: Colorimetric Dosimeter
More Improvements

Dec 1993  Vendor proposed a catalytic fan/filter with acrylic enclosure to reduce formaldehyde airborne concentrations

October 1997

A new problem appears - the elevators smelled bad after gross anatomy lab sessions!

1999 – More Solutions

- Put employees and students in respirators
- Lower concentration of formaldehyde in embalming fluid
- Improve general ventilation
- Install downdraft tables
July 2000 - June 2001

September 2001 - September 2002

Further Recommendations

- SOP incorporating better PPE
  - Nitrile gloves to replace latex
  - Fluid barrier mask with splash shield
  - Non-permeable gown
- Clinical vibration saw whenever bone material had to be sawed
- Appropriate eyewash and shower was retrofitted near exit door
- Downdraft tables
**Miran Results**

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**June 2002**

- **Sampling June 2003 - August 2003**

- **OSHA PEL (ppm)**
- **OSHA Action Level (ppm)**

- **Result (ppm)**
- **J N '03 AU '03 J N '03 AU '03 J N '03 AU '03 J N '03 AU '03 J N '03 AU '03 J N '03 AU '03 J N '03 AU '03 J N '03 AU '03 J N '03 AU '03**

- **STEI 2002**

- **June '03 Aug '03**

- **Results**
- **PEL**
- **STEL**
Finally

- Embalming fluid reformulation eliminated formaldehyde altogether
  - Ethanol and phenol
  - No problem with fixation
  - No mold growth
  - Tissues more pliable and softer
  - Tissues a clearer color
- Created another challenge
  - Flammable and toxic
  - Increased floor load of flammables

Lessons Learned

- Formaldehyde levels varied
  1. Time cadavers were used by students
  2. Body section studied
  3. Number of cadavers used
- Students didn’t stay in one place
- Sampling method will affect your results