

CASE STUDY: FORMALDEHYDE IN UNIVERSITY LABORATORIES

Project Description: Instructor/Student Exposures from Cadaver Examinations

Scope of Services: AET was contracted to evaluate formaldehyde exposures to Instructors and Students in two teaching labs where cadavers are examined. Each laboratory was 12'x20' (240sf) with 10 foot ceilings. A cadaver is wrapped in plastic within a zippered bag and placed in a stainless steel table in the center of each room. Each classroom has 8-10 students and 1 instructor. Instruction time is approximately 4 hours for each class, but can include up to 10 hours per week per student for personal learning activities.

General ventilation is provided to each lab by supply air from ceiling mounted diffusers associated with a dedicated HVAC unit; there is no return air system. Local exhaust ventilation is provided by two 4' long slot grills placed near floor level within 4 feet of the examination tables in each lab.

AET Experience: Formaldehyde exposure results from the embalming process used to preserve human cadavers. Reportedly the average embalming process requires 3 gallons of fluid containing formaldehyde, ethanol and methanol. The embalming fluid is injected into the arterial system to replace blood and can contain up to 5% formaldehyde; a more concentrated fluid containing 50% formaldehyde is injected into the body cavity. Formaldehyde vapors are slightly heavier than air tend to settle near the floor.

Health Effects/Standards: Short term health effects from inhalation of formaldehyde vapors including irritation of eyes, nose and upper respiratory tract. Coughing, wheezing and nausea can also occur. Irritant affects have been reported as low as 0.1 ppm. Formaldehyde has been classified as a known human carcinogen by the International Agency for Research on Cancer and is probably a human carcinogen by the EPA (Long term affects).

OSHA FORMALDEHYDE STANDARD 29 CFR 1910.1048		
PEL (8 hour TWA)	STEL (15 Minutes)	Action Limit (8 hour TWA)
0.75 ppm	2.0 ppm	0.5 ppm

AET's INVESTIGATIVE APPROACH/SAMPLING/TOOLS:

1. **Personal breathing zone (STEL) sampling** evaluated formaldehyde exposures to the instructors in each lab. The worse case formaldehyde scenario(maximum odor) was opening the zipper bag holding the cadaver.
2. **Personal breathing zone (8 hour TWA) sampling** evaluated both the instructors and students formaldehyde exposure throughout the entire class period.
3. **Stationary area sampling** evaluated the effectiveness of ventilation controls at strategic exposure points and at remote locations where odors are present to evaluate area isolation controls. Formaldehyde has a reported odor threshold of 0.05 ppm.
4. **Ventilation measurements** were taken to evaluate the capture velocities at the point of entry to the slot hoods and at varying distances away from the slot hoods.
5. **Smoke tube observations** were used to evaluate pressure differentials between laboratories and adjacent spaces.

CONCLUSION: Formaldehyde exposure in each lab were below OSHA Standards. Specific recommendation were made regarding cadaver handling and preventive maintenance of the ventilation system to further minimize instructor/student exposures.

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