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PHENOL EXPOSURE IN EMBALMING ROOMS

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Part 2

METHODS AND FINDINGS: For this study, numerous samplings for phenol vapor were taken during simulated embalmings utilizing phenol in very high concentrations (25% w/w) in highly volatile alcohol solvents (methanol and isopropanol). The purpose was to create an absolute worst case scenario for exposure and to determine the risks that are present when everything is done to maximize the exposure to phenol. The method was to simulate the embalming of an autopsy case by dispensing a concentrated phenol solution in a highly volatile alcohol solvent as an embalmer would use such a solution in the embalming operation. Three gallons of an "arterial" solution (final dilution of phenol-3.5%) was prepared for dispensing on a flat embalming table to simulate arterial injection. In addition, after the arterial injection, 48 ounces of the concentrated phenol in alcohol solution was splashed on the table and allowed to remain for 30 minutes to simulate a cavity treatment with concentrated chemical. Monitorings were taken at 30 minute intervals during the entire simulated embalming operation.

The measuring devices used were vapor monitor badges for phenol supplied by Advanced Chemical Sensors that met the criteria of NIOSH and OSHA respectively. All measurements were taken at chest height of the embalmer and attempted to always sample from the breathing zone of the embalmer.

The embalming room used was 17'x12'x8' and was actually 1470 cu. ft. in total dimension when deductions were made for sinktops and cabinets. The ventilation was average to slightly above average for a typical embalming room with as 12" exhaust fan and a 6" forced air inlet fan. The exhaust fans average flow was 320cfm and the inlet fan passed 240cfm. The average number of air exchanges was 13 per hour.

Vapor monitorings were taken under two sets of conditions. First-monitorings were done with no ventilation and no precautions for minimizing the exposure to fumes. This included leaving caps off all bottles, no irrigation on the table and the lid was left off the embalming machine. In the second set of monitorings, only ventilation was used as a vapor control measure. No irrigation of the table was allowed and the lids were left off all bottles and the lid from the embalming machine.

By reference to Table 1, it is seen that when ventilation is used during the simulated embalming operation, the exposure values for phenol are all below the recommended limits at all times during the monitoring. The spread of data delineate the maximum and minimum readings that were achieved during the several monitorings. The total exposure value (90 minute calculation) is well within acceptable limits.

The exposure values when no ventilation was used is, as expected, higher. The phenol exposure values ranged from slightly less than allowable limits to in excess of the limits by 1 to 3 ppm. The total exposure values (90 minute readings) were below limits to 2ppm in excess of allowed limits. Ventilation reduced the phenol exposures an average of 30-35% (total exposure). Ventilation is seen to reduce the individual monitorings during the procedure by 10-45% according to the particular phase of embalming selected.

TABLE 1
PHENOL EXPOSURE VALUES
(PPM)

	START —> 2nd GALLON	2nd GALLON —> START CAVITY	START CAVITY —> 15 MIN. AFTER	TOTAL EXPOSURE (90 MIN.)
VENTILATION	1.8 - 4	3 - 4.1	1.8 - 4.2	1 - 3
NO VENTILATION	4.5 - 6.1	4 - 5	6 - 8	4.6 - 7

DISCUSSION: From a reexamination of Table 1, it is obvious that with ventilation highly concentrated phenol solutions in extremely volatile alcohol diluents can be utilized in the embalming room without exceeding the exposure limits for phenol. This scenario was chosen so as to maximize the potential for exposure to phenol under all circumstances of the embalming operation. No embalmer would encounter these set of circumstances or consider using such concentrated solutions in the manner in which this test was conducted.

It should also be noted that even without ventilation and under extreme conditions such as these-that some monitorings were below the exposure limits despite the attempts to exceed the limits. Even when the exposure limits were exceeded the average values were only 1-2ppm high.

Ventilation obviously had a significant impact on the exposure values-lowering them by 10-45% individually and reducing the total average exposures (90 minute readings) by 30-35%. Even under these extreme conditions and concentrations of chemicals, ventilation alone reduced the exposure readings to acceptable levels.

The conclusion from this study is that phenol exposures of embalmers under normal circumstances utilizing concentrations typically available in embalming fluids will be well within the exposure limits set by OSHA. With proper engineering and safety precautions such as good operator technique, table irrigation, careful use of chemicals to avoid spills, leaving the lid on the embalming machine, replacing all caps on bottles and the use of adequate ventilation--the exposure to phenol is not significant. Even in the event that highly concentrated solutions of phenol are used in conjunction with alcohols in large quantities, the accepted exposure limits will not be exceeded.

With the use of appropriate safety gear such as impervious gloves and aprons with face shields or safety goggles, the potential exposure to phenol by accidental splash or ingestion is minimized. This, in combination with the use of ventilation and other vapor control measures will reduce the potential exposure hazard to phenol to an acceptable level in the embalming room. We conclude that overexposure to phenol in embalming rooms is possible only through deliberate misuse of the chemical, total disregard of ventilation and safety precautions or a serious accident such as ingestion of the chemical.

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