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## METHANOL AND ISOPROPANOL EXPOSURES IN EMBALMING ROOMS

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### Part 2

We simulated an autopsy embalming by dispensing concentrated methanol/isopropanol solutions as an embalmer would utilize such a solution in the embalming operation. Three gallons of an arterial solution was prepared (final dilutions of methanol and isopropanol 6.5%) and dispersed onto a flat embalming table to simulate the arterial injection. In addition, after the arterial injection, 48 ounces of the concentrated methanol/isopropanol solution was spilled onto the embalming table and allowed to remain for 30 minutes while monitoring was done. This technique was to simulate a worst case autopsy cavity treatment utilizing the chemicals. Individual monitorings were taken every 30 minutes during the entire procedure.

The monitoring devices used were vapor monitor badges for methanol and isopropanol supplied by Advanced Chemical Sensors. All badges used met the analysis criteria set by both NIOSH and OSHA. All measurements were taken at chest height of the embalmer and we 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 deduction were made for sinktops and cabinets. The ventilation present in this embalming room was average to above average for a typical embalming room with a 12" exhaust fan and a 6" forced air inlet fan. The exhaust had an average flow of 320 cfm and the forced air inlet fan had a pass rate of 240 cfm. When calculations were made, the average number of air exchanges per hour was 13. All temperatures were in the range of 65-75 degrees.

Vapor monitorings of both alcohols were taken under two sets of conditions. First, monitorings were taken with no ventilation and no precautions to minimize exposures. This included no table irrigation, leaving the lids off all bottles and the lid from 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 still left off all bottles and the embalming machine.

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## TABLE 1

### METHANOL EXPOSURE VALUES

(PPM)

<b>VENTILATION</b>	<b>10 - 60</b>	<b>20 - 30</b>	<b>40 - 110</b>	<b>10 - 50</b>
<b>NO VENTILATION</b>	<b>40 - 60</b> START → 2nd GALLON	<b>40 - 59.4</b> 2nd GALLON → START CAVITY	<b>30 - 125</b> START CAVITY → 15 MIN. AFTER	<b>18 - 51</b> TOTAL EXPOSURE (90 MIN.)

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By reference to Tables 1 and 2, it is seen that exposure values for both methanol and isopropanol were below exposure limits for both chemicals during all phases of the monitoring. In addition, the effect of ventilation was relatively insignificant. Only a small reduction of exposure was noted when ventilation was utilized in comparison to no ventilation.

DISCUSSION: From a reexamination of Tables 1 and 2, it is obvious that methanol or isopropanol overexposure by the airborne route is virtually impossible. At no time did any of the concentrations of either alcohol approach the limits of exposure despite the fact that extreme concentrations of methanol/isopropanol were used and an absolute worst case scenario was created to maximize the embalmers exposure. No embalmer would utilize either of the alcohols in these concentrations or in the manner in which our monitorings were conducted. The quantities used would be drastically less and ventilation and safety precautions would be used. The exposures that the embalmer would encounter with methanol or isopropanol under normal embalming conditions and reagents appears to negligible.

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## TABLE 2

### ISOPROPANOL EXPOSURE VALUES

(PPM)

<b>VENTILATION</b>	<b>5 - 25.7</b>	<b>20 - 38.7</b>	<b>51 - 119</b>	<b>2.8 - 15.1</b>
<b>NO VENTILATION</b>	<b>25.7 - 39.6</b> START → 2nd GALLON	<b>30.1 - 45.1</b> 2nd GALLON → START CAVITY	<b>12 - 140</b> START CAVITY → 15 MIN. AFTER	<b>12.5 - 50</b> TOTAL EXPOSURE (90 MIN.)

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It is also interesting to note that ventilation did not significantly reduce the airborne concentrations of either methanol or isopropanol during the monitorings. Perhaps this is due to the relatively high volatility of these alcohols and the concentrations remaining somewhat constant despite the air movement due to ventilation. However, ventilation did display a small decrease and obviously should be used whenever available.

The only significant exposure hazard involving methanol or isopropanol appears to be ingestion or large quantities of splashing on the unprotected skin surfaces of the embalmer. This hazard is readily eliminated by the use of appropriate safety gear such as impervious gloves and aprons with face shields or safety goggles.

The conclusion of this study is that methanol and isopropanol exposures of embalmers under normal circumstances utilizing concentrations typically available in embalming fluids will be well below any exposure limits set by OSHA and in most situations, so low as to be insignificant. Even if highly concentrated solutions are used under conditions of no safety precautions or ventilation-the exposures will be well below limits in all cases. We conclude that overexposure to methanol or isopropanol in embalming rooms is possible only through deliberate misuse of the chemicals, total disregard of ventilation and safety precautions or a serious accident such as ingestion of the chemical.

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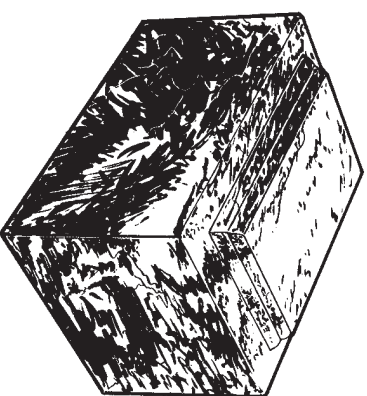
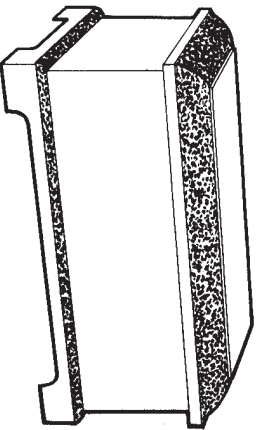
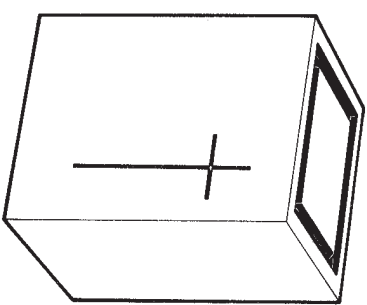
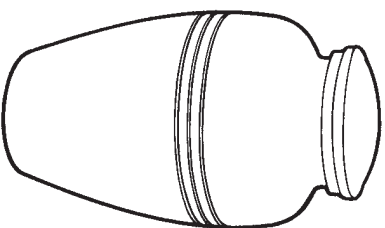
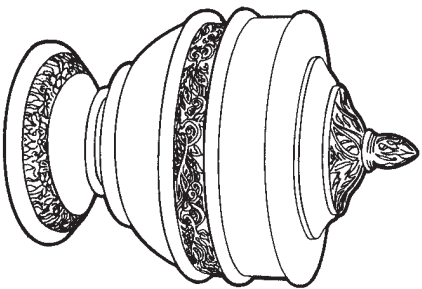
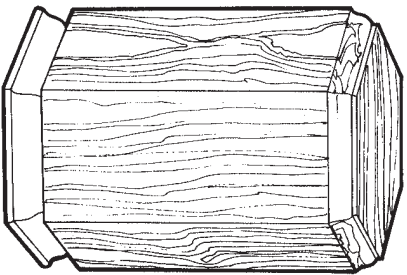
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