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PREGNANCY AND EMBALMING: FORMALDEHYDE AND OTHER DANGERS FOR FEMALE EMBALMERS

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ABSTRACT: An overview of the dangers associated with formaldehyde and other chemical embalming agents usage during pregnancy for female embalmers is presented. Specific dangers associated with formaldehyde in its various forms in the embalming room is discussed. The dangers of solvent exposure in general is investigated with emphasis on volatilities of various solvents and special problems with TCE usage in embalming rooms. Recommendations for embalming avoidance, respirator use and suggestions for low exposure embalming scenarios concludes the report.

INTRODUCTION. With the increasing numbers of female embalmers within the profession, a serious exposure problem has been brought to light with several research studies regarding women who are exposed to formaldehyde and other chemicals and the adverse effects on pregnancy, pregnancy outcomes and their newborns. This research has mostly occurred within the past two years and all point to the danger of formaldehyde exposure and other solvent-type chemical exposure on pregnant women. These findings are of great importance for women associated with the embalming profession. With these factors in mind, let us begin a discussion on these exposure dangers and the research confirming them.

FORMALDEHYDE EXPOSURE: The dangers involved in formaldehyde exposure in general are well documented for exposed workers. The indictments against formaldehyde as a carcinogen, asthma producer, skin sensitizer and serious health hazard are too numerous to list. Dozens of research articles every year are dedicated to investigations regarding these established exposure hazards and their health consequences.

Several studies now strongly implicate formaldehyde as a serious exposure hazard for pregnant women in several work environments that mimic embalming scenarios and exposures that are typical for embalmers whether male or female. Reduced fertility rates and adverse pregnancy results such as spontaneous abortions, early term births and fetal difficulties have all been documented. Studies in female wood industry workers particularly demonstrate these effects when formaldehyde exposure is documented. Almost all negative results

of reduced fertility and pregnancy difficulties were found in females who were symptomatic for formaldehyde exposure. Other maternal difficulties were associated also with formaldehyde and dusts and other solvents. Separate lab animals studies have documented an increased risk of major fetal malformations (birth defects) and teratogenetic effects in general (through metaanalysis) of formaldehyde and other solvents typically used in embalming scenarios. The more formaldehyde is investigated, the more obvious it appears that it has serious exposure dangers for pregnant women that are exposed.

SOLVENTS EXPOSURE: Several other solvent type chemicals that are typically used in embalming fluids and various other embalming formulations have also been implicated as causing serious effects on pregnancy, pregnancy outcomes and newborns. These solvents are various alcohols, acetone, phenols and others which quite commonly are present in modern embalming fluids. These chemicals have all been shown to increase the risk of spontaneous abortions, major fetal malformations and teratogenetic effects in general for exposed women in various work environments. In addition, prenatal exposures to organic solvents has resulted in color blindness and visual acuity losses for offspring of exposed women. These effects are documentable and implicate a wide variety of solvent chemicals that are widely used in numerous industries in addition to being used in embalming. TCE or trichloroethylene is included, not surprisingly, in this solvent list of exposure dangers for pregnant women. TCE, the main ingredient in dry wash type cleaning solvents has long been suspected as a definite teratogen (causer of birth defects) through lab animal studies and now is implicated in human exposure as well.

RECOMMENDATIONS: In general, if you are pregnant or planning on becoming pregnant, you should not embalm. If you must embalm, because of circumstances, then plan on diligently using a full-face or half-face respirator with fresh cartridges for formaldehyde and organic vapors whenever you do embalm. Maximize your other protections available — i.e. gloves, shields, impervious gowns and other exposure protection equipment. Avoid the use of latex — it affords little or no protection against formaldehyde and other chemicals in the embalming room and generates it's own serious health risks. Substitute nitrile or similar synthetic based impervious gloves instead. Minimize your time in the embalming room and your overall exposure to embalming chemicals.

FORMALDEHYDE — ELIMINATE IT OR LIMIT IT: Formaldehyde is the most indicted chemical in the embalming room for serious overall health hazards and insidious long-term health effects from chronic exposures. With modern embalming formulations, it is exceedingly easy to eliminate or limit severely the total exposure of an embalmer to formaldehyde. 90% of total formaldehyde exposure can easily be eliminated with no discernible differences in embalming results. Elimination of formaldehyde in cavity formulations and elimination of formaldehyde/wood dust/particulates in old-fashioned autopsy/hardening compounds by substituting powerful active formulations that contain no formaldehyde whatsoever is quite easy. Eliminate old-fashioned formaldehyde sprays — they are virtually useless and increase airborne formaldehyde exposures significantly. A far safer embalming room environment is created when formaldehyde is absent or present in only very small quantities.

Glutaraldehyde is the modern preferred aldehyde substitute for formaldehyde in embalming formulations. Glutaraldehyde exposures at working concentrations are usually a fraction of what comparable formaldehyde

exposures are in typical embalming scenarios — due to the fact that higher concentrations of formaldehyde is required to elicit an equal fixative action on tissues. The ambient vapor pressure of glutaraldehyde is 1/6 that of formaldehyde (which is a gas), consequently the vapor concentrations present during use is significantly lower than when using formaldehyde. Glutaraldehyde has either not been investigated or has not been implicated in the above mentioned studies. Numerous lab animal studies have failed to demonstrate statistically significant and repeatable teratogenicity of glutaraldehyde even when dosages are sufficient to cause maternal toxicity. Substitution of glutaraldehyde as a replacement for formaldehyde as an embalming agent in normal embalming circumstances would result in an overall total chemical exposure reduction. For female embalmers who are pregnant or planning to become pregnant however, the caveat remains, despite lowered exposures, all embalming chemicals are injurious to your maternal health and the well being of your newborn. Avoid embalming or use respirator protection if you must embalm.

SOLVENTS - ELIMINATE THEM OR DRASTICALLY LIMIT THEM: Careful choice of low volatility embalming fluids will result in significant reductions in exposures to phenols and alcohols that are present in modern embalming formulations. Exposure limits are, in general, relatively high and these chemicals are usually not a serious factor in exposure — but they should be minimized nonetheless. One of the worst overall exposure hazards are the drying-type cavity fluids that are popular with many embalmers. Formaldehyde in high concentration combined with an excess of alcohol solvent (to supposedly enhance the drying effect) results in a potent and dangerous high volatility mixture of formaldehyde/methanol that literally explodes into the atmosphere in a wet/rich humidity environment. The highest formaldehyde monitorings I have ever registered in an embalming room was with drying-type cavity fluids during cavity treatment. These formulations do not significantly embalm better than traditional cavity formulations. The heightened exposure dangers and high flammabilities of these cavity chemicals do not justify their use.

Phenols are not present in any significant amounts in general use fluids — they present no special hazards above and beyond what precautions should be taken with any organic solvents present in embalming fluids.

TCE or trichloroethylene is increasingly being used as a drywash/cleaning solvent in embalming rooms when virtually every other industry is trying to eliminate it. The indictment against TCE is massive from a health and exposure standpoint and a disaster from a liability standpoint due to its extreme damaging effects on the environment. Eliminate TCE in the embalming room — it is not necessary and there are far safer and effective substitutes for this dangerous chemical.

IN SUMMARY: Do not embalm unless absolutely necessary. If you must embalm utilize maximum protective measures and a respirator for formaldehyde and other organic solvent vapors that may be present. As a general rule, practice low-exposure embalming with elimination or drastic reduction of formaldehyde, wood or particulate dusts mixed with formaldehyde and other formaldehyde preparations such as formaldehyde sprays. Drastically reduce solvent exposures by utilizing modern low-exposure alternative embalming formulations that emphasize low volatility and minimal airborne exposures. Avoid high alcohol content drying cavity fluids because of the vapors produced. Avoid TCE usage completely. Create an environment in the embalming room that will benefit all embalmers by striving to reduce total overall chemical exposure during the embalming operation through judicious selection of embalming agents that deliver maximum embalming action with a minimum of exposure potential.

BIBLIOGRAPHY: The following are selected documents in this rapidly developing field of investigation.

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Voluminous amounts of documentation concerning formaldehyde and it's numerous health hazards and exposure risks is available and the quantity is constantly increasing. The following is just a small sampling of the most recent research.

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Documentation and research on TCE (trichloroethylene) and it's sister PERC can found in a previous article by me published in *The Champion Encyclopedia of Mortuary Practice*.