Hazardous Chemical Exposure, SDS, and PELs

In the Histology Laboratory, the employee is responsible for taking control of her exposure and health during pregnancy. Most laboratories do not have policies or protocols in place for pregnant workers. Supervisors typically allow employees to work at their own comfort level and expect the employee to discuss Safety Data Sheets (SDS, formerly MSDS), the working environment, and exposure limits with their physician; however, most SDS have not been updated to include current research on fetal exposure.

For example, in a 2016 audit, out of 22 SDS only 5 included Reproductive Toxicity statements[12,13,14,16,17]. Three of these were from *alcohol* based solutions stating, "ethanol is known to cause developmental toxicity when intentionally ingested during pregnancy" [12,13,14] which clearly does not indicate the hazards associated with the chemical in the laboratory setting. The components of *hematoxylin* are stated to have been shown to cause developmental delays and defects including cleft palates, facial defects, neural tube closure defects and skeletal abnormalities in studies with laboratory animals[16]. The *formalin* SDS included the statement "may cause genetic defects" within the Hazard Statement section[15]. Formaldehyde exposure is documented to increase chances of having fertility problems or miscarriage, is known to cause cancer, and can be absorbed by the skin[17]. The SDS for *xylene* did not include any reproductive hazard information[18]. Solvent (xylene) exposure increases the chances of having a miscarriage, stillbirth, preterm birth, a low birthweight baby, and birth defects[6]. Exposure occurs by breathing vapors and skin contact (xylene can be absorbed by the skin) [6].

Permissible exposure limits (PELs) are intended to protect the vast majority of workers against adverse effects during and beyond their exposure to workplace chemicals. They were created to minimize or prevent acute toxicity for normal, healthy adults without considering the effects on fetal development. The human placenta is responsible for the exchange of ions, nutrients, and gases between the baby and mother. Rapid transfer of formaldehyde from the maternal to the fetal compartment has been observed to occur in the human placenta[3]. Formaldehyde exposure has also been demonstrated to reduce pregnancy peptide hormone synthesis and secretion which may have harmful consequences for fetal growth and development[3]. While there is limited information regarding the impact of human exposure to organic solvents, animal studies have clearly shown that a variety of solvents, including xylene, readily cross the placenta and that maternal inhalation of organic solvents results in neurodevelopmental deficits in their young[4]. Though the potential hazards of formalin and xylene have been researched and documented. This updated information is not reflected in the SDS. It is, therefore, up to the individual laboratory worker to research the chemicals she is working with to make the changes necessary to protect her child and to ensure that her occupational exposure does not influence her reproductive outcome.

Recommendations for Pregnant Histotechs

- Educate yourself on the potential reproductive toxicity and fetal developmental effects of the chemicals in their labs
- Review all SDS in the lab with the understanding that chemicals, such as xylene, which studies have shown to effect pregnancy may not have information listed under the Reproductive Toxicity section[2,4,5,18]
- Have others change reagents (while pregnant tech is not in the lab) or offer temporary transfer to safer jobs during pregnancy
- No exposure to xylene
- No exposure to hematoxylin
- No exposure to xylene substitutes or similar reprocessing solutions
- Limited (use respirator and proper PPE) to no exposure to formalin neutralizer powders
- Use respirator and proper PPE for any exposure to formalin (respirators must be worn to eliminate vapor inhalation- a charcoal mask will not protect you[7])
- Gross dissection of well-fixed specimens with a fume hood, respirator, and full PPE only
- Use respirator and proper PPE for any exposure to alcohol vapors
- Monitor the fit of PPE and modify as necessary as pregnancy progresses[10]
- Present your physician with the SDS, respirator information, air exchange rates, and the most recent PEL tests for xylene and formaldehyde in your lab

Recommendations for Supervisors

- Supervisors should education themselves on the potential reproductive toxicity and fetal developmental effects of the chemicals in their labs
- Review all SDS in the lab with the understanding that chemicals, such as xylene, which studies have shown to effect pregnancy may not have information listed under the Reproductive Toxicity section[2,4,5,18]
- Make a plan for pregnant workers and share information with employees regarding which jobs may be hazardous to pregnant workers
- Consider going Xylene free[2]
- Utilize air filters to reduce concentrations of chemicals[19]
- Request a health hazard evaluation, a free service from NIOSH that helps you fix any problems they find[11]
- Understand that OSHA PELs need to be updated
- Acknowledge that while studies regarding chemicals and pregnancy are difficult, more research is needed

References

1. Lewandowski, T. & Dodge, D. (2016). Windows of susceptibility: Do OELs really protect workers from reproductive and developmental effects? *Synergist, 3*. Retrieved from http://synergist.aiha.org/windows-of-susceptibility

2. Buesa, R., & Peshkov, M. (2009). Histology without xylene. *Annals of Diagnostic Pathology, 13,* 246-256.

3. Pidoux, G., Gerbaud, P., Guibourdenche, J., Thérond, P., Ferreira, F., Simasotchi, C. & Gil, S. (2015). Formaldehyde crosses the human placenta and affects human trophoblast differentiation and hormonal functions. *PloS one, 10* (7), e0133506. doi: 10.1371/journal.pone.0133506. eCollection 2015.

4. Khattak, S., K-Moghtader, G., McMartin, K., Barrera, M., Kenney, D., & Koren, G. (1999). Pregnancy outcome following gestational exposure to organic solvents: A prospective controlled study [Electronic version]. *JAMA, 281* (12), 1106-1109.

5. Public Health Statement for Xylene. (2007, August). Retrieved September 10, 2016, from http://www.atsdr.cdc.gov/phs/phs.asp?id=293&tid=53

6. Reproductive Health and the Workplace Solvents. (2015, February). Retrieved September 10, 2016, from http://www.cdc.gov/niosh/topics/repro/solvents.html

7. Reproductive Health and the Workplace Formaldehyde. (2015, February). Retrieved September 10, 2016, from http://www.cdc.gov/niosh/topics/repro/formaldehyde.html

8. OSHA Annotated Table Z-1. (2016, March). Retrieved September 10, 2016, from https://www.osha.gov/dsg/annotated-pels/tablez-1.html

9. Permissible Exposure Limits – Annotated Tables. (2016, March). Retrieved September 10, 2016, from https://www.osha.gov/dsg/annotated-pels/

10. Reproductive Health and the Workplace What Employers Should Know. (2015, February). Retrieved September 10, 2016, from https://www.cdc.gov/niosh/topics/repro/employers.html

11. The National Institute for Occupational Safety and Health (NIOSH) Health Hazard Evaluations. (2015, February). Retrieved September 10, 2016, from http://www.cdc.gov/niosh/hhe/

12. Reagent Alcohol 100%; SDS No. 100; Leica Biosystems: Richmond, IL, August 22, 2013.

13. Reagent Alcohol 95%; SDS No. 101; Leica Biosystems: Richmond, IL, August 22, 2013.

14. Eosin Y; SDS No. 133; Leica Biosystems: Richmond, IL, August 22, 2013.

15. 10% Neutral Buffered Formalin; SDS No. S1; BBC Chemical: Mt. Vernon, WA, October 21, 2014.

16. Hematoxylin; SDS No. 132; Leica Biosystems: Richmond, IL, August 22, 2013.

17. JFC Solution; SDS No. MW51408; Milestone Medical: Soriole (BG), Italy, February 2, 2004.

18. Xylene; SDS No. 110; Leica Biosystems: Richmond, IL, August 22, 2013.

19. Health Science Associates. (2004). *Air Filtration System Evaluation* (HSA Project Number: 04LA0268). Los Alamitos, CA: Health Science Associates.

20. Kneebone, S. (2016, July 1). Pregnancy in the histology lab [Msg 1]. Message posted to http://theblock.nsh.org/home