

Workplace Reproductive & Developmental Hazards

Editor's Note: ASSE is seeking to publish more occupational health-related articles in the coming year. Articles should address physical and psychological occupational health problems or best practices to eliminate them. In addition, articles on workplace violence, which may increase in the next year due to job and economic pressures, are welcomed. Please send articles or reprints (with permission granted) to the publication editor of your pertinent practice specialty or branch or to rheath@asse.org.

In May 2007, nearly 200 leading international scientists in the fields of environmental health, chemistry, biology, epidemiology and paediatrics examined the human health effects of developmental exposure to chemicals in the environment. Their conclusions, in the form of a published statement (Nordic Pharmacological Society, 2007), is a strong “call to action” warning that human health effects of developmental exposure to chemicals in the environment are real, serious and require prompt attention in research and prevention.

According to the Faroes Statement, “Prevention should not await definitive evidence of causality when delays in decision-making would lead to the propagation of toxic exposures and their long-term, harmful consequences.” The statement calls for a paradigm shift in science and public policy to encourage health interventions at the earliest stages of life where timing of chemical exposure is just as important as the magnitude of exposure.

The last decade has seen remarkable advances in the understanding of reproductive and developmental health. The National Research Council (NRC, 2000) reports that between 1995 and 2000, the number of new discoveries in the field of developmental biology and genomics were “staggering” and future discoveries were expected to be even more “explosive.” These new advances now allow a man to measure the quantity of his sperm with a home test kit or a pregnant woman to clearly see the development of her unborn child with advanced 4-D ultrasound. New discoveries and understandings are altering how reproductive and developmental health hazards should be addressed in the workplace. This article explores whether U.S. safety and health professionals are ready, willing and able to take action.

For the purposes of this article, *reproductive* means the process where a man or woman is capable of producing a child. *Developmental* refers to the stages of child development from conception to adolescence.

KEY QUESTION

Should U.S. employers provide their workers with a risk assessment for workplace reproductive and develop-

mental hazards? The answer to this question will have a profound impact on SH&E professionals who may be called on to conduct and communicate this risk assessment. The answer to the question is predicated upon answers to other questions. Is the assessment conducted to help protect the reproductive capacity of workers or to protect the developmental health of an unborn child (i.e., during pregnancy) or a worker's child (e.g., take-home toxics or breastfeeding)? Is there a regulatory obligation or legal duty to conduct the assessment? Is there a moral responsibility? Is there a business incentive? Have science and knowledge advanced sufficiently enough to perform a valuable assessment? And if the risk assessment is not conducted, what are the pitfalls? This article explores answers to these and other questions through the author's journey with this topic over the past decade.

SNAPSHOT OF ANSWERS

A snapshot of answers to these questions is as follows. U.S. employers have a tort duty (as opposed to no legislative requirement) to conduct and communicate workplace developmental risk to employees. If this activity is not conducted, it is difficult for an employer to prove it performed due diligence if there is a negligence claim (and there is a growing possibility of this) for work-related prenatal injury. Workplace prenatal injury claims (for a single claim) have reached the \$100 million level—big enough to get any company's attention.

The author has learned that the language in the introduction and the snapshot of answers above are contentious and controversial enough to warrant the following disclaimer: The author is not an attorney and the information in this article should not be viewed as legal advice. In all matters where workplace reproductive or developmental concerns are present, legal counsel competent in these matters should be sought.

DEFINITION OF CHILD

The limited scope of this article does not allow a thorough discussion of the various legal and social definitions of child. However, this article defers to two new risk assessment guidance reports that describe the scientific principles to be considered in assessing health risks to children. These reports are “*A Framework for Assessing Health Risk of Environmental Exposures to Children*,” issued by

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EPA in October 2006 and “*Principle for Evaluating Health Risks in Children Associated with Exposure to Chemicals*,” released in July 2007 as Environmental Health Criteria 237 from the World Health Organization (WHO). Both EPA and WHO reports define *child* and *children* as life stages that begin at conception.

DEMOGRAPHICS

The cited definition of child places a substantial burden on the workplace with regard to developmental exposures. While the concern for reproductive health of men is important, pregnancies hold a special concern because of its contribution to developmental health.

Over one-half of all U.S. children are born to working mothers and over 70% of U.S. women of reproductive age are in the workforce (McElhatton, 2003). However, all adult workers may now be considered to be of reproductive age due to advances in medical science and fertility treatments. For example, in recent years, a 90-year-old man fathered a child and a 66-year-old lady gave birth. Under the old concept, reproductive age is generally reported as between the age of 15 to 45 years for both men and women.

Approximately 4 million children are born annually in the U.S. Therefore, approximately 2 million of these children are born to working mothers. Due to pregnancies that were not carried to term, this number underestimates the number of women who may be pregnant while at work.

The length and type of exposures to pregnant workers have changed significantly over the past few decades. During 1961-1965, 35% of women worked within 1 month of giving birth. Latest census data (2008) shows that during 2001-2003, 64% of women worked within 1 month of giving birth. Women now hold jobs in all occupations—even those once thought of as the exclusive domain of men (BLS, 2007)—and 2.4 million women hold production jobs today. About 10% of construction workers are women. Three of every 10 manufacturing jobs are held by women. One in every 25 firefighters is a woman.

CONCERNS

Although most children are born healthy, there are concerns to having successful reproductive and developmental health outcomes. Concerns include (NRC, 2000):

- between 5% to 10% of couples are infertile;
- about 50% of all pregnancies are unsuccessful;
- major birth defects occur in 2% to 3% of newborns;
- minor developmental defects occur in 14% to 22% of newborns;
- autism spectrum disorders have shown a 10-fold increase over the last decade,
- preterm birth has increased 30% in the last 25 years;
- sperm counts are decreasing and male birth defects are on the rise;
- asthma, acute lymphocytic leukemia and brain cancer are also on the rise in children.

HAZARDS

All hazards, including chemical, biological, physical and psychological, may impact reproductive and developmental health. European guidelines on the assessment of the chemical, physical and biological agents and industrial processes considered hazardous for the safety or health of pregnant workers and workers who have recently given birth or are breastfeeding (Council Directive 92/85/EEC) include the following hazards and situations:

- mental and physical fatigue and working hours;
- postural problems connected with the activity of new or expectant mothers;
- working at heights;
- working alone;
- occupational stress;
- standing activities;
- sitting activities;
- lack of rest and welfare facilities;
- risk of infection or kidney disease as a result of inadequate hygiene facilities;
- hazards as a result of inappropriate nutrition;
- hazard due to unsuitable or absent facilities;
- shocks, vibration or movement;
- noise;
- ionizing radiation;
- nonionizing electromagnetic radiation;
- extremes of cold or heat;
- working in a hyperbaric atmosphere;
- biological agents;
- chemical agents.

COSTS

The costs for reproductive and developmental problems are enormous. Preterm birth alone is estimated to cost the U.S. \$26 billion a year in medical care and lost productivity.

Apportioning these costs to workplace exposures is a difficult challenge, but data are building in this regard. Consider, for example, the research article, “Work Activity in Pregnancy, Preventive Measures and the Risk of Delivering a Small-for-Gestational-Age Infant,” which appeared in the May 2006 issue of the *American Journal of Public Health*. The research, conducted in Quebec, Canada, found that the occupational conditions of night hours, irregular or shift-work schedules, prolonged standing, lifting loads, noise and high psychological demand combined with low social support, increased the risk for having a low birth weight (LBW) infant. The research concluded that “Elimination of these conditions before 24 weeks of pregnancy reduced the risks close to those of unexposed women.”

How much money may be saved if there was intervention to control the workplace conditions that increase the risk for an LBW infant? Costs of delivery and care for an LBW infant may range from \$10,000 to \$100,000 more when compared to costs for a child born of normal weight. LBW infants are more prone to mortality in their

first year of life. Chronic health conditions, including asthma, high blood pressure and poor cognitive development, have been associated with LBW infants. Chronic health problems can greatly increase a LBW infant's lifetime healthcare costs.

TIPPING POINTS

The social and political landscape for protecting children's health in the U.S. has changed dramatically within recent years. New social and legislative activities focus on child health protections beginning at preconception. An example of these changes is CDC's April 2006 "Recommendations to Improve Preconception Health and Health Care—U.S." This report advises all women to treat themselves as pregnant even if they do not plan to conceive. The reasons for these changes are complex but include advancements in science along with changes in political and legal views.

The first significant tipping point experienced by this author was when a writer from *USA Today* contacted him. The writer was developing a front-page story titled "Workers take employer to court over birth defects" for the paper's Feb. 26, 2002, issue. The article described the growing tort liability for workplace prenatal injuries. This author contributed his views to the article in part saying that U.S. employers generally shy away from the topic. Tim Fisher of ASSE contributed to the article stating, "This is a huge issue that will continue to grow in importance as more women move into jobs traditionally the domain of men." William DeProspero, a plaintiff lawyer representing families who filed lawsuits, was quoted in the article saying, "This is a very, very serious problem and it is the tip of the iceberg." In March 2004, the employer being sued settled the \$100 million claim (for one child) before it went to the jury.

The issue of children's health now includes workplace exposures to both parents prior to conception, exposures to the mother/unborn child during pregnancy and exposures during the early prenatal period when an infant is breastfed. The European Union (EU) issued guidelines for member states to develop legislation to address these exposures in 2000. Countries such as England now have clear laws in this regard. Government authorities in the U.S., such as NIOSH, have not issued any comparable guidelines. However, these exposures will be examined in the U.S. during the early stages of the National Children's Study (the study will examine environmental exposures to over 100,000 pregnant women and will follow their children to the age of 21) that received FY 2007 funding approval for implementation.

Global pressures are stimulating U.S. legislation to address reproductive and developmental health protection from workplace exposures. Legislative initiatives include the DOL's September 2006 ANPR for changes to the OSHA Hazard Communication standard to address global harmonization of chemical hazards. Expected changes to hazcom include lowering the threshold to



0.1% from 1% by product weight for reporting reproductive and mutagen hazards on safety data sheets (SDS) and include a new hazard category of "effects on or via lactation." Terms such as "may cause harm to the unborn child" or "may cause harm to breastfed babies" are expected to appear on U.S. SDS to conform to standardized risk phrases used internationally but predominantly used in the EU.

The EU Registration, Evaluation and Authorization of Chemicals (REACH) legislation is expected to have a dramatic impact on U.S. chemical manufacturers. REACH identifies carcinogens, mutagens and reproductive toxicants (CMR) chemicals to be of "very high concern." Reproductive toxicants are defined within REACH as those that "interfere with normal human development, either before or after birth, resulting from exposures of either parent or exposure to the developing offspring to the time of sexual maturation." REACH's "precautionary principle" approach when dealing with CMR chemicals and persistent bioaccumulative toxicants (PBTs) (i.e., chemicals are not safe until proven otherwise) is already altering world markets.

Mothers are an integral part of a new emerging market model, more so than an at-risk population. Richard MacLean describes the emerging market model in the April 2007 issue of *Environmental Protection* as characterized "by increased global (vs. U.S.-dominated) public concern over long-term EHS social responsibility issues."

An example of the new emerging market is Wal-Mart's October 2006 implementation of its "Preferred Chemicals Principles" for product ingredients. Wal-Mart implemented the principles to drive the development of more sustainable products "for mother, child and the

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environment.” The principles call on Wal-Mart suppliers to screen chemical ingredients in their products with the intent to eliminate selected CMR chemicals and PBTs. If suppliers do not eliminate some chemicals from their products, the products will not be sold in Wal-Mart stores. Wal-Mart is not alone in taking this approach, but its huge presence (more than 6,600 stores worldwide) gives it the clout to fundamentally alter how business is conducted globally.

Mothers, children and the environment are central to the modern view of disease causation, which considers that children (beginning at conception) are more vulnerable to environmental exposures and early-in-life exposures to environmental hazards increase the risk of acute illness and chronic diseases. EPA’s 2005 cancer risk guidelines (e.g., children under 2 years of age are 10 times more vulnerable to carcinogens than an adult, illustrates this new position).

Recent actions by market leaders such as Wal-Mart and EU legislation to take a precautionary approach with CMR and BPTs chemicals will change the role of mothers and fathers in addressing health concerns for new and future generations through greater transparency of chemical exposure risks at work or elsewhere. More than individual and industry action, however, is the monetary might of this issue. EU REACH is expected to have an enormous impact on the \$2.5 trillion global chemical industry. Innovest Strategic Value Advisors’ January 2007 report, “Cross-Cutting Effects of Chemical Liability from Products” clarifies the driving force of money. Innovest reports that shareholder resolutions on toxics in products reached an all-time high in 2006. Part of the drive includes actions of investing organizations representing over \$22 billion in assets under management to seek better disclosure from companies regarding capital at risk to toxics, such as CMR chemicals, in products.

In 2005, the U.S. was next to last, just ahead of Latvia, for having the worst infant mortality rate among the world’s 33 major industrialized nations, according to Save the Children, a global nongovernmental organization. There are many reasons why the U.S. fares so poorly in regard to infant mortality. One reason is that the U.S. healthcare system greatly favors treatment over prevention.

Social concerns for children are additional tipping points. In February 2007, the United Nations Children’s Fund’s (UNICEF) Innocenti Research Center released Report Card 7, “An overview of child well being in rich countries.” The report card ranked child well being in six categories. In the health and safety category, the U.S. ranked at the very bottom among 25 rich countries. Components for the health and safety rank were child health at age 0-1, preventive health services and safety (i.e., deaths from accidents and injuries).

The U.S. also fared poorly in other categories. In the behaviors and risks category, the U.S. was next to last. In the measurement of “relative income poverty” (i.e., percentage of children in households with income less than

50% of the median), the U.S. was so outside the norm for last place that it did not seem to belong at all with the ranking of rich countries. The poverty measurement was perplexing. The U.S. was ranked among the top five countries for having a child live with an employed parent. Did the measurement imply that some working parents in the U.S. had very meager incomes?

One of the stated purposes of UNICEF’s report card is to “stimulate discussion and development of policies to improve children’s lives.” This raises the question, how does the U.S. measure up? The Institute for Health and Social Policy at McGill University addressed that very question in the February 2007 report, “The Work, Family and Equity Index.” The report compared public policies for working families in 177 countries. A key finding of the report states, “When it comes to ensuring decent working conditions for families, the latest research shows many U.S. public policies still lag dramatically behind all high-income countries, as well as many middle-and low-income countries.”

Lesotho, Liberia, Papua New Guinea and Swaziland—you may not be familiar with these countries but add the U.S. to the list. These are the only countries in the world that “do not guarantee any paid leave for mothers in any segment of the workforce,” according to the McGill study. Other findings in the equity index report that may reflect poorly on U.S. social policies are:

- 66 countries ensure that fathers either receive paid paternity/parental leave. The U.S. has no guarantees in this area.
- 107 countries protect working women’s right to breastfeed; in 73 of these countries, breaks are paid. The U.S. does not guarantee the right to breastfeed.
- 137 countries mandate paid annual leave. The U.S. does not require employers to provide paid annual leave.
- 134 countries have laws that fix the maximum length of the work week. The U.S. does not have a law for the maximum length of the work week or a limit on mandatory overtime per week.
- 126 countries require employers to provide a mandatory day of rest each week. The U.S. does not guarantee workers this 24-hour break.
- 145 countries provide paid sick days for short- or long-term illness. The U.S. provides only unpaid leave for serious illness through the Family and Medical Leave Act (FMLA), which does not apply to all workers.

The McGill report claims that lack of social policies, such as not providing paid leave for childbearing or no paid leave for illness and family care, eventually impacts the health and well being of children. This goes back to the UNICEF report, which indicates that the U.S. ranks last among rich countries in children’s health and safety.

It is difficult to have policies without politics and the politics on these issues are heating up. Is the UNICEF report correct in ranking U.S. children’s health and safety so low? The U.S.’s National Children’s Study would answer this question. Former President George W.



Bush's proposed federal FY 2007 budget did not provide any funding for the study and, in an unusual move, went further to order that the study be shut down. There is general agreement among politicians that the budget process should avoid earmarking funds for any special projects, but in the final federal FY 2007 budget, NCS was earmarked to receive all funds for which it asked.

Employed women with children or employed women who plan to have children are disproportionately affected by lack of social and private policies to address their needs as primary caregivers for their children. WHO's 2006 report, "Gender equality, work and health: A review of the evidence" is just one of many recent studies that supports this position.

"Mom's Mad—And She's Organized" is the title of an article that appeared in the Feb. 22, 2007, issue of *The New York Times*. This article indicates that U.S. mothers who hold jobs outside of the home are in larger numbers than ever before and they are not happy. They feel that there should be more social and private policies to address their special needs in the workplace. However, unlike years past, these moms are banding together and have considerable political clout.

MomsRising, established in May 2006, is one example. Membership in the group has been growing at over 10,000 per month. In September 2006, Ted Kennedy, Christopher Dodd, Hillary Clinton and Barack Obama spoke at an event in Washington to support Moms Rising's causes including promotion of the book and documentary film "The Motherhood Manifesto."

Ted Kennedy's proposed Healthy Families Act and proposed changes to FMLA from Christopher Dodd (who authored FMLA in 1993) are examples of new legislation geared toward fairer treatment of working mothers. Disease prevention and improving science to curb rising healthcare costs are also goals of the current administration. Given the demographics of workplace reproductive and developmental hazards, along with other information

covered in this article, the workplace seems like a strong potential target for disease prevention.

ARE SH&E PROFESSIONALS READY TO ACT?

U.S. employers have generally sidestepped directly addressing reproductive and developmental risks from workplace hazards. Part of the reluctance to address these risks was a misreading by most employers of the 1991 U.S. Supreme Court's decision in *UAW v. Johnson Controls* outlawing "fetal protection programs." The decision centered on employee discrimination concerns and never intended for employers to abdicate responsibility on workplace reproductive hazards, primarily to a pregnant employee or to employees planning a pregnancy.

A hands-off approach when dealing with pregnant employees can also be seen in the U.S.'s official response to the International Labor Organization's (ILO) Maternity Protection Convention (No. 183) and Recommendation (No. 191) of 2000, which calls for risk assessments for pregnant workers. The U.S. informed ILO that, in regard to maternity protection, "The (U.S.) government should not decide whether the (work) position held by a woman is prejudicial to her health or that of her child. That decision should be made by a woman in consultation with her physician. Additionally, a woman should not be prohibited from making her own decisions as to whether to work and when to work."

The U.S.'s approach to risks faced by pregnant employees goes against the tide of other nations' actions. As of June 2006, 92 countries around the globe, which include all countries in the European Union, have established legislative health protections for pregnant employees. Health protections include provisions on work time, breastfeeding and/or avoiding dangerous or unhealthy work. For example, in the U.K., legislative health protections for pregnant employees require employers to conduct and communicate a risk assessment for workplace pregnancy hazards before an employee is pregnant. If an

employee voluntarily declares that she is pregnant, the employer then must tailor a risk assessment for that employee. Based on the findings of this risk assessment, the employee's physician may then provide specific guidance for a healthy pregnancy.

It is the author's opinion that in regard to workplace hazards, it is unreasonable to expect that pregnancy risk decisions should only be made by a woman in consultation with her physician, unless the physician conducts an on-site inspection of the workplace, which rarely happens. The employer, through its

Fetal Growth Studies

Many epidemiological studies have observed a significant effect of some occupational conditions on fetal growth, including long hours of work, shift work, prolonged standing, lifting loads and high psychosocial stress. However, some studies showed no effect. In a number of studies, limitations related to the measurement of exposure may have led to underestimation of the true effect. These limitations include having a reference group that includes moderately exposed workers, measuring occupational conditions on the basis of job title, and failing to take into account changes in occupational conditions that occur during pregnancy. The latter limitation is important because previous studies have suggested that workers most heavily exposed during early pregnancy are more likely to experience a reduction in exposure over the course of the pregnancy or to take earlier antenatal leave.

For more information, visit <http://www.ajph.org/cgi/reprint/96/5/846>.

superior knowledge of workplace hazards, is a critical interface between a pregnant employee and her health-care providers.

However, the effect of the *Johnson Controls* decision is that U.S. employers are believed to shy away from the issue, which has led to occupational safety and health practitioners in the U.S. not acquiring sufficient awareness or knowledge to successfully manage workplace reproductive and developmental hazards. It is hypothesized that these safety and health practitioners now have low self-efficacy in this regard. No qualified studies specifically measure this self-efficacy.

The author has conducted professional development conferences (PDCs) annually at the AIHce conferences since 2004 on "Implementing Reproductive and Developmental Health Programs." The experience is that participants have only a cursory understanding of the topic. Participant acceptances of the topic and issues presented in this article are high. The 2006 AIHce in Chicago ranked number two (out of 72 PDCs) and the 2007 AIHce in Philadelphia ranked number four (out of 69 PDCs).

CONCLUSION

U.S. safety and health professionals should complete a risk assessment for workplace reproductive and developmental hazards in advance of growing litigation, potential legislative rules or business imperatives. A major driving factor for business action is the threat of litigation that may occur if a child is born with prenatal injuries caused by workplace exposures. These tort claims are not covered by workers' compensation and may impose a multimillion dollar liability upon an employer. ☺

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Daniel S. Markiewicz, M.S., CSP, CIH, CHMM, is president of Markiewicz & Associates Ltd. in Toledo, OH. He may be reached at dan.markiewicz@gmail.com or (419) 356-3768.

Pandemic Planning

A workplace should keep informed, develop a plan and implement public health programs are some of the tips offered to businesses and members in an ASSE article, "Avian Flu: Infection Control Guidelines." While there is no one-size-fits-all solution, it is suggested that communities, workplaces and individuals should:

- develop and implement preparedness plans as one would for other public health emergencies;
- participate and promote state and community public health efforts and implement prevention and control actions recommended by public health officials and providers who can supply information about the signs and symptoms of a specific disease outbreak and to communicate this information with employees;
- participate in influenza vaccination programs annually;
- participate in annual health promotion programs to prevent airborne, bloodborne, waterborne, food borne and contact types of diseases and infections if you are a healthcare worker, school teacher, work in protecting public safety, prison population and an emergency responder;
- adopt business and school practices that encourage sick employees/students to stay home;
- anticipate how to function with a significant portion of the workforce/school population absent due to illness or caring for ill family members;
- practice good health habits;
- stay informed about pandemic influenza and be prepared to respond;
- use national and local pandemic hotlines that will be established in the event of a global influenza outbreak; and consult the White House web site for national and international information.

Additional Resources: Contact U.S. Centers for Disease Control and Prevention (CDC) at <http://www.cdc.gov/flu/avian/index.htm>; the World Health Organization, http://www.who.int/csr/disease/avian_influenza/en/; your state or local health department (<http://www.cdc.gov/mmwr/international/relres.html>) to notify them of any symptomatic employees or suspected exposure incidents. Also refer to the White House's web site, <http://www.pandemicflu.gov>; and OSHA's "Guidance for Protecting Workers Against Avian Flu" at <http://www.osha.gov>. For more information, visit www.asse.org/newsroom/safetytips/pandemic-flu.php.