

Maternal Occupational Exposure and Oral Clefts in Offspring

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ABSTRACT

Background:

Oral clefts are essentially openings in either the roof of the mouth (cleft palate) or openings from the upper lip to the nose (cleft lip with or without palate) [\[1\]](#). They result from failure of the tissues of the lip and/or palate to fuse while developing in the mother's womb.

A cleft lip with or without cleft palate is the second most common birth defect in the United States, affecting 1 in every 940 births. [\[2\]](#) The rates are highest among Asians and Native Americans, and lowest among African American children. In total, the country sees about 4,440 cases per year, and most babies get corrective surgery within one year. Additional surgeries, as well as speech therapy, dental treatments, and more may be necessary as the children grow older.

However, people without health insurance may not have the means to pay for the \$5,000-\$20,000 procedures, and are at risk of suffering lifelong consequences with their oral clefts. [\[3\]](#) This can include a range of issues, including those with feeding, speech, infections of the ears or teeth, and of course emotional well-being.

Previous studies suggest that women who were exposed to solvents and pesticides in the periconceptional period (roughly 2-3 months before and after conception and early pregnancy [\[4\]](#)) were more likely to give birth to children with oral clefts. Less is known about the effect of maternal workplace exposure to metals, dust, and gases and fumes on development of oral clefts.

Objective:

To examine the association between maternal workplace exposure to primarily solvents and pesticides (as well as metals, minerals, organic dusts, and gases and fumes) during the periconceptional period and risk of oral clefts in their children.

Methods:

In order to achieve the objective, the Netherlands-based study compared children with and without oral clefts based on their mother's exposures in the workplace during the periconceptual period. This was done by analyzing a population-based birth defects registry called the "Eurocat" (European Registration of Congenital Anomalies and Twins database of the Northern Netherlands). The Eurocat tracked (with permission of the parents) birth abnormalities in a few provinces for decades, and also tracked relevant parent information, such as where they worked.

Results:

A higher percentage of the mothers of the children with oral cleft had workplace exposure to all agents (solvents, pesticides, metals, etc.) than did the mothers of children without oral cleft. The most common exposure to solvents was of “other solvents” (as opposed to aromatic solvents in things like paint or chlorinated solvents that may have been found in cleaning products) – especially by the women working in healthcare.

There was greater odds of a child developing an oral cleft with maternal workplace exposure to pesticides and dust. The odds related to dust exposure and to fungicides (pesticides that target fungi) were significant. Further analysis between sexes of the offspring showed that there was also increased risk for male infants exposed to “other solvents” and for female infants exposed to mineral dust while in the womb.

Conclusion:

The study findings indicate that maternal workplace exposure to agents such as pesticides and dust may be risk factors for their babies to be born with oral clefts. Larger studies will be needed to validate this finding.

POLICY IMPLICATIONS

Women working in healthcare and agriculture seem to have had the most exposure to the harmful agents tested in the study. Employers and workplaces in these fields need to adopt and enforce strong protections to minimize employees', especially pregnant women's, contact with different pesticides, metals, solvents, dust, etc. Fortunately, the United States has a legal principle called “right to know” – that an individual has a right to know the chemicals to which they may be exposed in their daily living (“Community right to know”) and workplace (“Workplace right to know”). In the workplace, this is enforced by the Hazard Communication standard of OSHA, or the Occupational Safety and Health Administration. This standard requires chemical manufacturers and importers to evaluate the hazards of their chemicals and prepare labels and safety data sheets to convey the hazards and protective tips. OSHA also requires employers with these toxicants in the workplace to make these data sheets available to employees and to train workers to handle the toxicants appropriately and to protect themselves effectively. [\[5\]](#) However, studies show that not only do material safety data sheets have an overall significant under-use by employers, but that even when they are used, less than half (37% in the research cited) actually have accurate health effects data – with chronic health effects being the most inaccurate [\[6, 7\]](#).

The EPA set forth the agricultural Worker Protection Standard (WPS) to reduce pesticide poisoning and injury for workers, which was revised in 2015, and the revisions just became implemented earlier this year. [\[8\]](#) Although the new changes (such as annual training rather than every 5 years, a minimum age for handling, etc.) are steps in the right direction, there are still some barriers to many workers gaining the knowledge and tools to reduce their exposures. Many workers, especially in agriculture, only speak English as a second language, and may not fully understand why certain chemicals are hazardous. Currently, the WPS does not require safety data sheets to be printed in Spanish, the primary language many minorities in this line of work speak. Thus, even if information is available, it may not be truly

accessible. [9] This issue of environmental justice needs to be addressed so that thousands more of our agricultural workers can obtain appropriate safety information in order to best protect themselves and their families.

As a whole, more needs to be done to ban particularly dangerous substances. There are many toxicants in and out of the workplace for which we have sufficient evidence of harm, but that are not being regulated nor enforced adequately. In addition, much more effort is needed to provide accurate and accessible information to all workers about their potential exposures.

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