Prenatal exposure to ethylene oxide associated with lower birth weight and head circumference in newborns

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A study led by the Barcelona Institute for Global Health (ISGlobal) provides new evidence on the adverse effects of prenatal exposure to

ethylene oxide (EO) on fetal development. The results, published in *Epidemiology*, show that increased EO exposure in utero is associated with a reduction in birth weight and head circumference in newborns.

Ethylene oxide is a chemical used in various industrial processes and in hospitals, and is known for its mutagenic and carcinogenic properties. Human exposure to EO is mainly through inhalation of tobacco smoke and air pollution produced from various household products, including cleaning and personal care products.

Workers in the health care and chemical industries are particularly exposed to this substance, which is commonly used in sterilization processes. Previous studies have found that women exposed to higher levels of EO at work during pregnancy had a higher risk of miscarriage and premature birth than those with lower exposure.

This new study focused on pregnant women and newborns in the general population, rather than a specific population with known high levels of EO exposure. The research team looked at the levels of EO hemoglobin (Hb) adducts in the cord blood of 1,106 newborns from five countries: Greece, Spain, Norway, UK and Denmark.

This measurement provides valid information on the amount of EO the fetus was exposed to during the last three months of pregnancy, which may help to better understand potential adverse effects on fetal development and birth outcomes.

The study used data from the NewGeneris project, which aimed to study genotoxic exposures in the environment on children's health by measuring several biomarkers in cord blood. Information on birth weight , head circumference, sex and gestational age was obtained from maternity records.

Higher exposure, lower birth weight and smaller head circumference

The results of the study showed that median levels of EO-Hb adducts in the umbilical cord were higher in smoking mothers compared to non-smoking mothers. Higher levels of hemoglobin adducts were associated with lower birth weight. Specifically, mean birth weight decreased by 3.30 grams with each 10 pmol/g increase in hemoglobin adducts. Increasing levels of hemoglobin adducts were also associated with a decrease in head circumference.

"Reduced head circumference has been linked to delayed neurodevelopment, and reduced birth weight increases the risk of cardiovascular disease, type 2 diabetes mellitus and osteoporosis," says Barbara Harding, ISGlobal researcher and first author of the study.

The team found no evidence of an association between EO Hb adduct levels and the risk of being small for gestational age (SGA), a condition that can compromise a baby's short and long-term health.

"The study results highlight the importance of addressing EO exposure in both occupational and non-occupational settings. Policy changes to reduce EO exposure in vulnerable populations, such as women of childbearing age, could protect fetal health and improve birth outcomes," says Manolis Kogevinas, ISGlobal researcher and senior author of the study.

More information: Harding BN, Ethylene oxide hemoglobin adducts in cord blood and offspring's size at birth: The NewGeneris European Cohort Study, *Epidemiology* (2024). DOI: 10.1097/EDE.0000000000001767

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