

TITLE

Outdoor Formaldehyde and NO₂ Exposures and Markers of Genotoxicity in Children Living Near Chipboard Industries

AUTHOR(S)

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ABSTRACT

Background:

Industrial air pollution is a serious public health hazard. Industrial wood manufacturing in the chipboard production process commonly uses urea-formaldehyde resins, which may release formaldehyde into the atmosphere. Formaldehyde has been classified as a known human carcinogen. A variety of combustion byproducts may also be generated from wood waste incineration and heavy traffic, which include nitrogen oxides (NO_x), carbon monoxide, and volatile organic compounds. Previous evidence has documented increased respiratory symptoms and hospitalizations in children who live near the largest chipboard manufacturing factories in Viadana, Italy.

Objective:

Researchers conducted a study to evaluate the association of outdoor exposure to formaldehyde and nitrogen dioxide (NO₂) with markers of early genotoxic damage in oral mucosa cells (cells of the mucous membrane lining the inside of the mouth) of randomly selected children (6-12 years of age) living in Viadana.

Methods:

A baseline questionnaire was distributed to participants to determine children's health and risk factors. Parents also collected mucosa cell samples by gently brushing the inside of both cheeks of the children with a cytology brush. The study authors evaluated DNA strand breaks and nuclear abnormalities in the cells, and conducted passive air sampling at 62 sites in the district to monitor outdoor levels of formaldehyde and NO₂. The mean annual concentrations of formaldehyde and NO₂ estimated at the participants' home addresses served as estimates of the children's outdoor residential exposures to the pollutants.

Results:

Researchers found that children living near (defined as less than 2 kilometers from chipboard industries) had the highest average exposure to formaldehyde and NO₂. They also found that exposure to those pollutants was associated with several markers of genotoxicity in the children's mucosa cells.

Conclusion:

This study adds to the evidence that children who lived closer to big chipboard industries had more asthma-like symptoms, irritative symptoms of the eyes and airways, and hospitalizations for respiratory diseases than children who lived farther away. It documents statistically significant associations between estimated residential outdoor levels of formaldehyde and NO₂ and markers to genetic response in oral mucosa cells. These findings add to the consensus about potential adverse effects of industry-related exposures in the Viadana district.

POLICY IMPLICATIONS

In the US, President Obama signed the Formaldehyde Standards for Composite-Wood Products act in 2010, which adds a Title VI to the Toxic Substances Control Act (TSCA) to limit formaldehyde emissions from composite wood products. The Environmental Protection Agency (EPA) proposed two rules to protect the public from the risks associated with exposure to indoor formaldehyde emissions from composite wood products and finished goods containing these products that are sold, supplied, offered for sale, manufactured, or imported into the US. These proposed rules were issued in 2013 and are not yet final.

There are no National Ambient Air Quality Standards (NAAQS) for outdoor formaldehyde emissions in the US. NAAQS are put in place to provide protection for the nation's public health and the environment, and are set and revised by the EPA with authority from the Clean Air Act. NO₂ is regulated under the NAAQS: the NO₂ NAAQS were implemented in 1971 and amended slightly in 2010.

To ensure that children who live near any facilities that produce pollutants such as NO₂ and formaldehyde do not experience detrimental health effects, the EPA should propose rules to limit outdoor pollution levels for formaldehyde. The NO₂ NAAQS is overdue for revision to assure that it is based on current science on health effects of vulnerable populations, including children. Additionally, in industrial areas, emissions of formaldehyde, NO₂, and similar pollutants should be assessed, evaluated, and, as needed, limited to ensure that children in these communities are not being exposed to levels of pollution that may incur genotoxic damage or other harm to health and development.

References:

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Article available in [Environmental Health Perspectives](#).

KEY WORD(S)

Formaldehyde, NO₂