



## Occupational Health: Why the Environment Matters

Occupational health is a specialty that strives to keep people safe and well in the workplace. Work can affect physical, mental, and social well-being in many ways.

Different jobs carry more risk than others. Environmental hazards for some workers include exposure to chemical compounds, heavy metals, poor air quality, or extreme heat or cold.

### Learning how the environment affects health

Chronic diseases, such as cancers and cardiovascular disease, may result from multiple and varied environmental exposures over time, as well as interactions among those exposures and genes.

The **exposome** is the sum of all environmental exposures and the body's response to those exposures across the lifespan. Environmental factors can be external to the body, such as chemical pollutants, or internal, such as stress. The National Institute of Environmental Health Sciences (NIEHS) supports research that will result in a complete characterization of the exposome, which may help develop ways to reduce harmful exposures.

**Exposure science** is the study of contact with environmental factors and their effects on the human body.

### What is NIEHS doing?

With funding and support from NIEHS, scientists contribute to the body of evidence on how environmental factors may affect occupational health. Examples from this research follow.

#### Agricultural workers

NIEHS partners with the National Cancer Institute in the Agricultural Health Study, which began in 1993 and has included more than 89,000 farmers and their spouses in Iowa and North Carolina. It studies links between the agricultural environment and the health of farmworkers. Farmers have unique work-related exposures such as herbicides and insecticides, animals, and dusts, as well as risks from operating machinery.

Among 38 pesticides studied, researchers found six were associated with increased risk of renal cell carcinoma, the most common form of kidney cancer.<sup>1</sup> Atrazine, a widely used herbicide, was associated with diminished kidney function and end-stage kidney disease in people who applied the chemical.<sup>2</sup>



The study continues to evaluate how exposure to certain agricultural chemicals might influence the development of kidney disease and kidney cancer.

Pesticide exposure may also contribute to the loss of sense of smell in older people. Study participants who reported high pesticide exposure were more likely to also report a loss of sense of smell 20 years later.<sup>3</sup> The study also suggests prevention strategies, such as a quick cleanup with soap and water after pesticide exposure, to lessen risk.

#### Light and working at night can affect workers

Patterns of light exposure directly affect health by altering circadian rhythms.<sup>4</sup> People who are exposed to electric light at night by using electronic devices, or living in highly lit urban locations, or working night shifts could be affected.

Night shift work is a complex exposure scenario that includes, but is not limited to, light at night. Being awake at night and asleep during the day may be linked to metabolism disruptions, which may help explain disorders such as obesity and diabetes in people who work at night.<sup>5</sup>

After conducting cancer assessments on those who work at night, researchers found that persistent night shift work that disrupts circadian rhythms can cause breast cancer in women.<sup>6</sup>

#### Office workers

Most Americans spend the majority of their time indoors.<sup>7</sup> Buildings can influence health due to air pollution of both outdoor and indoor origin and ventilation factors in them. NIEHS-funded researchers studied office workers to see if cognitive function was affected by indoor air quality. They found that higher indoor air pollution and carbon dioxide levels were significantly associated with decreased performance.<sup>8</sup>

## Welders

Welders work with various metals, and resulting fumes may put them at increased risk of adverse health effects, especially cancer and respiratory problems. Welders exposed to manganese, a component of metal alloys, may develop Parkinson's disease symptoms, and the symptoms may get worse the more they are exposed over time.<sup>9</sup> A subsequent study provided clues about the biological processes that link manganese exposure and the onset of Parkinson's-like symptoms.<sup>10</sup>

## Chemicals of concern

Here are a few chemicals that NIEHS research has linked to adverse health effects in occupational settings.

**Formaldehyde**, a naturally occurring compound with a distinct odor, is known to be a human carcinogen. Occupational exposure can happen at workplaces that use this chemical, such as pathology departments, funeral homes, textile processing, and hair salons.<sup>11</sup> Materials containing formaldehyde, such as pressed wood products, can release it as a gas into the air.

**Hexavalent chromium compounds** are used in a variety of industrial processes and are known to be human carcinogens. Most occupational exposure to chromium compounds is through inhalation or skin contact.<sup>12</sup> Occupations associated with exposure include stainless steel welding, chromate production, and chromium plating. Odorless and tasteless, these compounds are also found in air, water, soil, and food.

**Polycyclic aromatic hydrocarbons (PAHs)**, a group of more than 100 chemicals, are common byproducts of combustion. Workers who use or produce petroleum or coal, or burn organic material, might be exposed to PAHs. The National Toxicology Program states that 15 types of PAHs are reasonably anticipated to be human carcinogens.<sup>13</sup> The federal government has set limits for workplace exposure.<sup>14</sup>

**Trichloroethylene (TCE)**, a colorless liquid, is known to cause kidney cancer in humans.<sup>15</sup> Exposure occurs in workplaces that produce or use this compound as a degreaser or solvent. People are also exposed by drinking water and breathing air contaminated with TCE.

## Programs at NIEHS

The **Occupational and Inhalation Exposures Program** studies airborne exposures in a variety of workplace settings.<sup>16</sup> Health effects studied range from mild respiratory conditions to progressive, irreversible diseases, and even fatalities. Substances studied include asbestos,  $\alpha$ -pinene, and mold.

The **Worker Training Program** provides grants to labor-based health and safety organizations, academic institutions, and other nonprofit organizations to deliver training to workers who may face a hazardous work environment. Occupations addressed by the program range from environmental cleanup to construction to health care and first responders. Find information on available training: <https://niehs.nih.gov/careers/hazmat>.

## Interagency coordination

The **National Toxicology Program (NTP)**, an interagency partnership within the U.S. Department of Health and Human Services administered by NIEHS, provides the scientific basis for programs, activities, and policies that promote health or lead to disease prevention. Part of NTP, the **National Institute for Occupational Safety and Health**, an agency of the Centers for Disease Control and Prevention, conducts research and makes recommendations to prevent work-related injury and illness. These programs coordinate and conduct research to improve understanding of health effects from occupational exposures, such as chemicals in asphalt paving. Scientific evidence discovered through the partnership can inform improved safety guidelines for workers and other public decision-making. Learn more: <https://ntp.niehs.nih.gov>.

NTP produces the congressionally mandated, science-based **Report on Carcinogens**. Visit: <https://ntp.niehs.nih.gov/whatwestudy/assessments/cancer/roc>.

For more information on the National Institute of Environmental Health Sciences, visit <https://niehs.nih.gov>.

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