Construction Exposure Profiles:

Paints

PROVINCIAL BUILDING & CONSTRUCTION TRADES COUNCIL OF ONTARIO

Paints can either be solvent or water-based and contain pigments, binders (resins) and other additives. Pigments are used as colouring agents and increase durability and provide corrosion protection. Modern paints use resins and drying oils as binders. Resins can provide corrosion resistance, waterproofing, and other weather resistant coatings that can coat steel, wood, concrete structures, and facades.

Additives give special properties to paints, such as preventing bacterial growth, speeding up the drying process, or inhibition of corrosion. Nanoparticle additives, which were more recently added to paints, have a variety of properties like scratch resistance, hardness, gloss, and stability but there is limited research on the safety of paints containing nanoparticles.

Paints can contain harmful chemicals such as alcohols, cadmium compounds, chromium compounds, coal-tar and asphalt, isocyanates, lead compounds, nickel, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), silica and various volatile organic compounds (VOCs) such as formaldehyde, benzene, and glycol ethers. In the past, asbestos was used as a filler and arsenic was used as an anti-fouling agent in paint which may still exist in older buildings.

Waterborne paints contain lower levels of toxic chemicals and low-VOC and have been widely used in the construction industry. Over the years, solvent content in other paints has been reduced to an extent that VOC emission levels are similar to that of waterborne paints. Powder coatings are applied to surfaces by spraying and are cured with heat or ultraviolet light. They do not contain solvents but contain all other paint elements (pigments, binders, and additives) in a powdered form.

Health Effects

Workers are primarily exposed when they breathe in paint vapours or when paint comes in contact with skin or eyes. Paint can also be unintentionally ingested when workers have traces of paint left on their hands.

Painters are at an increased risk of bladder and lung cancer. It is difficult to determine if the increased risks of cancer are due to the contents in paint, other hazards in the work environment, or a combination of the two factors. Individually, many chemical additives and solvents in paint can cause cancer. Painters may be at increased risk of mesothelioma from asbestos exposure through paint or other sources in their work environment.

Some chemicals in paints can cause dermatitis, asthma, fertility problems, and liver, kidney, or neurological diseases. Temporary acute effects may include coughing, wheezing, headaches, nausea, and irritation of the eye, skin, and respiratory system.

Examples of materials commonly found in paint are shown in Table 1 on the following page. Many other chemicals used as surfactants, driers, thickeners, preservatives, plasticizers, biocides, anti-skinning agents, corrosion inhibitors, and light stabilizers may also be present in paint. It is important to review the material safety data sheet to understand the ingredients and health effects of each paint.

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Table 1. Selected materials in paints and their health effects

Material	Use in paint	Known health effects
Alcohols, aliphatic	Solvents	Eye, nose, and skin irritation Headache, nausea, vomiting, unconsciousness
Aromatic hydrocarbons (e.g. benzene, toluene, xylene)	Solvents	Eye, nose, and skin irritation (including dermatitis) Kidney and liver damage, dizziness, headaches, memory loss, and other neurological effects Benzene causes acute myeloid leukemia and some evidence for chronic lymphocytic leukemia, multiple myeloma, and lung cancer
Cadmium compounds, chromium and chromium compounds	Pigments	Cadmium has a negative effect on the kidneys and bones. Inhalation can cause lung cancer and possibly prostate, kidney and bladder cancers Hexavalent chromium can cause shortness of breath, coughing, bronchitis and other respiratory effects. Hexavalent chromium causes lung cancer
Coal tar and asphalt	Special waterproof coatings in ships, tanks, pipes	Eye, respiratory tract, and skin irritation Skin and scrotal cancer with some evidence for leukemia, kidney, bladder, and digestive tract cancers
Formaldehyde	Amino resin varnishes, biocide (water-based paints)	Eye, nose, skin, and airway irritation Long-term exposure linked to nose and throat cancers and leukemia
Glycols (e.g. ethylene glycol)	Polyester resins, water-based paints	Narcosis, pulmonary edema, severe liver and kidney damage Long-term exposure can cause neurological and blood effects such as fatigue, nausea, tremor, and anemia
Isocyanates	Two-component polyurethane resins	Eye, nose, throat, and skin irritation Occupational asthma and is a potential carcinogen
Lead compounds	Primers, pigments, driers	Abdominal pain, headache, tiredness, memory loss Long-term symptoms may affect kidneys, heart, brain, immune system, reproductive system, lungs, liver, and eyes
Nickel	Pigment	Contact dermatitis, asthma, chronic bronchitis, decreased lung function, immunological and renal effects May cause lung cancer
Polychlorinated biphenyls	Plasticizers	Skin irritation and high exposure levels can lead to liver damage Melanoma (a type of skin cancer) and may cause non-Hodgkin lymphoma and breast cancer
Silica, crystalline	Filler, sand-blasting operation	Chronic obstructive pulmonary disease and rheumatoid arthritis Silicosis and lung cancer
Styrene	Polyester resins	Eye, skin, and throat irritation Central and peripheral nervous system effects, hearing problems, and dermatitis May cause cancer with some evidence for increased risk of blood cancers (e.g., myeloid leukemia)
Titanium dioxide	Pigment	Eye, nose, throat, and skin irritation May cause cancer

PROVINCIAL BUILDING & CONSTRUCTION TRADES COUNCIL OF ONTARIO

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Exposure Sources and Construction Trades

Exterior house paints, interior paints, masonry paints, and waterproof paints are examples of types of paints used in construction trades. While exposure to paint is highest in painters, other building trades workers can also be exposed when working near painters such as during surface preparation (ex. sanding and paint stripping), paint application, and drying.

Occupational Disease Risks

Painters, paperhangers and related occupations had a 39% increased risk of lung cancer and 14% increased risk of bladder cancer compared to all other workers in the Occupational Disease Surveillance System. These workers also had a 12% increased risk of asthma and 13% increased risk of dermatitis compared to all other workers.

Prevention

There is no general occupational exposure limit for paint in Canada, however there are limits for specific chemicals that may be in paint, such as formaldehyde or benzene, which can help reduce exposure. As paint content can vary greatly between type of paint and brand, it is important to read each material safety data sheet carefully to understand the contents of the paint and potential health effects. Workers should be aware that paint purchased through retail outlets lack material safety data sheets.

Although elimination of paint is generally not feasible, less hazardous types such as waterborne paints or isocyanate-free alternatives can be used. Other methods such as use of a brush or roller instead of spraying the paint could also reduce the amount of paint particles and solvents released into the air. Engineering controls may include using enclosed barriers to prevent other workers from being exposed and improving ventilation inside the work area to remove fumes/dusts and introduce fresh air. There are administrative controls that can also help reduce exposure, such as ensuring that there are warning signs specifying paint work is underway, policies to keep paints in tightly closed containers when not in use to reduce unnecessary solvent evaporation, appropriate handwashing facilities and policies, and scheduling shift work so that there are fewer workers exposed to tasks involving painting. Finally, personal protective equipment like properly fit-tested respirators, eye protection, gloves, and coveralls can provide protection for workers.

As there are various chemicals in paint that can be hazardous to workers, it is important to be aware of the composition of new paint and of existing hazards in old paint. This can help guide workplaces to reduce paint exposure and better protect workers.

This profile was prepared by the Occupational Cancer Research Centre in collaboration with the Ontario Building Trades Council with funding from the Ontario Ministry of Labour, Immigration, Training and Skills Development.

OCRC Occupational Cancer Research Centre

Resources

Infrastructure Health & Safety Association - Occupational Health Risks - Painters & Decorators:
https://www.ihsa.ca/pdfs/products/id/W116.pdf

Health and Safety Executive - Construction hazardous substances: Solvents:
https://www.hse.gov.uk/construction/healthrisks/hazardous-substances/solvents.htm

Health and Safety Executive - Painting by Brush/Roller:
https://www.hse.gov.uk/pubns/guidance/oce2.pdf

The National Institute for Occupational Safety & Health - Epoxies and Resins - Reproductive Health:
https://www.cdc.gov/niosh/topics/repro/epoxiesresins.html

WorkSafeBC - Paints & coatings:
https://www.worksafebc.com/en/health-safety/hazards-exposures/paints-coatings

The National Institute for Occupational Safety & Health - Isocyanates:
https://www.cdc.gov/niosh/topics/isocyanates/default.html

To access this fact sheet and other health and safety and prevention information please visit:
www.obtworkplaceresource.com/health-safety