

CAUSATIVE AGENT: ISOCYANATES

LUNG IRRITANT, LUNG SENSITIZER, SKIN IRRITANT, SKIN ALLERGEN

DEFINITION

Chemically reactive compound containing the isocyanate group “-NCO”; primary routes of exposure are inhalation and skin absorption; exposure may lead to lung irritation or sensitization (i.e. allergy) as well as skin irritation or allergy.

HEALTH EFFECTS

- Occupational asthma: asthma (i.e. airway obstruction) or the exacerbation of pre-existing asthma resulting from an exposure in the workplace
- Allergic contact dermatitis: an allergic reaction of the skin triggered by exposure to a chemical allergen
- Irritant contact dermatitis: a skin rash triggered by over-exposure to water, solvents, friction, or contact with irritating substances (e.g. soaps, detergents)
- Upper respiratory tract irritation
- Cancer resulting from exposure to carcinogenic compounds
- Other health effects (e.g. dizziness, headaches)

EXAMPLES

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| • Polyurethane foam (e.g. airbag cover, cargo containers, roofing, spray-foam insulation in buildings/door frames/window frames, steering wheel, truck/trailer insulation, vehicle door panels, vehicle seating) | • Adhesive | • Epoxy |
| | • Anti-corrosion coating (e.g. bridge structures, telecommunication towers, transformers, wind turbines) | • Laquer |
| | • Cable and wire insulation and coating | • Paint |
| | • Caulking | • Polyurethane coating (i.e. vehicle and vessel coating) |
| | • Elastomer/synthetic rubber | • Sealant |
| | | • Synthetic textile/fibre |
| | | • Truck bedliner |

KEY COMPOUNDS

Review cleaning products' Safety Data Sheets to identify the presence of these compounds. Follow the appropriate precautionary measures.

- Hexamethylene diisocyanate (HDI)
- Isophorone diisocyanate (IPDI)
- Methylene biscyclohexylisocyanate (HMDI)
- Methylene diisocyanate (MDI)
- Methyl isocyanate (MIC)
- Naphthalene diisocyanate (NDI)
- Toluene diisocyanate (TDI)
 - Classified by the International Agency for Research on Cancer (IARC) as a Group 2B carcinogen

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SECTORS

Construction, electrical and utilities, transportation.

JOB

Construction

Acoustic/drywall trade, boilermaker, bricklayer, concrete finisher, contractor, elevator constructor, general labourer, glazier, hardwood floor installer/finisher, insulator, ironworker, mason, millwright, painter, plumber, refrigeration/air conditioning mechanic, riveter, rubber worker, solderer, sprinkler fitter, steamfitter/pipefitter, tile setter, welder

Electrical

Electrician, power line worker

Transportation

Marine deckhand, mechanic, transport truck driver

OTHER CONSIDERATIONS

- Isocyanates are classified as designated substances in Ontario (i.e. medical surveillance must be provided to workers with occupational isocyanate exposure, with the exclusion of workers in the construction sector)
- Some isocyanates have legal airborne exposure limits (i.e. TDI, HDI, HMDI, IPDI, MDI, MIC)
 - Currently Ontario only regulates monomer isocyanates
 - However, many newer isocyanates are polymeric
- Sensitization from dermal isocyanate exposure can trigger an asthma-like response upon inhalation
- Isocyanates lead to extreme sensitivity (hypersensitivity) reactions that can occur at very low concentrations
- Workers who do not work directly with isocyanates but are exposed by touching surfaces or tools can develop isocyanate-induced asthma

HOW COMMON ARE THE HEALTH EFFECTS?

Isocyanate exposure is the most common cause of occupational asthma (prevalence ranges from 5-15%).

Approximately 24,000 Canadians are occupationally exposed to some types of isocyanates; Ontario workers have the greatest exposure (approx. 12,000 exposed).

KEY PREVENTION STRATEGIES

Substitution

- Substitute monomeric isocyanates with pre-polymeric isocyanates (they become less airborne)
- Choose less hazardous application processes (i.e. roller application vs. spray gun)

Engineering Controls

- Block off access to other workers who are not adequately protected
- Improve dilution ventilation using fans (i.e. local and general)
- Use tools to prevent direct contact with isocyanates or products containing isocyanates

Administrative Controls

- Provide training on proper handling, avoidance of spills, and good housekeeping practices
- Follow manufacturers' directions for curing
- Restrict access where Isocyanates are used (i.e. the area should not be re-occupied by workers or nearby trades for a minimum of 24 hours)

Personal Protective Equipment

- A full-facepiece supplied air respirator is required for working with Isocyanates (ensure workers are periodically fit-tested)
- Avoid gloves made from natural rubber latex (consult manufacturer; if necessary, use low-protein and powder-free styles)

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SOURCES

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