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**
- 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
- Anti-corrosion coating (e.g. bridge structures, telecommunication towers, transformers, wind turbines)
- Cable and wire insulation and coating
- Caulking
- Elastomer/synthetic rubber
- Epoxy
- Laquer
- Paint
- Polyurethane coating (i.e. vehicle and vessel coating)
- 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 bis(1-cyclohexyl)isocyanate (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

www.creod.on.ca
CAUSATIVE AGENT: ISOCYANATES

SECTORS
Construction, electrical and utilities, transportation.

JOBS

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)
CAUSATIVE AGENT: ISOCYANATES

SOURCES


