PSHSA

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

- Adhesive
- Anti-corrosion coating (e.g. bridge structures, tele-communication towers, transformers, wind turbines)
- Artificial limbs
- Dentures
- Elastomer
- Fire effluent
- Medical devices/ products (e.g. electrodes, plaster band, wound dressings)
- Orthopedic casting/ immobilization product
- Paint
- Sealant
- Synthetic rubber
- Synthetic textile/fibre
- Varnish

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

creod Centre for Research Expertise in Occupational Disease

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SECTORS

Health services, education, municipal.

JOBS

Health Services

Dental personnel (e.g. dentist, dental technician, denturist, orthodontist, periodontist), firefighter, orthopedic personnel (e.g. cast technician, orthopedic surgeon)

Education

Childcare worker (e.g. daycare worker, elementary school teacher, kindergarten teacher)

Municipal

Civil engineer, incinerator operator, sewage worker

OTHER CONSIDERATIONS

- Isocyanates are classified as designated substances in Ontario (i.e. medical surveillance must be provided to workers with occupational isocyanate exposure)
- 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 iscoyanates

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)

SOURCES

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