

HNS Toxicity Assessment

How to protect populations?

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Introduction

- There is significant differences between oil and HNS spills
 - Various substances
 - Various behaviour
 - **Potential impacts on human health**
- Could have major consequences
 - Affect credibility of response
 - Create crisis



Chemical emergency response



Basic toxicology

- To suffer adverse effects an individual must:
 - be in contact with the substance (exposure) at a sufficient concentration (dose).
 - Exposure routes = **inhalation**, contact, absorption and ingestion
- To avoid adverse effects:
 - Prevent exposure or
 - Concentration is below adverse effects thresholds

How to deal with the human health aspect?

- Protection strategies
 - For responders must identify the proper PPE
 - For population must choose between shelter in place or evacuation
- But:
 - what are the steps to make this decision?
 - which data should a responder use?

Steps for decision making

1. Exposure
 - Identify the appropriate exposure level
2. Dose
 - What will be the concentration?
 - Use of dispersion model to identify potentially impacted area
 - Validation with air monitoring
3. Identify strategy
 - Shelter in place
 - Evacuation

1) Identify the appropriate exposure thresholds

- Which threshold to use?
 - Public exposure guidelines
 - specifically designed to predict how the general public will respond to a short-term release.
 - Occupational health and safety threshold
 - For workplace exposure

Public exposure guidelines

- **Acute exposure guideline levels (AEGL)**
 - for nearly all members of the general public—including sensitive individuals.
 - few available
 - for 10 min, 30 min, 60 min, 4 hours and 8 hours exposure.
 - AEGL-1,2,3, Increasing adverse effects, mild to severe
- **Emergency response planning guidelines (ERPG)**
 - based on experimental data
 - not designed for sensitive individuals
 - for 1 hour exposure
 - ERPG-1,2,3,
- **Temporary Emergency Exposure Limits (TEEL)**
 - temporary exposure limits for chemicals for which AEGLs or ERPGs have not yet been defined.
 - TEEL-1,2,3,4

Public exposure guidelines

- Most useful:
 - AEGL-2:
 - Airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other long-lasting adverse health effects or an impaired ability to escape.
 - ERPG-2:
 - Maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action.

Workplace exposure limits

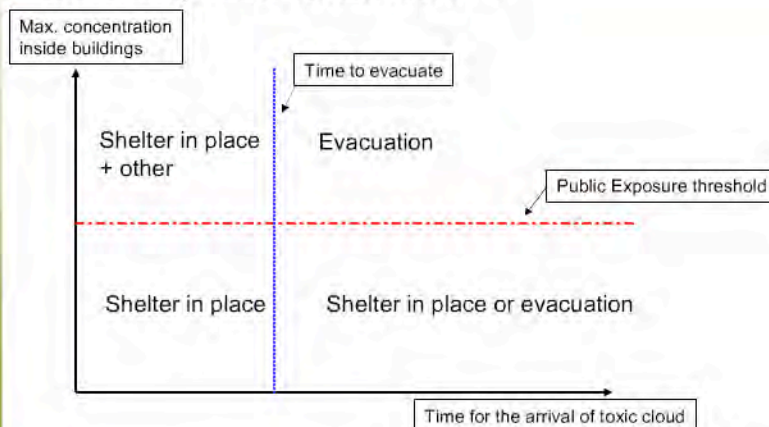
- Exposure levels for workers
 - Appropriate for responders
 - Not appropriate for populations
- Most common:
 - Threshold limit value (TLV)
 - Time weighted Average (TWA)
 - Immediately dangerous to life or health (IDLH)

2) What is the concentration?

- Use atmospheric dispersion models
 - Provide an indication of the concentration and of the extent of the contaminated area
 - Aloha
 - Weather services?
- On site air monitoring
 - Validation
 - Real time data

3) Strategy

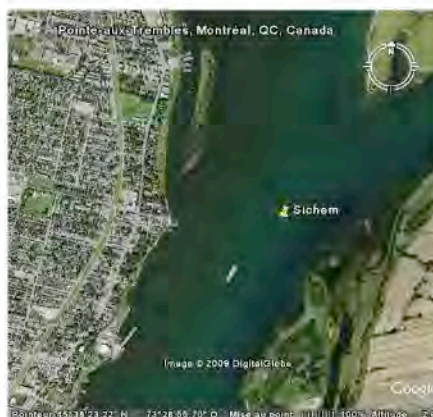
- Shelter in place or evacuation???



Source: National Institute of Public Health, QC

Sichem Aneline grounding

- Chemical tanker aground with 7700 m³ of benzene on board in Port of Montréal
 - Approximately 1km from densely populated area
 - 8 tanks with approximately 900 m³ each
- Benzene is toxic by inhalation and flammable
- Major risk for the population in case of release



Public exposure guidelines for benzene

Emergency Response Planning Guideline (ERPG) <u>1 hour</u>		Acute Emergency Guideline Levels (AEG) <u>1 hour</u>		AEGL 10 MINUTES	AEGL 30 MINUTES
ERPG 1	50 ppm	AEG 1	52 ppm	130 ppm	73 ppm
ERPG 2	150 ppm	AEG 2	800 ppm	2000 ppm	1100 ppm
ERPG 3	1000 ppm	AEG 3	4000 ppm	9700 ppm	5600 ppm

Scenario 1: 10m³/hr



Scenario 2: sudden release of 1 tank (900m³)



Sichem Aneline: Strategy

- Real time air monitoring
- Civil Protection agencies on standby to initiate shelter in place in case of release
- Risk communication



Conclusion

- **Must prepare in advance!**
- Work closely with:
 - Public health authorities to identify thresholds
 - Civil Protection authorities to identify strategies
- Use of scenarios for Ports and HNS handling facilities
 - Integration in emergency plan
 - Training and exercises