

## Nitric acid esters

### Definition of causal agents

Compounds formed out of nitric acid and alcohols. The major representatives are nitric acid esters of polyalcohols (Nitro derivatives of glycols and glycerol) such as

- Nitroglycerin (glyceryl trinitrate), an oily, slightly yellow liquid, highly explosive substance, with percutaneous absorption.
- Nitroglycol (ethyleneglycol dinitrate), a clear colourless liquid with high percutaneous absorption, less explosive than nitroglycerin
- Propylene glycol dinitrate (PGND or 1,2-Propanediol dinitrate)

### *Main occupational uses and sources of exposure:*

Used as explosive, pharmaceutical, marine engine fuel, occupational exposure can occur both in the production and handling of these products

### Toxic effects

#### *1. Acute and subacute effects*

These agents are vasodilators and as such can affect the cardiovascular system, the blood and the nervous system.

Subacute exposure causes vasodilatation, tachycardia, and hypotension. This can be followed by bradycardia and collapse. Flushing of the face, headache, dizziness, restlessness, confusion, hallucination, syncope, convulsions and coma may occur. Other features are nausea, vomiting, diarrhoea, cyanosis, methaemoglobinaemia and respiratory failure. Fatal collapse may occur. Effects are enhanced by alcohol consumption.

#### ***Exposure criteria:***

*Minimum intensity of exposure:* Occupational exposure confirmed, if possible assessed by

- history and evaluation of exposure conditions showing significant exposure by inhalation or skin contact
- and, if possible
  - by workplace air monitoring
  - biomonitoring (drug use of glyceryl trinitrate should be taken into consideration).

*Minimum duration of exposure:* Minutes to hours depending on the intensity of exposure

*Maximum latent period before onset of disease:* A few hours.

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## 2. Chronic effects

Prolonged exposure results in the development of tolerance (acclimatisation, tachyphylaxis) to the cardiovascular effects. However, disruption of chronic exposure, even for a few days, may interrupt this acclimatisation and can result in malaise, weakness, vomiting, dizziness, headache, or impaired vision. Severe chest pains, palpitations, and even sudden death may also result. 'Monday morning' headaches or angina pectoris occur in workers on the first day back at work after a weekend break.

### ***Exposure criteria:***

*Minimum intensity of exposure:* Occupational exposure confirmed (percutaneous, inhalation) by history, and if possible by

- workplace air monitoring : nitroglycerin >> 0.05 ppm (0.47 mg/m<sup>3</sup>), nitroglycol >> 0.05 ppm (0.32 mg/m<sup>3</sup>)
- biomonitoring at the end of working-day (>0.5 µg/l 1,2- or 1,3-glyceryl dinitrate in plasma/serum as a metabolite of nitroglycerin; >0.3 µg/l ethyleneglycol dinitrate in blood); drug use of glyceryl trinitrate should be taken into consideration.

*Minimum duration of exposure:* 5 – 10 years depending on the intensity of exposure

*Maximum latent period before onset of disease:* one week.

Vague gastrointestinal symptoms and Raynaud's phenomenon have been described but there is no good evidence on the causal relationship with exposure to these compounds.