Dichloroethane as a cause of Parkinsonism: A case report

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Objective: Parkinsonism is a syndrome defined by the presence of tremor at rest, bradykinesia and rigidity. The leading cause of neurodegenerative Parkinsonism is Parkinson's disease, but chronic exposure of chlorinated pesticides is among other causes of Parkinsonism. [3,4]

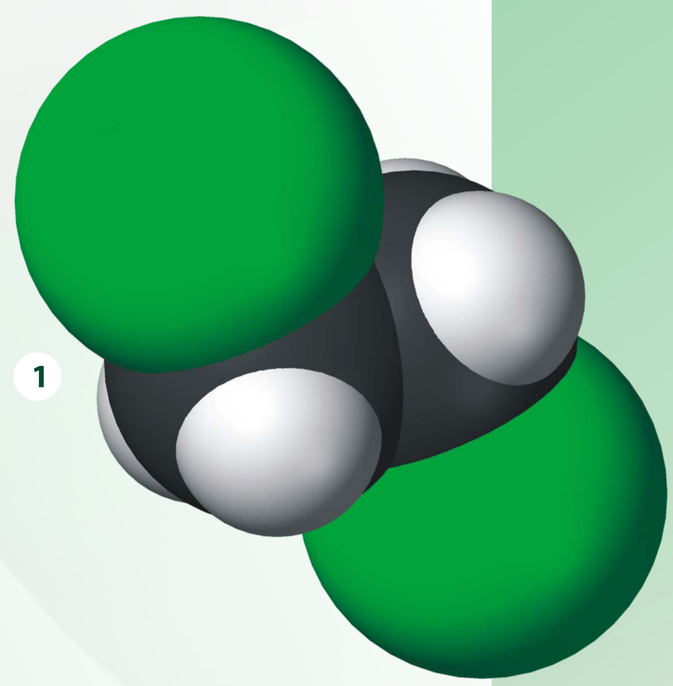
1,2-Dichloroethane (CH_2Cl-CH_2Cl, figure 1) is a chlorinated hydrocarbon solvent which is widely used as industrial solvent. The target organs after poisoning are the liver and kidney but damage of neurones and respiratory distress can also occur.

Mechanism of toxicity

Little information is available on the effects of dichloroethane in humans. Mechanism of toxicity is not fully elucidated. Due to direct toxicity and toxic metabolites 1,2-dichloroethane can cause various changes of central nervous system, liver and kidney injury, sensitization of myocardium to arrhythmogenic effects of catecholamines, etc. 1,2-Dichloroethane is more toxic than 1,1-dichoroethane.

Toxicokinetics

1,2-Dichloroethane is well absorbed through the lungs and the skin and from gastrointestinal tract. It is rapidly distributed in the body and has a large volume of distribution. Some of its metabolites such as acetyl chloride or chloroacetaldehyde are more toxic than parent compound. Elimination both of metabolites and unchanged parent compound is very slow.



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Symptoms of poisoning

Local effects varies from slight irritation till chemical burns. Inhalation can result in respiratory irritation, pneumonitis and asphyxia, ingestion – in nausea, vomiting, diarrhea and abdominal pain. Severe poisonings are causing CNS depression, cardiac arrhythmias (e.g. ventricular fibrillation), hepatic and renal injury. Onset of neurological symptoms and life-threatening cardiac arrhythmias can start very soon and deteriorate very rapidly, acute injury of liver and kidneys is developing later.

Main causes of death are cardiac arrest and liver necrosis.

Treatment

Exposed areas of skin must be washed with soap and water.

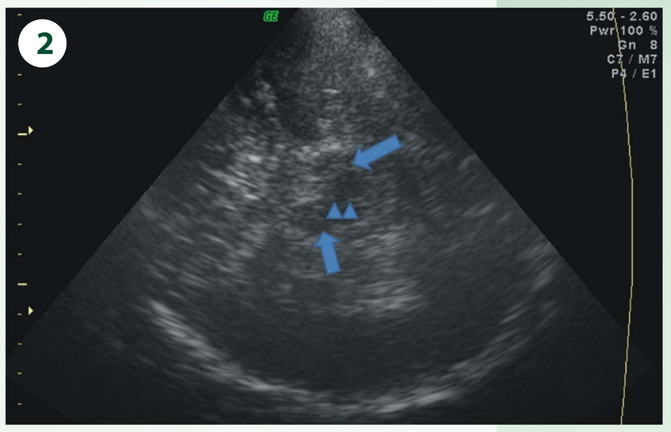
Exposed eyes must be irrigated with copious tepid water or saline, consultation of ophthalmologist is advisable.

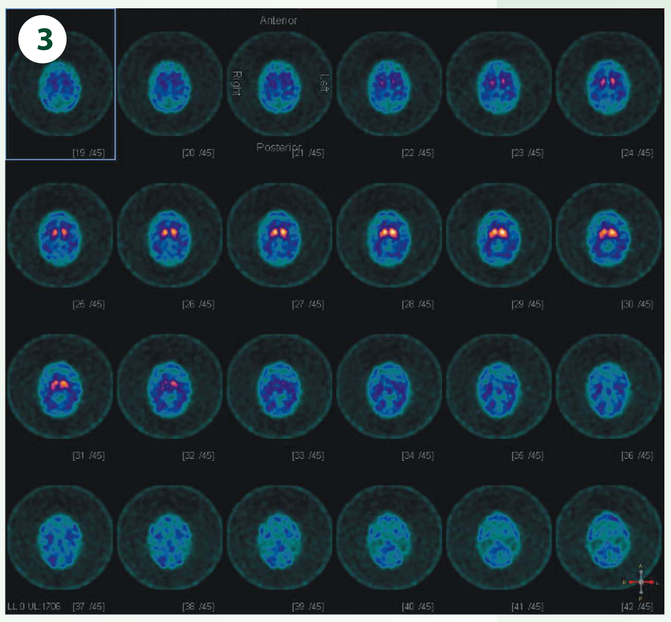
Gastric lavage is not recommended due to the risk of vomiting and aspiration. Multiple-dose of activated charcoal may be effective.

Hemodialysis and hemoperfusion are ineffective in removing of chlorinated hydrocarbons.

There is no specific antidote.

Supportive care is the main sort of treatment. Continuous ECG monitoring is advisable. Antiarrhythmic agents may be helpful, but catecholamines must be strictly avoided.





Case report: A 55-year-old man was investigated and treated in Neurological Out-patient Department for asymmetrical rest tremor, sleeping disorders and visual disturbances. During the investigation pathological changes of the substantia nigra were found in transcranial sonography (figure 2) and single-photon emission computed tomography (figure 3), with cortical atrophy detected by computed tomography and magnetic resonance imaging (figure 4). Changes typical of other diseases were not found. The absence of treatment effect with levodopa suggested it was unlikely to be Parkinson's disease. After detailed history taking, it was discovered that the patient had suffered acute inhalational and percutaneous poisoning by dichloroethane in 1999. Depression of central nervous system and respiratory insufficiency were dominant in the clinical picture at that time. He recovered one month after poisoning, but the recovery was partial. He had visual disturbances immediately after this incident and these may have been deteriorating. Three years later he developed sleeping disorders. Tremor at rest, postural tremor and bradykinesia started approximately 5 years ago. In the last 2 years he has been treated with levodopa and propranolol, but treatment is ineffective.

Conclusion: This case demonstrates the possibility of developing Parkinsonism after acute poisoning by 1,2-dichloroethane.

References:

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3. Liu B, Gao HM, Hong JS. Parkinson's disease and exposure to infectious agents and pesticides and occurrence of brain injuries: role of neuroinflammation. Environ Health Perspect 2003; 111(8):1065-1073.
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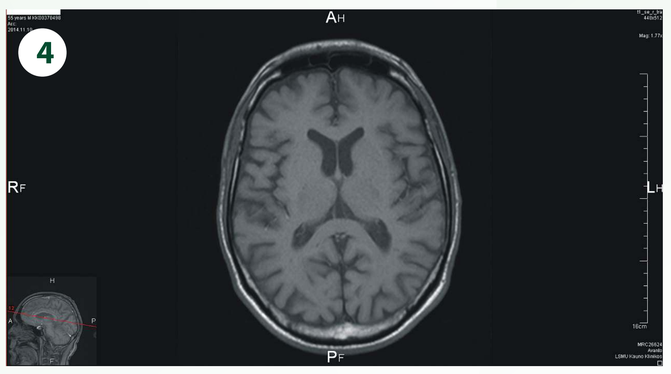

Figure 1. 1,2-Dichloroethane (en.wikipedia.org)

Figure 2. Transcranial sonography image of the mesencephalic plane, zoomed x3, obtained with GE Voluson 730 Expert (Austria) equipped with a PA2-5 transducer. Arrows indicate hyperechogenicity of the substantia nigra, triangles – hypoechogenicity of the nuclei raphe

Figure 3. Single-photon emission computed tomography

Figure 4. Cortical atrophy in magnetic resonance imaging