



RESEARCH ARTICLE

OCCUPATIONAL POISONING BY CHLOROACETYL CHLORIDE

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ABSTRACT

Introduction: Chloroacetyl chloride is chlorinated acyl chloride it is bifunctional compound thus making it useful building block chemical in many chemical reactions. It is corrosive to eye and skin on contact. Liquid or spray mist produces tissue damage particularly on mucous membrane of eyes, mouth, respiratory tract and can cause multi-organ dysfunction because of oxidative and hypoxic effect. **Case report:** 29 year old male patient presented to us with history of exposure to white colored smoke that formed after accidental spillage of Chloroacetyl chloride on floor containing water. He complained of redness and watering of eyes, vomiting and shortness of breath, as there is no specific antidote available he treated symptomatically and put on mechanical ventilation for respiratory distress for 3 days. After 5 days he made fully recovery and discharged from hospital. **Conclusion:** - As one of the few documented cases of chloroacetyl chloride exposure, this case report contributes to the limited literature and emphasizes the potential risks of chloroacetyl chloride exposure and the need for further research and increased awareness among healthcare professionals.

INTRODUCTION

Chloroacetyl chloride is corrosive chemical having molecular formula $\text{ClCH}_2\text{COCl}/\text{C}_2\text{H}_2\text{Cl}_2\text{O}$ and molecular weight 113.94g/mol, it is colorless to light yellow liquid with very pungent odour^[1]. Chloroacetyl chloride used as an intermediate reactive agent in manufacture of chloroacetophenone and other chemicals like adrenaline, diazepam, chloroacetate esters and chloroacetic anhydride^[2]. It is considered as dangerous chemical to human health and living, recommended exposure limit is 0.05ppm over 10 hours time period^[3]. Acute exposure mainly affects skin, respiratory system, eyes and gastrointestinal system. On skin exposure it causes pain, redness, burns and blisters.

On inhalations it causes cough sore throat, cyanosis and shortness of breath. Eye exposure it causes pain, redness, blurred vision. Ingestion of chloroacetyl chloride causes burning sensation, pain abdomen, diarrhoea^[1]. Chloroacetyl chloride, a potent chemical intermediate, plays a crucial role in synthesizing various pharmaceuticals and chemicals. Despite its utility, handling and exposure to this substance pose significant health risks. This case report aims to elucidate the hazardous effects of chloroacetyl chloride on human health

and the environment, emphasizing the need for stringent safety protocols and alternative synthesis methods to mitigate its detrimental impacts. A comprehensive understanding of its properties and risks is essential for safe handling and application.

CASE REPORT

29 year old male working as a laborer for more than 1 year in a chemical plant that manufactures lumefantrine brought to RNT medical college and MBGH hospital with the history of exposure to white smoke that formed immediately after accidental spillage of chloroacetyl chloride on to the floor that contained water on it (patient was shifting the cylinder that filled with chloroacetyl chloride). He presented to us with complaints of burning sensation, redness of eye, vomiting and shortness of breath. On examination patient's vitals were, Bp-120/68 mmHg, PR-104 bpm, SpO₂-71% at room air, respiratory rate 28cpm, GCS-15/15. Redness and watering from eyes were present (figure 1). On auscultation diffuse crepitation present all over the chest. Laboratory investigations showed hemoglobin (Hb) -11g/dL, total leukocyte count (TLC)-11800 /micro litre, platelet count -98000/micro litre, blood urea -32

mg/dL, serum creatinine -0.7 mg/dL, total bilirubin-1.07mg/dL and direct bilirubin-0.484 mg/dL,SGOT-42 mg/dl,SGPT-19 mg/dl.ECG and Chest X-ray was normal. Initially patient treated with oxygen through NRBM mask at 10 to 15 litre of oxygen,anti emetics and his eyes were washed with distilled water, later due to persistent saturation drop and altered respiratory pattern patient was shifted to ICU, where he was intubated (Figure 2)and put on mechanical ventilation on vcv mode with fio2 90%,PEEP-10 cm of water .he is also treated with broad-spectrum antibiotics, furosemide, bronchodilators, systemic steroids and topical moxifloxacin, CMC eye drops as per ophthalmological reference. Gradually patient was improved ,on day 3 he was extubated and shifted to ward ,later on day 5 he was discharged on tapering dose of steroids.



Figure 1. Showing redness and watering of both eyes



Figure 2. Patient intubated and put on mechanical ventilation

DISCUSSION

Chloroacetyl chloride is highly reactive ^[4] and decomposes in water to form chloroacetic acid and hydrogen chloride ^[5]. As described by our patient he exposed to fumes and white smoke that are formed after accidental spill of chloroacetyl chloride liquid on floor that contain water. Occupational exposure to chloroacetylchloride may occur through inhalation or skin contact ^[6] Hydrogen chloride is highly corrosive and can damage the eye and respiratory mucosa even at low concentrations ^[7]. Human inhalation of hydrogen chloride affects the upper and lower respiratory tracts, causing laryngeal edema, bronchial inflammation, alveolar edema, and hypoxemia ^[8].it may also induce cardiac arrhythmias, cerebral

oedema ,depression of respiratory centre, this could be because of direct toxic effect or hypoxic effect caused by inhaled hydrogen chloride^[9]

As there is no specific antidote for systemic chloroacetyl chloride poisoning, management focuses on symptomatic treatment. ^[1], irrigation of eyes with water, use antibiotic eye drops to prevent secondary infection. Provide 10-15 litres of oxygen, intubate if necessary. sodabicarbonat can be used for treatment of metabolic acidosis.

Employers should ensure proper handling procedures, including using personal protective equipment (PPE) such as gloves, masks, and eye protection. Adequate ventilation in areas where chloroacetyl chloride is used or stored is essential. Training for workers on emergency response and first aid for chemical exposures can help mitigate the impact of accidental exposures.

A review of existing literature reveals limited information on chloroacetyl chloride poisoning. The case reported by Guo L *et al* ^[9], in which one patient died after developing heart failure ,respiratory failure and neurological complications and other two survived after showing mild respiratory distress, skin erosion and redness of eyes. Guo L et al. highlights severe outcomes and emphasizes the need for detailed management protocols.

CONCLUSION

Chloroacetyl chloride exposure, though rare, presents severe health risks due to its corrosive byproducts. Given the limited literature, it's crucial to follow comprehensive management protocols and stay informed to enhance patient outcomes in such rare cases. This case report aims to assist physicians in handling such cases effectively and improve patient outcomes.

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