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## HYDROGEN SULFIDE TOXICITY: TWO CASE REPORTS

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### ABSTRACT

Hydrogen sulfide (H<sub>2</sub>S) toxicity is a known occupational/industrial hazard in organic decaying disposal, sulfur springs, natural gas well and coal pits. We report two deaths due to acute accidental hydrogen sulfide poisoning. Two males 40 and 36 years old were found dead in two different water treatment plants after spilling of sewage. Autopsy revealed greenish discoloration of skin and brain in one individual and pulmonary oedema in both. Toxicology revealed lethal levels of thiosulfate which is a metabolite of H<sub>2</sub>S. Death investigation concluded that both fatalities were due to toxicity of H<sub>2</sub>S in an accidental manner. Toxicological investigations are important in cases where occupational hazards are suspected.

**Keywords:** Thiosulfate, H<sub>2</sub>S, Occupational hazard, Water treatment plant



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## INTRODUCTION

Hydrogen sulfide (H<sub>2</sub>S) inhalation is not a rare presentation in routine forensic practice. Majority are accidental<sup>1-4</sup> but rarely could be intentional.<sup>5-7</sup> H<sub>2</sub>S is a colorless gas with the smell of rotten eggs, commonly generated by degrading of protein waste. It is also identified in sewers and is known commonly as “sewers gas”.<sup>8</sup> It is flammable at ambient temperature and pressure is irritant and causes asphyxiation.<sup>9,10</sup> We report two fatal cases of H<sub>2</sub>S toxicity where toxicological analysis played a vital role in addressing important medico-legal issues.

## CASE REPORT

### Case 01:

A previously healthy 40-year-old male was working in a water treatment plant which was almost closed. His body was recovered submerged in spilled sewage hours later. The body was refrigerated till autopsy. Autopsy revealed early stage putrefaction including foul odour, swelling of body, marbling, peeling of epidermis and greenish color skin (Figure 01). Upper and lower airways showed a small amount of dark colored semisolid substance with retention of patency of air passage. Mild frothy fluid was noted on cut surface of lungs. Brain was greenish in color but otherwise normal. Other organs were normal macroscopically and microscopically except for early putrefactive changes. Femoral blood was positive for thiosulfate with a level of 10 µg/mL by GC/MS.

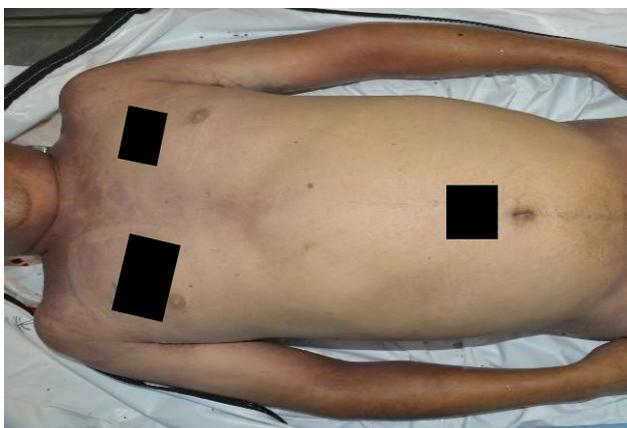


**Fig. 01: Body showed early stage of putrefaction with green color hypostasis**

### Case 02:

A 34-year-old male working in a water treatment plant was trapped in a closed space due to sudden spillage of sewage. He died prior to initiating resuscitation.

He was an adult of average build. There was no evidence of putrefaction or greenish discoloration of skin (Figure 02). Respiratory passages were normal with no evidence of sewage within. Cut surface of the lungs showed mild frothy fluid. Mild atherosclerosis of the left coronary and mild fatty changes of the liver were noted. Other organs appeared normal macroscopically and microscopically. Toxicology revealed a thiosulfate level of 10 µg/mL by GC/MS.



**Fig. 02: No evidence of putrefaction and normal skin color**

The cause of death in both cases was confirmed as hydrogen sulfide gas toxicity. The manner of death was concluded as accidental.

## DISCUSSION

H<sub>2</sub>S toxicity is not commonly seen in forensic practice. H<sub>2</sub>S is very unstable and rapidly converts to its main metabolite: thiosulfate which remains stable in the body.<sup>11-13</sup> Therefore the level of thiosulfate is considered as a reliable marker of H<sub>2</sub>S poisoning.<sup>3,14</sup> However thiosulfate is naturally present in very low levels in blood and urine even in healthy individuals.<sup>15-17</sup> In both cases, the blood levels of thiosulfate was above the toxic level<sup>1,2,5,18,19</sup> and was sufficient to cause death.

It is well known that H<sub>2</sub>S is produced naturally during putrefaction.<sup>20</sup> Absorption of H<sub>2</sub>S via the skin is also reported if body is exposed to high concentration of hydrogen sulfide.<sup>19</sup> However there is a no huge influence on concentration of blood levels in our cases which showed very high level of toxicity.<sup>19</sup> The mechanism of action of H<sub>2</sub>S is almost similar to the action of cyanide where there is prevention of oxygen utilization at cellular level which is postulated as the mechanism of death in this case.<sup>21</sup>

Low and moderate exposure to hydrogen sulfide mainly causes local tissue irritation with cyanosis, coma and rapid death in severe exposure.<sup>22-25</sup> Minimal local reaction due to H<sub>2</sub>S in these two individuals indicated that victims were exposed to high level of H<sub>2</sub>S than lower level. Mild frothy fluid seen on cut sections of lungs in both the diseased indicates the possibility of asphyxia due to rapid exposure to high concentrations than local irritation which occurs in low and moderate exposure.<sup>26-28</sup> Greenish discoloration of skin seen in one case is a recognized feature of H<sub>2</sub>S poisoning.<sup>29-31</sup> Similar discoloration was seen in the brain at autopsy of the same case which is consistent with previous fatal case reports.<sup>24</sup>

Findings at scene investigation and autopsy concluded that the manner was accidental in both instances. This assists the next of kin to claim insurance, compensation or any other benefits.

## CONCLUSION

Toxicological investigation is vital where there is a suspicion of H<sub>2</sub>S toxicity. Scene investigation with autopsy assisted in addressing possible issues which could arise in cases of H<sub>2</sub>S toxicity especially in the working environment.

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