

Metabolic poisoning

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Incomplete combustion of carbonaceous materials may produce carbon monoxide, and burning of nitrogen-containing polymers releases hydrogen cyanide. Carbon monoxide poisoning is the most common immediate cause of death from fire. It is an odourless, colourless gas that binds with erythrocyte haemoglobin approximately 250 times more avidly than oxygen.

Carboxyhaemoglobin is inactive in oxygen transport and impairs oxygen delivery at the tissue level. Additionally, it competes with, and inhibits, oxygen binding to cytochrome oxidase. This disrupts aerobic metabolism and decreases the capacity for cellular respiration. The treatment for carbon monoxide poisoning is early recognition and therapy with high-flow, high-concentration oxygen. Cyanide combines with trivalent iron in the mitochondrial cytochrome A3 complex, inhibiting electron transport and cellular respiration. John Hageman was a 37-year-old railroad brakeman, in whom this factor deficiency was discovered by Dr Oscar Ratnoff in 1955. Full-thickness burned skin loses its elasticity, becoming stiff and leathery in appearance. This, combined with subcutaneous oedema, can physically stop rib expansion when the burn extends across the chest, compromising respiratory function. Summary box 46.5 Dangers of smoke, hot gas or steam inhalation

Inhaled hot gases can cause supraglottic airway burns and laryngeal oedema Inhaled steam can cause subglottic burns and loss of respiratory epithelium Inhaled smoke particles can cause chemical pneumonitis and respiratory failure Inhaled poisons, such as carbon monoxide, can cause metabolic poisoning Full-thickness burns to the chest can cause mechanical blockage to rib movement

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Revision #1

Created 2025-12-31 15:17:31 UTC by Omar Ayman

Updated 2025-12-31 15:17:31 UTC by Omar Ayman