Hydrogen Peroxide Poisoning

Hydrogen peroxide is an oxidising agent that is used in a number of household products, including general-purpose disinfectants, chlorine-free bleaches, fabric stain removers, contact lens disinfectants and hair dyes, and it is a component of some tooth whitening products. In industry, the principal use of hydrogen peroxide is as a bleaching agent in the manufacture of paper and pulp. Hydrogen peroxide has been employed medicinally for wound irrigation and for the sterilisation of ophthalmic and endoscopic instruments. Hydrogen peroxide causes toxicity via three main mechanisms: corrosive damage, oxygen gas formation and lipid peroxidation. Concentrated hydrogen peroxide is caustic and exposure may result in local tissue damage. Ingestion of concentrated (>35%) hydrogen peroxide can also result in the generation of substantial volumes of oxygen. Where the amount of oxygen evolved exceeds its maximum solubility in blood, venous or arterial gas embolism may occur. The mechanism of CNS damage is thought to be arterial gas embolisation with subsequent brain infarction. Rapid generation of oxygen in closed body cavities can also cause mechanical distension and there is potential for the rupture of the hollow viscus secondary to oxygen liberation. In addition, intravascular foaming following absorption can seriously impede right ventricular output and produce complete loss of cardiac output. Hydrogen peroxide can also exert a direct cytotoxic effect via lipid peroxidation. Ingestion of hydrogen peroxide may cause irritation of the gastrointestinal tract with nausea, vomiting, haematemesis and foaming at the mouth; the foam may obstruct the respiratory tract or result in pulmonary aspiration. Painful gastric distension and belching may be caused by the liberation of large volumes of oxygen in the stomach. Blistering of the mucosae and oropharyngeal burns are common following ingestion of concentrated solutions, and laryngospasm and haemorrhagic gastritis have been reported. Sinus tachycardia, lethargy, confusion, coma, convulsions, stridor, sub-epiglottic narrowing, apnoea, cyanosis and cardiorespiratory arrest may ensue within minutes of ingestion. Oxygen gas embolism may produce multiple cerebral infarctions. Although most inhalational exposures cause little more than coughing and transient dyspnoea, inhalation of highly concentrated solutions of hydrogen peroxide can cause severe irritation and inflammation of mucous membranes, with coughing and dyspnoea. Shock, coma and convulsions may ensue and pulmonary oedema may occur up to 24-72 hours post exposure. Severe toxicity has resulted from the use of hydrogen peroxide solutions to irrigate wounds within closed body cavities or under pressure as

oxygen gas embolism has resulted. Inflammation, blistering and severe skin damage may follow dermal contact. Ocular exposure to 3% solutions may cause immediate stinging, irritation, lacrimation and blurred vision, but severe injury is unlikely. Exposure to more concentrated hydrogen peroxide solutions (>10%) may result in ulceration or perforation of the cornea. Gut decontamination is not indicated following ingestion, due to the rapid decomposition of hydrogen peroxide by catalase to oxygen and water. If gastric distension is painful, a gastric tube should be passed to release gas. Early aggressive airway management is critical in patients who have ingested concentrated hydrogen peroxide, as respiratory failure and arrest appear to be the proximate cause of death. Endoscopy should be considered if there is persistent vomiting, haematemesis, significant oral burns, severe abdominal pain, dysphagia or stridor. Corticosteroids in high dosage have been recommended if laryngeal and pulmonary oedema supervene, but their value is unproven. Endotracheal intubation, or rarely, tracheostomy may be required for life-threatening laryngeal oedema. Contaminated skin should be washed with copious amounts of water. Skin lesions should be treated as thermal burns; surgery may be required for deep burns. In the case of eye exposure, the affected eye(s) shod eye(s) should be irrigated immediately and thoroughly with water or 0.9% saline for at least 10-15 minutes. Instillation of a local anaesthetic may reduce discomfort and assist more thorough decontamination.