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Acid and Base Poisoning

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Commentary

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ABSTRACT

Acids are the most important components of human life. As an evolutionary benefit many exist inside the human body to complete biological cycles. Some of them are mild acids and some are concentrated. Gut wall of the human body can with stand P^H of 2 to support the digestion process. We generally use acids in several ways to run our life some examples are benzoic acid to preserve food, Carbonic acid to prepare soft drinks, Ethanoic acid in vinegar and most of the Drugs we consume are acid salts, the mentioned are the allowed ones where the usage is limited. But we have habituated to over usage of anything hence the problems arise. We also use concentrated acids in plethora to comfort our lifestyle; some of the examples are Conc. HCl to clean metals before electroplating / household cleaning / leather processing and Nitric Acid in Production of fertilisers, explosive and Sulphuric Acid to make detergent, polymer and fertilisers. Anything excess is harmful. We are going to review the hazardous nature of Acids and their effect of human health.

INTRODUCTION

Acid can be defined in many ways the basic formula is the substance which convert blue litmus to red litmus or a substance which can liberate a proton or can accept an electron pair [1-11]. Strength of an acid depends on its ability to lose a proton, which loses very sharply is known as strong or concentrated acids. A person is exposed to concentrated acids in following ways Ocular exposure, dermal exposure, Inhalation exposure and Ingestion exposure. All the mentioned exposure are very harmful even can be lethal on chronic exposure. Of all Sulphuric acid, Hydrochloric acid, Nitric Acid and Boric acids are most powerful acids [12-15].

All the mentioned Acids are corrosive in nature and act similarly when they are in contact with humans by any means. Since the e Strong acids are strong oxidising agents they tend to attract electrons from surrounding by liberating proton. Human body is made of mainly proteins and lipids acids, which are decomposed in presence of acids by amide and ester hydrolysis respectively [16-29]. In addition strong acids act as dehydrating agents on carbohydrates.

Acid poisoning:

When acids come in contact with eyes they release the proton, this changes the P^H in ocular plane. Due to the chemical activity of acids proteins inside the eye gets coagulated, denaturated and precipitated. The precipitates form a plate obstructing the vision. In one sense this plate protects eye from severe penetration of acids. Damage to the eye is dependent on the strength of the acid. Heavy concentrated acids can penetrate through the precipitation glass [30-40].

The first targets will be conjunctiva and anterior orbital tissues [41-50]. Heavy concentrated acids which can penetrate through the precipitation glass results in loss of stromal clarity. The hydration of collagen leads to increase of intraocular pressure leading to distortion of trabecular meshwork [50-58]. Acid

penetration damages limbal stem cells, stromal keratocytes, stromal nerve endings, endothelium, lens epithelium and vascular endothelium of conjunctiva, Iris and ciliary body.

Inhalation of Concentrated acid vapours in the atmosphere makes the breathing very difficult. It's the worst case if you have asthma [58-69]. The acid vapours entering to the respiratory track create irritation and tooth erosion. When swallowed they burn gastrointestinal resulting in esophageal or gastric perforation. Symptoms may include drooling, dysphagia, and pain in the mouth, chest, or stomach strictures. Acids cause coagulation necrosis; an eschar forms, limiting further damage. Acids will affect the stomach more than the esophagus [70-77].

Base poisoning:

Bases are strong corrosive and substantial irritant by any means of exposure. They cause extreme burns and lasting damage to the tissues in contact. The damage is caused in two ways one is bases in contact with moisture release of heat and skin burn by reaction of bases with the organic skin [78-85]. Inhalation of vapors causes irritation to respiratory tract resulting pulmonary edema. Heavy inhalation of bases swells the larynx, perforate gastro intestinal tract. Bases when come in contact with eyes cause burning and higher doses can permanently damage the eye. Long term exposure may cause throat irritation, Chest pains, Ulcers, uneasy breathing and dermatitis to skin [86-94].

Eye contact with concentrated bases can dissolve proteins in the eyes, causing severe burns and eye damage. Formation of surface lesions, harming of cells, inflammation, and opacification of the cornea may follow [95-103]. Final outputs include cataracts, glaucoma, and adhesion of the eyelid to the cornea, blindness, and eye loss. The lesions and ulcerations will grow for few days and lead to clouding of the eye surface and blindness.

Ingestion of Basic solutions causes severe and rapid corrosive injury to the mouth, esophagus, and stomach. The absence of visible burns in the mouth does not reliably exclude the presence of esophageal burns. Swallowing immediately becomes painful and difficult; drooling may be profuse. Chest and abdominal pain are often present. Vomiting, prostration, rapid and feeble pulse, and collapse may occur. People who are suffering from asthma and emphysema are more vulnerable to the toxicity by the bases [104-110].

Symptoms:

Any of the chemical injury should be considered as a medical emergency. Most of the chemical injuries will happen to face, eyes, hands and legs. The extent of the injury mostly depends on strength of the chemical, period of exposure and site of contact. After the poisoning by the caustic agents mouth and throat may start paining and amplified as the time progresses. Coughing, drooling, inability to swallow and inability to breath symptoms may be observed. When strong agents are in business blood pressure may drop. Oesophageal perforation will start after some time of the incident causing chest pain, fever and abdominal pain. Children have relatively larger surface area, body weight ration so they are more susceptible to get effected by the injuries [111-115].

Management:

As a first aid to the caustic agents water or milk is used as initial smoothening agents but studies reveal it may work in dermal exposure condition where you need to wash injury with plenty of water for nearly half an hour, in other exposures the acid remains may react with water and can cause secondary burns which are lethal. In inhalation exposure radiological studies will reveal oesophageal perforation. Copious amounts of oxygen should be administered to the victim injure by inhalation exposure. Inhalation injuries results persistent hoarseness and reactive airways dysfunction syndrome [116-126].

In case of non-perforated situations endoscopy can be a choice. Endoscopy should be performed immediately after the havoc it serves two purposes one if individual is not damaged his gastrointestinal

tract he can be relieved and if person is injured he can be treated appropriately. Patients with less severe injuries can be treated with oral administration of drugs along with nutritious intake. In case of the heavy injuries surgery is the only reliable treatment along with supportive measures. Early mediation of surgical treatment may serve the purpose.

Safe Practices:

1. Should go through the MSDS of Chemical about to use.
2. Should have protective measure and equipment.
3. Working area should be well ventilated.
4. Should keep away from the ignition source when working with the flammable substances.
5. Should not suck chemicals into mouth.
6. Should not touch chemicals with the bare hands.
7. Should not use narrow opening containers for the heat evolving reactions.
8. Should not mix oxidizing agents with combustible agents.
9. Should not mix oxidizing agents with bleaching solutions.

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