INTRODUCTION

Phosphorus is available in white and red forms. White phosphorus (synonym yellow phosphorus) a highly poisonous variety is available as luminous, waxy translucent soft cylinders or sticks kept under water to prevent oxidation. On exposure to air it becomes yellow and oxidizes with dense fumes of phosphoric and phosphorus acids. The red amorphous form has none of these properties. It is used in the manufacture of safety matches, fertilizers, explosives and also in chemical industry. White phosphorus used for match heads in past, now prohibited for this purpose, has yet one domestic form of rat paste.1,2 Collapsible tubes with this rodenticidal paste are available in India as Ratol. Each tube has 80 g of white luminescent substance with 7% of white phosphorous in it. Other ingredient include jelly, sugar (12%) and wheat flour (2.2%). White phosphorus rolled up in wet cloth or carbon bisulphide was employed to set fire to postal letter-boxes during the Indian civil disobedience movement in 1932. It has been detected in unoxidized form in dead bodies after several days of death because the reducing gases of decomposing body protect phosphorus from oxidation. Besides few accidental, suicidal and homicidal poisonings in humans, other unusual presentations of this poisoning are not reported, although acute and chronic poisoning by this substance is evidently described.1,2 An explosive encounter while resuscitating a young male is unique in itself and hence this presentation.

CASE REPORT

In one evening of April, and 18 year male was rushed into intensive care unit (ICU), in an unconscious and gasping state, after ingestion of some poison with tea, about 1½ hours before. He was areflexic, pulse and blood pressure not recordable and had an irregular ausculated heart rate of 40 per minute. Immediate cardiopulmonary resuscitative measures were undertaken and artificial respiration was established. Abdomen was soft with no organomegaly. No injury marks were present over head or body. ECG and cardiac monitoring revealed irregularly appearing broad and bizarre wide QRS complexes, absent P waves and biphasic T waves. X-ray examination of chest was normal.

After negotiating a Ryle’s tube through the right nostril unto the 30.0 cm mark, to obtain the stomach contents and for a gastric lavage, a small cloud of whitish smoke and a yellow flame was seen peeping our the free end of Ryle’s tube. Within seconds there was an explosion loud enough to worry the patients and call attention of ICU staff. Next, a huge ball of dense whitish smoke filled up the 4x4x4.5 metre ICU cabin, leaving all the entrants to cough for about 30 seconds. Moments later, while emptying the stomach, the left scalp hair of patient, his left side of shirt and collar were found to be on a low flame fire. A wet cloth extinguished this. The free end of the Ryle tube also got burnt as evidenced by blackening flattening of the tubal shape and charring for about 3.0 cm. Aspirated stomach contents were brownish with shiny particles and garlicky odour.

Patient died of peripheral circulatory failure within next two minutes, in spite of adequate stomach wash with potassium permanganate solution and intense resuscitation. Reports of blood count and biochemistry received later were non-contributory. Arterial blood gas analysis suggested, hypoxia, acidosis, hypercarbia and base deficit. Post-mortem examination revealed congested brain, liver and spleen. On opening the stomach a gush of gas smelling of garlic, was observed. There was no evidence of darkening or charring of internal structures of body indicative of burn injury by fire. Brownish content of stomach with multiple grayish, luminescent particles were collected.

Repeated insistence and inquiry of the of the relatives of the patient, was rewarded by the search of an empty tube of

Abstract

Poisoning by white or yellow phosphorus is reported in various forms and also in ages varying from infants to adults, but spontaneous combustion and explosion during its management has never been described. This incidence occurred while attempting to pass a Ryle’s tube. Its free end first exhibited a yellow flame and this later on led to an explosive encounter. Role of static electricity generated while handling plastic materials leading to ignition and explosion cannot be overlooked.

TK Pande*, S Pandey**

*Senior Deputy Director; **Consultant; Department of Internal Medicine, JLN Hospital and Research Centre, Bhilai-490 009, India.
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Ratol paste, found lying in his cupboard amongst his clothes.

**DISCUSSION**

The usual fatal dose of white phosphorus is about 30 -120 mg. Ingestion of a massive dose (5.6 g) of white phosphorus along with tea lead to unconsciousness and respiratory distress within 1½ hours. Rapid absorption of poison is due to its solubility in milk fat present in tea.2 Loss of consciousness, hypotension, peripheral circulatory failure and absence of vomiting has further helped this process. Brownish, shiny, luminescent aspirated gastric contents with garlicy odour, indicate the presence of white phosphorus.1,2,3

Lay process describes spontaneous human consumption (SHC) ever since 1600, but they lack scientific observation and explanation.5 Earliest documentation is in the Bible, but in 1763 Frenchman Jonas Dupont published about SHC cases in De incendis Corporis Human Spontaneous, on being inspired by the Nicole Millet murder case wherein a man was acquitted, after the court upheld that she had died of spontaneous combustion. In 1852, Charles dickens researched on 30 cases and then made use of SHC to kill a character named Krook in his novel Bleak House.5 This phenomenon doesn’t apply to this case because the post-mortem findings are contrary to combustion.

Late Professor Robin Beach of Polytechnic Institute, Brooklyn, believed that, certain people could build up of enough static charges to accidentally light combustible materials, without being harmed themselves. But electrical engineers believe that no know form of electrostatic discharge could cause a human to burst into flames.6

Accidental burn due to unprotected handling in match industry and spontaneous combustion of white phosphorus is known.1,2 The sequence of events that occurred in the ICU favours this phenomenon. The fumes of oxidized phosphorus leaking out through the free end of the Ryle’s tube have possibly accidentally or spontaneously undergone combustion leading to explosion. This could have happened due to :

(a) Sudden contact or released phosphorus with the atmospheric oxygen at a combustible temperature.2 The room’s temperature ranges from 39 to 44.4°C from mid March to mid June in this part of the country.

(b) Sparking, on account of static electricity being transferred from plastic material to the less charged hands of working nurse.4,6

(c) Generation of static and sparking due to sudden release of phosphorus fumes.4,6

Wetting property and low value of resistivity (less than 10.10 Ohm-cm) of water, helps in rapid loss of static charges.4 Hence safety of the patient and the treating personnel can be achieved by following easily applicable precautions:

(a) Keep the free end of the Ryle’s tube or the stomach tube under water while intubation.

(b) Pushing water into the stomach before sucking out the contents

(c) Wetting of hands or plastic or rubber material like gloves, Ryle’s tube, stomach tube, endotracheal tube etc. before use.3,4

(d) Periodic checking of oxygen lines for leakage

Other protective measures to prevent accidents due to static electricity would be earthing and bonding of equipment, increasing conductivity of non conductors by incorporation of conductive additives, surfaces, layers and films and also raising the relative humidity of the working atmosphere to about 70% to prevent development of static on fabric, wood, paper, concrete, masonry etc.

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