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## 1. Learning Outcomes

After studying this module, you shall be able to know about-

- Some unconventional types of poisons
- Illustrations of certain substances acting as poisons unsystematically
- Toxicological details of various drugs and other poisons

## 2. Introduction

While studying the toxicology, by and large, the emphasis is given upon the stereotyped substances known having poisonous nature. But there are several unconventional substances present in the world which are not poison but their mode of administration, dosage and site of incompatibility makes them poison. While discussing about such poisons, it is important to discuss about mechanical poisons which are not poisons in the true sense, as these are not absorbed in the biological systems. But these produce symptoms of irritants because of mechanical action of their sharp angular edges and points thereby causing irritation of stomach and bowels due to contact. These poisons are powdered glass, pins or needles, glass fibers, chopped animal hair etc. are hence included in Section 328 of IPC. Out of these materials, powdered glass has some medico-legal importance. Glass powder is used for destroying cattle i.e. homicidal purposes, but rarely found in suicidal poisoning. It does not produce the desired effect, if it entangled in the mucous or food in the stomach. Similarly, it will not have any effects if it is well powdered. Mechanical irritants, intrinsically, are not poisons and do not cause toxic effects but cause local irritation at the site of application. For example, glass powder can cause irritation of gastrointestinal mucosa if ingested. Powdered glass, diamond powder, needles, etc. may cause pain in abdomen, nausea and vomiting, may injure tissue and causes bleeding. If bleeding is considerable and acute, death may occur due to haemorrhagic shock. If bleeding is gradual and concealed, e.g. malena may induce anemia, weakness, general debility, etc. Similarly death may occur if the agents cause perforation of stomach or intestine Pieces of chopped hairs cause nausea, vomiting and irritation. In such cases the gastro intestinal tract mucosa may be exacerbated. The Fatal dose and fatal period for these types of exceptional toxicants are rather ambiguous due to their unknown mode of action.

## 3. Forensic Issues

Generally, poisoning due to these types of substances is either accidental or sometimes suicidal but homicidal use has not been frequently observed as such. Imaginably, the homicidal usage can be seen in maliciously killing of cattle but that is also obsolete due to hectic preparations and easy availability of other over the counter poisons. For a moment, sugar which is not a poison on the other it is used to enhance flavour to a food product may act as a potent poison when taken in as excess amount. In a more refined illustration, insulin is a necessary drug for a diabetic patient but if it is injected to a healthy normal person may cause his or her death. .In humans, accidental ingestion of these types of poisons may occur with accidental mixing with food products such as jam, jelly or canned products, etc. Circus artists may swallow glass particles while performance of the stunt appearance. These agents may be used with an evil intention to cause ill health and death. Children having access to these substances may accidentally ingest them or may inhale in respiratory tract causing respiratory obstruction. Diamond powder administered internally, is however a mythical poison. It is believed that the son of the Sultan Bajazet of Turkey slayed his father by pouring an enormous quantity of powdered diamond in his father's food. In 1532 the doctors of Pope Clement -VII administered him with fourteen spoonfuls of powdered gems, including diamond, which resulted in death for the Pope. Many of poisons of this category display their apparent toxic effect by inducing allergic reaction to the body rather producing any toxic effect of their own chemical or biological nature.

## 4. Types of Miscellaneous Poisons

### 4.1 Mechanical Dust

Mechanical dust cannot be type casted by a particular substance, but they can be a variety of perceivable substances which can cause toxic effects to the body. Some of the mechanical toxicants are discussed below:

#### 4.1.1 Airborne Contaminants

Airborne contaminants occur in the gaseous state (gases and vapours) or as aerosols. In scientific expressions, an aerosol is defined as a arrangement of particles suspended in a gaseous medium, commonly air in the perspective of occupational hygiene, is typically air.

Aerosols may occur in the form of airborne dusts, sprays, mists, smokes and fumes. In the occupational situation, all these forms may be significant because they relate to a wide range of occupational diseases. Airborne dusts are of specific concern because they are well known to be related with classical prevalent occupational lung diseases such as the pneumoconiosis, as well as with general intoxications such as lead poisoning, specifically at higher levels of exposure. But, in the present time, there is also increasing curiosity in other dust- associated diseases, such as cancer, asthma, allergic alveolitis, and irritation, as well as a complete variety of non-respiratory diseases, which may occur at much lower exposure levels.

Examples of the types of dust found in the work environment include:

- Mineral dusts, such as those containing free crystalline silica (e.g., as quartz), coal and cement dusts
- Metallic dusts, such as lead, cadmium, nickel, and beryllium dusts
- Other chemical dusts, e.g., many bulk chemicals and pesticides
- Organic and vegetable dusts, such as flour, wood, cotton and tea dusts, pollens
- Biohazards, such as viable particles, moulds and spores

### 4.1.2 Diamond Dust

The term diamond originates from the Greek word “adamas” meaning undefeated or invincible. Remarkably, its Aryan essence “dam”, to tame or pacify, is also the source of the expression “madam”. The adjective "adamas" was engaged to refer to the hardest substance recognized and turn out to be synonymous with the gem. In reference to the toughness of this stone made of carbon, a chemical element essential to all life, in this it’s most concentrated form. Diamond dust is possibly the most awful poison in existence. If someone consumes diamond dust, the regular peristaltic motion of the digestive tract causes these minute fragments of the world's hardest substance to imbed themselves along the alimentary canal, the natural motions of the inner body causing them to work deeper and deeper until the internal organs are pierced and shredded.

### 4.1.3 Glass Dust

The powdered glass and diamond dust does not act as poison as they are not absorbed in the blood but they do act mechanically causing irritation of the gastrointestinal tract. Their fatal periods as well as fatal doses are uncertain. The faint shadow of glass particles on X- ray due to presence of radio opaque silica helps in diagnosis. Their related signs and symptoms are burning pain in mouth, throat, stomach and intestines, Nausea, vomiting and constipation. Rarely diarrhoea with tenesmus and bloody stools occur. Death may result from shock following perforation of stomach or intestines by sharp glass fragments.

Glass fragments picked up from stomach contents or materials adhered to the persistent mucous section or faecal matters are washed with water and then with ether. Alternatively, the contents of the bowel or the ejection can be destroyed by concentrated Hydrochloric Acid and Potassium Chlorate. The organic matter passes in to the solution and the glass is left as fragments. In suspected homicidal poisoning by glass, the organs removed should not be preserved in glass container. The particles are then noticed by naked eye, magnifying glass and then under microscope as the glass fragment should appear as transparent and amorphous particles. The picked up particles are melted in a spatula on flame. If the molten material is touched with a thick platinum wire and the wire is pulled up, a glass thread is formed.

## 4.2 Animal Hairs

Normally, hairs of the pet animal do not produce poisoning. Rather they may induce allergic reactions which may lead to serious hyperactivity of the biological system. However, some animals, especially insects, contain irritating hairs known as Urticating hairs or bristles which can produce stinging effects. And if those bristles are somehow reaches the gastrointestinal tract, they may produce irritating effect resulting ulcers and bleeding internally. Urticating hairs are seen in caterpillars and some species of spiders like tarantula among other animals.

## 4.3 Plant Pollens

Trees, grasses, and weeds are all responsible to contributing to airborne pollen. Grass species Poa and Festuca are major contributors along with pollen from several weed genera in the Asteraceae (e.g., mugwort, Artemisia vulgaris), and ragweed, Ambrosia sp.

Toxic effects on humans can range from simple hay fever caused by exposure to plant pollen all the way to serious systemic reactions caused by ingestion of specific plants. “Hay fever” or rhinitis from inhalation of plant pollens is a seasonal problem for many individuals. The common denominator in the various pollen allergens is the conserved binding domain known as profiling, which is also found in birch pollen. Asthma and rhinitis have been linked to individuals who are exposed to *cascara sagrada* (Rhamnus purshiana) or workers in greenhouses in which bell peppers are growing.

## 4.4 Glue Sniffing

These substances are customarily volatile hydrocarbons which are used as solvents, propellants, thinners, and fuels. The hydrocarbon is characteristically inhaled by pouring into a container for “sniffing”, a cloth or sock for “huffing”, or a plastic/paper bag for “bagging”. Abusers often begin with “sniffing” (lower concentrations), and progress subsequently to “huffing” and “bagging” (higher levels of exposure). The most commonly abused inhalants include toluene from paints and glues, petrol, butane from cigarette lighter fluids, butyl and isobutyl nitrite and halogenated hydrocarbons from typewriter correction fluids, propellants, and dry cleaning fluids. Inhalation of volatile substances produces intoxicating effects rapidly. They are well absorbed through the lungs and distributed quickly to the Central Nervous System. One or two huffs will begin to intoxicate the user within seconds, and the effects usually last for several hours. Chronic users can maintain a prolonged high with periodic inhalations every few hours. Poisoning in the cases of glue sniffing results from inhalation of vapours and ingestion of liquid. Ingestion of liquid is more hazardous due to low surfaces tension of liquid. The liquid is aspirated into respiratory tract by vomiting or eructation with resulting chemical peritonitis, secondary bacterial pneumonia and pulmonary oedema. The last two are the most serious consequence to aspiration. Death occurs within 16-18 hours.

## 4.5 Over the Counter Drugs

### 4.5.1 Analgesics

Drugs used to reduce or relieve pain are called analgesics. Aspirin or Acetylsalicylic Acid is a white powder commonly used antipyretic and analgesic. Most of the cases of overdose are suicidal in nature; a few may be accidental. In some individuals, a small dose of aspirin can provoke a fatal hypersensitivity reaction.

Another example of over the counter analgesic is Acetaminophen or commonly known as Paracetamol. It is an analgesic and antipyretic, without the anti- inflammatory properties of aspirin, for which it is time and again used as an alternative because of the lack of gastric irritation. Paracetamol poisoning is more common in children who have low hepatic glucuronide conjugating ability. When a large dose is taken, it causes severe toxicity. Fatality is common with doses >250mg/ kg. Paracetamol is a potent liver poison.

### 4.5.2 Insulin Poisoning

Death from parenteral administration is insulin is quite common. Fatal insulin toxicity can be accidental, suicidal and even homicidal. Accidental fatalities are mostly medical mistakes resulting from misreading the label on the box or container. Suicidal incidences by the use of insulin are also quite common. Insulin is inactive orally and has to be given parenterally for its hypoglycaemic action.

### 4.5.3 Antiseptics

Disinfectant and antiseptic, such as Mercuric Chloride and Carbolic Acid, causes accidental poisoning. Other antiseptic contains Potassium Permanganate which may be ingested by the children accidentally seeing as syrup.

### 4.5.4 Cough remedies

Codeine which is easily available over the counter in the form of antitussive preparations is being increasingly abused especially by college going youth. Codeine is slightly less depressant to the cortex and medullary centres but stimulates the spinal cord. Fatal dose of codeine is extremely variable as it depends on age and habit. The usual blood concentration of codeine that proved fatal to an adult is 1000–10,000 µg/L in cases of acute over dosage.

## 5. Summary

- There are several unconventional substances present in the world which are not poison but their mode of administration, dosage and site of incompatibility makes them poison.

- Mechanical poisons are not absorbed in the biological systems but produces symptoms of irritants because of the mechanical action of their sharp angular edges and points thereby causing irritation of stomach and bowels due to contact.

- Poisoning due to these types of substances is either accidental or sometimes suicidal but homicidal use has not commonly been frequently observed.

- Poisons like powdered glass, pins or needles, glass fibers, chopped animal hair etc. are included in Section 328 of IPC and known as "unwholesome poisons".

- Airborne dusts are of particular concern because they are well known to be associated with classical widespread occupational lung diseases such as the pneumoconiosis, as well as with systemic intoxications such as lead poisoning, especially at higher levels of exposure.

- If someone consumes diamond dust, the regular peristaltic motion of the digestive tract causes these minute fragments of the world's hardest substance to imbed themselves along the alimentary canal, the natural motions of the inner body causing them to work deeper and deeper until your internal organs are perforated and ripped.

- Some animals, especially insects, contain irritating hairs known as Urticating hairs or bristles which can produce stinging effects. And if those bristles are somehow reaches the gastrointestinal tract, they may produce irritating effects.