

**CHAPTER
14**

TOXICOLOGY

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INTRODUCTION

Toxicology is the study of the harmful effects of chemical and physical agents on all living things. Poison, toxic substance, and toxicant are all interchangeable terms. Toxicology's most important axiom is that "the dose makes the poison," which means that any chemical or drug can be toxic if the dose or exposure is high enough. Poisoning can be caused by non-therapeutic substances such as household and environmental toxins, as well as therapeutic overdose. Poison can be consumed accidentally or on purpose. The identification of the toxicant and the limited availability of antidotes present a difficult challenge for the health care provider. As a result, symptomatic therapy may be limited for most health care providers.

The most basic and important principle of clinical toxicology is to "treat the patient, not the poison".

A toxic response can happen in minutes or take hours, days, months, or years to manifest. For practising health care providers, acute toxicities are of particular interest.

General Measures in Poisoning

The treatment of a poisoned patient necessitates a quick and sincere response. The management of poisoning is based on three principles:

- i. Drug detoxification
- ii. Drug identification, and
- iii. life support

Acute clinical emergencies can arise from drug overdose or poisoning by other chemicals. Seizures, cardiac arrhythmias, circulatory shock, and coma are examples of life-threatening emergencies. Massive damage to the liver, lungs, or kidneys can also result in death in a short amount of time. Identification and detoxification of the offending agent may take priority over immediate supportive measures. As a result, vital functions such as respiration, circulation, seizure suppression, and so on are prioritised. A combination of client history, clinical manifestations, and laboratory findings may be required to determine drug identification and dosage.

The first step in drug detoxification is to stop administering the offending substance until the crisis has passed. The effectiveness of the detoxification methods used may be affected by the poison's route of administration.

When the client's gag reflex is still intact, an emetic (e.g., epecac syrup), a cathartic (e.g., magnesium sulphate), an adsorbent (e.g., activated charcoal), or a

combination of these is used to reduce systemic absorption of an ingested poison. Emesis is not recommended after consuming corrosive chemicals.

More invasive procedures, such as gastric lavage and haemodialysis, can be performed in a clinical setting.

Detoxifying agents can also be found in specific antidotes. Antidotes are available to treat poisoning caused by the following substances and can reverse the toxic effects (See Table 15.1).

Table 15.1: Specific antidotes for poisoning with substances

Substance	Specific antidote
Paracetamol	Acetylcysteine, methionine
Anticholinesterases	Atropine, pralidoxime
Antimuscarinics	Physostigmine
Iron	Desferrioxamine
Opioid drugs	Naloxone, naltrexone
Benzodiazepines	Flumazenil
Heparin	Protamine sulfate
Warfarin	Vitamin K ₁
Digoxin	Digoxin-specific antibodies
Methoanol	Ethanol
CO	O ₂
Lead	Calicum disodium edetate
Arsenic, gold, mercury, bismuth, antimony	Dimercaprol
Copper, Zinc, gold	D-penicillamine

Questions

- i. Describe poisoning management measures that hinder the absorption of the poison from the gut.
- ii. List down heavy metal chelators