Toxicology Lecture 13 Dr.siham. A.Wadee

Environmental toxicants

Exposure of biological systems to chemicals may occur through environmental pollution of the atmosphere, water or soil

This results from industrial, agricultural & other human activities. Food born toxins derived from different microbes also can contribute in causing environmental intoxication. The .atmosphere may be polluted by gases such as carbon monoxide & particulates.

a) Carbon monoxide poisoning

Carbon monoxide (CO) is a colorless, odorless gas that is ubiquitous because it is produced by the incomplete combustion

of carbon compounds. The possibility of carbon monoxide poisoning is obvious for the victim ;of fire and smoke inhalation

but accidental and suicidal exposures are also common.

The gas is readily absorbed across the alveolus and combines with hemoglobin with high affinity than oxygen. This displacement of

oxygen from hemoglobin leads to a decrease in oxygen transport and causes tissue hypoxia. Elimination of carbon

monoxide is predominantly through respiration; only about 1% ismetabolized to carbon dioxide.

Victims with mild to moderate CO poisoning often complain of headache, dizziness and nausea

and vomiting. Severe poisoning may result in chest pain dyspnea, syncope, seizures and ,.coma.

Treatment:- oxygen 100%.

b) Food – born toxins

A microbial toxin is a compound produced by a microorganism that acts to cause disease. Food poisoning syndromes result

after ingestion of a wide variety of foods contaminated with pathogenic microorganisms or microbial toxins. The pathogenic

organisms are Clostridium perferinges, Bacillus cereus Escherichia coli, Closterdium ,.botulinium and Vibrio cholerae

Preformed toxins are from A.Staphylococcus aureus, B.cereus and C.botulinum. The illnesses produced usually are associated

With produce GI symptoms.

C-Opioids

Opioids comprise a broad spectrum of substances that include opiate alkaloids (e .g morphine &codeine), synthetic opioids (e .g

pethidine) & semi synthetic opioids (e .g heroin).

They exert their effect acting on opiate receptors located within the CNS resulting in analgesia & euphoria. Opioids are used to treat cough diarrhea, dyspnea (congestive heart failure), and sometimes anxiety as well as pain. The most commonly abused drugs in

this group are heroin, and morphine. Tolerance and dependence of opioids develop with chronic use. The classic triad for opioid

poisoning is miosis, coma and respiratory depression.

D-Nicotine toxicity

Nicotine is one of the most widely abused chemical and now considered to be one of the most addicting substances. It is the

principal pharmacologically active component of tobacco in which poisoning may occur in accidental ingestions of tobacco

products (especially by children), use of nicotine-containing gums, and industrial exposure to tobacco products, contact with

.some pesticides and so on Nicotine has both stimulant and depressant action. Nicotine is

readily absorbed through intact skin as well as through mucus membranes and the respiratory tract. It is metabolized by the

liver and excreted by the kidney. Victims can complain of nausea, emesis, excessive salivation, and diarrhea at low

doses. But at high dose it can cause respiratory paralysis cardiovascular collapse, and ,convulsions

There is no simple qualitative test for Nicotine, but this compound can be detected and identified by thin layer

chromatography of a basic solvent extract of urine.

E-Alcohols

Alcohol, primarily in the form of ethyl alcohol (ethanol), has occupied an important place in the history of human kind for at

least 8000 years. Young children, chronic alcoholics or suicidal persons may ingest toxic quantities of one or several of the

alcohols. Whether intentional or accidental, alcohol ingestions remain one of the more common, yet potentially devastating

poisonings commonly encountered in the emergency department..

Ethanol is mildly polar and readily penetrates cell membrane. Approximately 25% of ingested ethanol is absorbed

unaltered from the stomach and the rest from the small intestine Distribution is rapid and .wide. Over 90% of alcohol consumed is

oxidized in the liver; much of the remainder is excreted through the lungs and in the urine. Alcohol is a central nervous system

depressant. It can cause sedation, impaired motor function slurred speech, emesis, ataxia ,etc. At high blood

concentrations, it induces coma, respiratory depression, and death

F-Snake venom

Snake bite is one of the most common forms of poisoning by natural toxins world wide. The snake venom is a complex

mixture of compounds. The enzymatic components of snake venom cause local and sometimes systemic effects, and the

non-enzymatic components provide lethality. Absorption of snake venom is variable but most rapid through the blood

vessels. Distribution depends on protein binding, membrane permeability and pH. The kidney excretes venom. Clinical

presentations of snakebite may be obvious, but not always. It can cause anaphylactic ,reactions, nausea, vomiting, diarrhea

hemolytic anemia, hemorrhage, respiratory failure.

G-Plant toxins

Many species of plants contain toxic chemicals. There are many well known plant toxins ranging from the irritant formic acid

found in nettles to more poisonous compounds such as atropine(atropa belladonna). The concentration of toxic chemicals is

variable among the same species & different species. Major toxic effects are on the skin (e. g allergic dermatitis), GIT (e. g

(gastroenteritis), cardiovascular(E .g  arrhythmia).