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قسم : فرع الادوية والسموم

اسم المادة باللغة العربية: السموم السريرية

اسم المادة باللغة الإنكليزية: **Clinical toxicology**

المرحلة: الخامسة

التدريسي: م.د. محمد مالك عبدالرحمن

عنوان المحاضرة باللغة العربية: علم السموم البيئية والمهنية.

عنوان المحاضرة باللغة الإنكليزية: **Environmental& Occupational Toxicology**

Environmental& Occupational Toxicology

Occupational toxicology deals with the chemicals found in the workplace. The major emphasis of occupational toxicology is to identify the agents of concern, identify the acute and chronic diseases that they cause, define the conditions under which they may be used safely, and prevent absorption of harmful amounts of these chemicals.

Environmental toxicology deals with the potentially deleterious impact of chemicals, present as pollutants of the environment, on living organisms. The term environment includes all the surroundings of an individual organism, but particularly the air, soil, and water. Although humans are considered a target species of particular interest, other species are of considerable importance as potential biologic targets.

Ecotoxicology is concerned with the toxic effects of chemical and physical agents on populations and communities of living organisms within defined ecosystems; it includes the transfer pathways of those agents and their interactions with the environment. Traditional toxicology is concerned with toxic effects on individual organisms; ecotoxicology is concerned with the impact on populations of living organisms

Bioaccumulation : If the intake of a long-lasting contaminant by an organism exceeds the latter's ability to metabolize or excrete the substance, the chemical accumulates within the tissues of the organism.

Biomagnification : Although the concentration of a contaminant may be virtually undetectable in water, it may be magnified hundreds or thousands of times as the contaminant passes up the food chain.

AIR POLLUTANTS

Air pollution may result from vapors, aerosols, smokes, particulates, and individual chemicals. Five major substances have been said to account for about 98% of air pollution: carbon monoxide (about 52%); sulfur oxides (about 14%); hydrocarbons (about 14%); nitrogen oxides (about 14%) and ozone, their breakdown product; and particulate matter (about 4%). Sources of pollutants include fossil fuel burning, transportation, manufacturing, other industrial activities, generation of electric power, space heating, refuse

disposal, and others. Sulfur dioxide and smoke from incomplete combustion of coal

have been associated with acute adverse effects among children, the elderly, and individuals with preexisting cardiac or respiratory disease Ambient air pollution has been implicated as a cause of cardiac disease, bronchitis, obstructive ventilatory disease, pulmonary emphysema, bronchial asthma, and airway or lung cancer.

Carbon Monoxide

Carbon monoxide (CO) is a colorless, tasteless, odorless, and non-irritating gas, a byproduct of incomplete combustion. CO combines tightly but reversibly with the oxygen- binding sites of hemoglobin and has an affinity for hemoglobin that is about 220 times that of oxygen. The product formed—carboxyhemoglobin—cannot transport oxygen. Furthermore, the presence of carboxyhemoglobin interferes with the dissociation of oxygen from the remaining oxyhemoglobin as a result of the Bohr effect. This reduces the transfer of oxygen to tissues. Organs with the highest oxygen

demand (the brain, heart, and kidneys) are most seriously affected.
Clinical effects—The principal signs of CO intoxication are those of hypoxia. They progress in the following sequence: (1) psychomotor impairment; (2) headache and tightness in the temporal area; (3) confusion and loss of visual acuity; (4)
tachycardia, tachypnea, syncope, and coma; and (5) deep coma, convulsions, shock, and respiratory failure.
Treatment—Patients who have been exposed to CO must be removed from the exposure source immediately. Respiration must be maintained and high flow and concentration of oxygen—the specific antagonist to CO—should be administered promptly. If respiratory failure is present, mechanical ventilation is required, High concentrations of oxygen
may be toxic and may contribute to the development of acute respiratory distress syndrome. Therefore, patients should be treated with high concentrations only for a short period.

Sulfur Dioxide

Sulfur dioxide (SO2) is a colorless irritant gas generated primarily by the combustion of sulfur-containing fossil fuels. When SO2 contacts moist

membranes, it transiently forms sulfurous acid. This acid has severe irritant effects on the eyes, mucous membranes, and skin.

Clinical effects: include irritation of the eyes, nose, and throat, reflex bronchoconstriction, and increased bronchial secretions. In asthmatic subjects, exposure to SO2 may result in an acute asthmatic episode. If severe exposure has occurred, delayed-onset pulmonary edema may be observed.

Treatment is not specific for SO2 but depends on therapeutic maneuvers used to treat irritation of the respiratory tract and asthma.

Nitrogen Oxides

Nitrogen dioxide (NO2) is a brownish irritant gas sometimes associated with fires.NO2 is a cause deep lung irritant and pulmonary edema.

The signs and symptoms of acute exposure to NO2 include irritation of the eyes and nose, cough, mucoid or frothy sputum production, dyspnea, and chest pain. Pulmonary edema may appear within 1–2 hours

Treatment—There is no specific treatment for acute intoxication by NO2; therapeutic measures for the management of deep lung irritation and pulmonary edema are used.

Ozone

Ozone (O3) is a bluish irritant gas found in the earth's atmosphere, where it is an important absorbent of ultraviolet light at high altitude. At ground level, ozone is an important pollutant. Ozone can be generated in the workplace by high-voltage electrical equipment, and around ozone-producing devices used for air and water purification.

clinical effects—Ozone is an irritant of mucous membranes. Mild exposure produces upper respiratory tract irritation. Severe exposure can cause deep lung irritation, with pulmonary edema when inhaled at sufficient concentrations .Pulmonary function is impaired at concentrations exceeding 0.8 ppm

Treatment—There is no specific treatment is available . measures that reduce inflammation and pulmonary edema .

SOLVENTS

A-Halogenated aliphatic hydrocarbons

These “halohydrocarbon” agents once found wide use as industrial solvents, degreasing agents, and cleaning agents. The substances include carbon tetrachloride, chloroform, trichloroethylene, tetrachloroethylene (perchloroethylene), and 1,1,1- (methyl chloroform). Many halogenated aliphatic hydrocarbons are classified as known or probable human. Trichloroethylene and tetrachloroethylene are listed as “reasonably anticipated to be human Carcinogens Clinical effects : solvents are potent CNS depressants. The cute effect of toxicity are nausea ,vertigo, headache and coma. Chronic exposure lead to hepatic dysfunction and nephrotoxicity.

Treatment:There is no specific treatment for acute. Management depends on the organ system involved.

B-Aromatic Hydrocarbons

Toluene,Xylene,Benzene is used for its solvent properties and as an intermediate in the synthesis of other chemicals. It remains an important component of gasoline.

The acute toxic effect of benzene is depression of the CNS. Exposure to 7500 ppm for 30 minutes can be fatal. Exposure to concentrations larger than 3000 ppm may cause euphoria, nausea, locomotor problems, and coma. Vertigo, drowsiness, headache, and nausea may occur at concentrations ranging from 250 to 500 ppm. No specific treatment exists

for the acute toxic effect of benzene.
Chronic exposure to benzene can result in very serious toxic effects, the most

significant of which is bone marrow injury. Aplastic anemia, leukopenia,

pancytopenia, and thrombocytopenia occur, as does leukemia
Toluene (methylbenzene) and xylene does not possess the myelotoxic properties,

but cause a CNS depressant and a skin irritation .
Treatment: removal from exposure ,CNS depression is mange by support the

vital signs.

A-Chlorinated hydrocarbons

PESTICIDES

These agents are usually classified into four groups: DDT (chlorophenothane) and its analogs, benzene hexachlorides, cyclodienes, and toxaphenes. These agents are persistent, poorly metabolized, lipophilic chemicals that exhibit significant bioaccmmulation.

These agents interfere with inactivation of the sodium channel in excitable membranes and cause rapid repetitive firing in most neurons. Calcium ion transport is inhibited. These events affect repolarization and enhance the excitability of neurons. The major effect is CNS stimulation. With DDT, tremor may be the first manifestation, possibly continuing to convulsions, whereas with the other compounds convulsions often appear as the first sign of intoxication. There is no specific treatment for the acute intoxicated state, and management is symptomatic. The organochlorine pesticides are considered persistent chemicals. Degradation is quite slow when compared with other pesticides, and bioaccumulation, particularly in aquatic ecosystems

B-Choliesterse Inhibitors

Carbamte and organophosphours (malathion , parathion). They are useful pesticides when in direct contact with insects or when used as plant systemics, where the agent is translocated within the plant and exerts its effects on insects that feed on the plant the major effect of these agents is inhibition of acetylcholinesterase through phosphorylation of the esteratic site. The signs and symptoms that characterize acute intoxication are due to inhibition of this enzyme and accumulation of acetylcholine; some of the agents also possess direct cholinergic activity. Specific treatment with antidotes and useful antagonists is available. In addition, neuropathy target esterase (NTE). This results in progressive demyelination of the longest nerves. Associated with paralysis and axonal degeneration, this lesion is sometimes called organophosphorus ester-induced delayed

polyneuropathy (OPIDP). Delayed central and autonomicneuropathy may occur in some poisoned patients.

C-Botonical

Nicotine has effect on nicotinic cholinoreceptors(excitation follow by paralysis of ganglioc, neurotransmission) treatment is supportive.

Rotenone :plant alkaloid pesticide cause GIT distress when ingested and conjunctivitis and dermatitis after direct contact with exposed body surface. Treatment is supportive.

HERBICIDES

1-Chlorophenoxy

2,4-Dichlorophenoxyacetic acid (2,4-D), 2,4,5-trichlorophenoxyacetic acid (2,4,5- T), and their salts and esters have been used as herbicides for the destruction of weeds. can cause coma and generalized muscle hypotonia. Rarely, muscle weakness and marked hypotonia may persist for several weeks

2-Bipyridyl Herbicides

Paraquat is the most important agent of this class. signs and symptoms after oral exposure are hematemesis and bloody stools. Within a few days, however, delayed toxicity occurs, with respiratory distress and the development of congestive hemorrhagic pulmonary edema accompanied by widespread cellular proliferation. During the acute period, oxygen should be used cautiously to combat dyspnea or

cyanosis, because it may aggravate the pulmonary lesions. Hepatic, renal, or myocardial involvement may develop. The interval between ingestion and death may be several weeks because delay toxicity ,prevent absorption is important. Adsorbents (eg, activated charcoal) Once the paraquat is absorbed, treatment is successful in fewer than 50% of cases. Monitoring of plasma and urine paraquat concentrations is useful for prognostic assessment. Antioxidants such as acetylcysteine and salicylate might be beneficial through free radical- scavenging,and anti-inflammatory, best supportive treatment dialysis