AL- Mustaqbal University
Pharmacy college

Pharmacognosy1
Second stage

Lecture: 3
Drug adulteration/ Pharmacological activities of natural products

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Drug adulteration

The term 'adulteration' means debasement (decrease the quality or decrease the value) of an article or any drug which may be deliberate or accidental.

Usually in crude drugs, this practice includes substitution of the original crude drugs partially or fully with other substances which is either free from or inferior in therapeutic and chemical properties.

Types of Drug Adulteration

1-Inferiority

is a natural substandard condition (e.g. where a crop is taken whose natural constituent is below the minimum standard for that particular drug) which can be avoided by more careful selection of the plant material. e.g. the dried ripe seeds of strychnos nux vomica, contains the alkaloid strychnine about 1.15% but when contain less than 1.15% of strychnine it considered inferior or substandard drug.

2-Spoilage: is a substandard condition produced by the action of bacteria, fungi, which makes the product not suitable for human use, this can be avoided by careful attention to the drying, and storage conditions.

3-Deterioration: is an impairment of the quality or value of a drug due to destruction or abstraction of valuable constituents by bad treatment or aging or to the deliberate extraction of the constituents and the sale of the residue as the original drugs.

The factors which must be considered in relation to drug deterioration are moisture content, temperature, light and the presence of oxygen.

When these conditions are suitable, organisms (bacteria, molds and insects) are rapidly multiply using the drug as a source of nutrient. Drugs affected in this way are excluded by national pharmacopoeias. e.g. coffee beans contain caffeine (alkaloid) as active constituent, this is lost over roasting.

4-Admixture: is the addition of one article to another through accident, ignorance or carelessness e.g. inclusion of soil on an underground organ or the co-collection of two similar species.

5-Sophistication: is the addition of spurious or inferior material with intent to defraud. such materials are carefully produced and may appear at first sight to be genuine e.g. addition of wheat flour to powdered ginger with addition of capsicum to give pungency also addition of curcuma to maintain the color.

6-Substitution: is the addition of an entirely different article or drug in place of that which is required e.g. supply of cheap cottonseed oil in place of olive oil.

Pharmacological activities of natural products.

Drugs acting on the nervous system

The nervous system coordinates and regulates the various voluntary and involuntary activities of the body and is conveniently considered under two classes.

The central nervous system (CNS) and the autonomic nervous system.

The two are interlinked and some drugs which affect the CNS may also produce reactions associated with the autonomic system.

The central nervous system

The central nervous system comprises the brain and the spinal cord. It coordinates the voluntary activities of the body and exhibits numerous interactions within the system together with linkages to the autonomic system.

Drugs involved with the CNS can be broadly classified according to whether they have a general stimulatory or depressant action with further subdivision regarding specific actions such as anticonvulsant, narcotic, analgesic and hallucinogenic drugs.

- **Examples of drugs acting on CNS**
- Cocaine: used as a mental stimulant.
- Ginkgo biloba: improves short term memory.
- Ginseng: improves mental concentration particularly in the elderly.
- Cannabis: Hallucinogen

The autonomic nervous system

The autonomic nervous system supplies the smooth muscle tissues and glands of the body.

Its function is complex, involving ganglia situated outside the spinal cord; it is composed of two divisions, the sympathetic and the parasympathetic.

Two important neurotransmitter substances of the autonomic nervous system are acetylcholine and noradrenaline and its derivatives; hence, other substances which either mimic or antagonize the action of either of these will produce a marked physiological response.

Examples of drugs acting on the autonomic nervous system

Acetylcholine liked drugs: Pilocarpine, Muscarine and Physostigmine

Antagonists of acetylcholine: atropine

Adrenaline like drugs: Ephedrine

Antagonists of adrenaline Ergot alkaloids (e.g. ergotamine).

- **The Heart, Circulation and Blood Cardioactive glycosides**
- Glycosides of this group are characterized by their highly specific action on cardiac muscle, increasing tone, excitability and contractility.
- They consist of sugar and non-sugar moiety (aglycon).

- The pharmacological effectiveness of the cardioactive glycosides is dependent on both the aglycones and the sugar part, the pharmacological activity belongs to the aglycones, but the sugars render the compounds more soluble and increase the targeting of the glycosides to the heart muscle.

- The clinical effect in cases of congestive heart failure is to increase the force of myocardial contraction (the positive inotropic effect), the digitalis glycosides are also used to control supraventricular (atrial) cardiac arrhythmias.

- **Antiarrhythmic drugs**

- As mentioned above, the cardiac glycosides can be used to control supraventricular (atrial) cardiac arrhythmias.

•There are a number of other drugs such as the alkaloid quinidine (obtained from various cinchona barks) which act on both supraventricular and ventricular arrhythmia.

- **Antihypertensive drugs**
- The plant drugs as rauwolfia and its principal alkaloid reserpine together with Venfirum extracts were used in the treatment of hypertension.
- A possible mechanism of action for these drugs is by inhibition of angiotensin converting enzyme (the enzyme that convert angiotensin I to angiotensin II which is vasoconstrictor).
- **Platelet activating factor (PAF) antagonists**
- In the circulatory system thrombi may be caused on the arterial side as a result of the adhesion of blood platelets to one another and to the walls of the vessels.
- This platelet aggregation is triggered by the platelet activating factor.
- Plants with active constituents include lignans, sesquiterpenes, coumarins, and salicyl alcohol, were reported to have anti-PAF activity.
- Extracts of Ginkgo biloba have been used for the treatment of various circulatory disorders

- **Hypolipidemic drugs**

garlic (Allium sativum) lowers serum total cholesterol and improves the lipid profile.

Psyllium seed reduce serum levels of total cholesterol, and low-density lipoprotein.

Action on gastrointestinal tract

Anticholinergic drugs, hyoscine and hyoscyamine are used in muscle spasm particularly with some ulcer patients.

Emetics Ipecacuanha preparations, on oral administration have emetic action produced by irritation of the mucous Membrane.

Picrotoxin simulate the vomiting Centre in the central nervous system.

Ginger has been used in prevention of the symptoms of motion sickness.

The plant or oils used as Carminatives include caraway, peppermint, thyme, nutmeg and so on.

For ulcer derivatives of glycyrrhizinic acid (triterpenoid of Liquorice root) prove effective in the treatment of peptic ulcer.

Laxatives: Senna (leaves and fruit), Cascara, rhubarb, aloes. These Contain anthraquinone derivatives which are hydrolyzed in the bowel to stimulate intestinal wall.

Antidiarrheal drugs Morphine and codeine act by decreasing bowel mobility. Commonly prescribed with kaolin.

Drugs acting on the nasal and respiratory systems.

Bronchodilators and nasal decongestants: Ephedra, ephedrine Expectorants: liquorice roots, squill bulb

Cough depressants: Morphine and codeine.

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Thank you