Medical Botany
4: Introduction to active constituents

- Herbal medicines are grouped according to their physico-chemical properties and their parental status as follows.
- O Alkaloids
- O Balms
- O Phenols
- O Flavonoids
- O Glycosides
- O Glucosinolates
- O Latex
- O Lignans / Lignins
- O Musilages
- O Resins
- O oleo-resins
- O Fixed and essential oils
- O Saponins
- O Candies
- O Tannins
- O Terpenoids (Terpenes)
- O Oils (fixed and volatile oils)
- O Like gums

- • Some plant families are more rich in some substances than others.
- O Solanaceae; Tropane alkaloids (such as atropine, scopolamine).
- O Rosaceae (Rosaceae); Tannins and flavonoids.
- O Hardalgiller (Brassicaceae / Cruciferae); Glucosinolates.
- O Ballibagiller (Lamiaceae / Labiatae); Antibacterial effective tannins and essential oils.

- • Some active ingredients are found in many plants; Organ;
- O Betulinic acid (Triterpenoid)> 460,
- O Kaempferol (Flavonoid) is found in 150 plants.

- It prevents NMDA-R activation.

- • Some plants have hundreds of substances.
- O Plants in the knotted pepper line> 600 carry secondary material.

- • In some plants, some are highly effective, there are dozens - hundreds of substances; Some examples are as follows.
- O Altınçiçek (Arnica montana)
- O Laurel (Laurus nobilis)
- O Gingeng (Panax ginseng)
- O Hayıt (Vitex agnus-castus)
- O Symphytum officinale (Symphytum officinale)
- O Kipriotu (Echinacea angustifolia)
- O Gooseberry (Ginkgo biloba)
- O Mint (Mentha piperita)
- O Sarichantaron (Hypericum perforatum)
- O Sedefortu (Ruta graveolens)

- Sarichantaron (Hypericum perforatum) is one of the most typical examples; Some of the ingredients and effects found in the plant are as follows.
- □ Amentoflavone (3 ', 8' '- Biapigenin; biflavonoid);
- O Serotonin (5-hydroxytryptamine, 5HT) 5HT1D-, 5HT2C-R,
- O Dopamine (D) D3-R,
- O the delta-opioid-R of the opioids,
- O Benzodiazepines (BZ) to BZ-R,
- It prevents estrogenic substances from binding to estrogen-α-R.

- □ Hyperforin (Floroglucinol);
- O D1-Rs, to some extent other D-Rs,
- O to 5HT-R,
- O Opioid-R,
- O BZ-R,
- It is linked to βA-R.

- O Dopamine,
- O 5HT,
- O Cholin,
- O Noradrenaline (NA),
- O Gamma-aminobutyric acid (GABA),
- It prevents the ingestion of substances such as L-glutamate (unlike synthetic-selective 5HT-reductase inhibitors such as paroxetine).
- It affects the flow of the cell membrane.
- It leads to the release of aspartate, glutamate and GABA.

- Hyperin (Hiperocide; flavonol O-glycoside);
- O Malondialdehyde and NO content in damaged structures,
- O Reduce the intake of calcium into the brain cells.

- Hypericin (Biantroquinone);
- O to D3- and D4-R,
- O βA-R,
- O Human corticotropin releasing factor (CRF1) -R,
- It is connected to Sigma-R.
- O Noropeptide Y1-R,
- It blocks N-methyl-D-aspartate (NMDA) -Rs.

- Amentoflavone, hyperin, kaempferol (flavonol), quercetin (flavonol), quercitrin (flavonol O-glycoside), isoquercidin (quercetin 3-O-glycoside), rutin (flavonol O-glycoside);
- O Dopamine inhibits β-hydroxylase.

- Pseudohypercin;

- 1. Alkaloids • Nitrogenous bases which are found in plants and which are commonly found in plants and which can form salts with acids.
- • They are present as primary, secondary, tertiary, quaternary ammonium hydrates.
- • Alkaloid name is given because of similarity of alkalinity.
- • It is usually found in plants at 0.1-10%.
- O In the context of an alkaloid-bearing plant, the term usually means> 0.01% alkaloid.

- • There are some firsts.
- O Alkaloid morphine first isolated from the environment (Derosne and Seguin 1803-1804, Serturner 1805)
- O First synthesized cone (Ladenburg 1886)
- O The first used striknin (Magendie 1821)

- • Plants often have multiple alkaloids in different amounts in similar structures.
- • An alkaloide can be found in more than one plant family, as well as a single plant species.
- • Alkaloids are usually found in the form of their salts in their own juice (salts with acids such as malic acid, tartaric acid, oxalic acid, tannic acid, citric acid).
- • They are found in almost all parts of plants (root, crust, leaf, seed etc.) but in different amounts.
- This does not mean that an alkaloid will be found in all parts of a plant.
- □ Some fruits only fruit (morphine, etc., while there are poppy seeds, not in the seed),
- □ Some of them are found in leaves and flowers (not found in the seeds of nicotine tobacco plant).

- Nicotine, cones, other than those without oxygen in the constructions are usually white, crystallized dust; The above two substances are liquid.
- • Alkaloids are almost insoluble in water as free base (atropine, morphine); They are well soluble in alcohol and other organic solvents.
- • In acid salts (such as atropine sulphate and morphine sulphate) they are reversed.
- • Heat, light and air break down.
- • Some (such as quinine, strychnine) are extremely painful.
- • If necessary, the free base, if necessary, salts with tannic acid, heavy metals and their salts.

- • Alkaloids
- • Some (such as cone, strychnine) are extremely toxic,
- • Some (such as bophotenine, dimethyltryptamine, psilocybin, etc.) are hallucinogenic,
- • Some (such as codeine, morphine)
- • Some are carcinogenic / tumorigenic (such as aristolesin, colchicine, pyrrolizidine alkaloids).
- • Some of the poisonous ones (atropine, codeine, colchicine, morphine, scopolamine) are also used as medicines.

- Especially the plants in the following families are rich in alkaloids.
- • Legumes (Fabaceae / Leguminosae)
- • Poppycorn (Papaveraceae)
- • Berberidaceae
- • Rootbill (Rubiaceae)
- • Solanaceae
- • Sedefotugiller (Rutaceae)
- • Yasemingiller (Loganaceae)
- • Zakkumgiller (Apocynaceae)

- • They are usually named after the end of the active substance, or with the -ina (Latin) suffix.
- • Some of the effects (emetic, vomit),
- • Some (pelletierin; Pelletier) are named according to the name of the first one found.
- • Alkaloids are generally classified according to the chemical nature of the structure; There are still a large number of alkaloids in many sub-groups.

- Alkaloids have a wide variety of effects; Some alkaloids for some effects are as follows.
- • Bitter alkaloids: Quinine, quinidine, kynonine, kinkonidine.
- • Adenosine receptor antagonist: caffeine, theobromine, theophylline.
- Adrenergic receptor antagonist: xylopinin, berberine, xylopinin, yohimbine.
- • Pain reliever: opioids such as Argemonin, morphine etc.
- • Aphrodisiac: ibotenic acid, muscimol, yohimbine.
- • The inhibitor of ACE activity: Berberine, deoxypeganine, deoxivasicinon, eseramin, eseridin, artichoke (fizostigmine), galantamine, palmatin, peganine, vasicinol.
- • Analeptic: Caffeine, strychnine.
- • Antelmintic: Pelletierin.
- • Antibacterial: phagaronine, gerardine, pteleatin, sanguinarin.
- • Antimicrobials: Dictyamine, β-phagarin, □-phagarin, flindersin, gerrardin, haplopine, isodicytamine, cocusaginin, maculocidin, N-methylfindersin, O-methylptelefolonium, veprisinium.
- • Anti-microsporidium: Haemantidine, 7-deoxynarcicline.
- • Addictive: opioids like codeine, heroin, morphine.
- • Sputum suppressant: Emetin, psychotrin.
- • Renal osmoprotectant: Stacridine, 3-hydroxystarchine.
- • COX-2 inhibitor: Tryptantrin.

- • Striated muscle-heart stimulator: Ryanodin
- Dioxin receptor agonist: Tryptantrin.
- • Preventing dopamine re-uptake: benzoylcigonine, benzoyltropine, ecgonine, cinnamiolcocaine.
- • Smooth muscle relaxant (spasmolytic): Arborin, edulin, codeine, dionine, japonin, morphine, narcotine, vasicinon.
- • Photomutagenic: Dictyamine, □-phagarin, β-phagarin.
- GABA receptor agonist: Muscimol, risinin.
- GABA receptor antagonist: Bikukkulin.
- • GABA vehicle inhibitor: Guvacin.
- • α-, β-Glycosidase inhibitor: Alecine, australin, deoxymannoglycinine, deoxynojirimycin, hiasintasin-B1, -C1, castanospermin, cucumber.
- Glycine receptor antagonist: Striknin.
- • Glutathione deficiency: Convicide, vicin
- Glutamate receptor agonist: ibotenic acid.

- Glutamate receptor antagonist: Iboganin.
- • Halucinogenic: Bifotenine, DMT, ergometrine, ergosine, ergocrin, ergocristine, ergokrinin, ergotamine, 5HT, gramine, harmaline, blend, harmin, ibotenic acid, LSD, N-methylcytidine, muscimol, psilocybin, psilocin, cytidine.
- • 5HT (serotonin) receptor agonist: Ergometrine, ergosine, ergotamine and other ergot alkaloids; Prolactin secretion.
- • 5HT receptor antagonist: cocusaginin, confusamelin, β-phagarin, yohimbine.
- • 5HT inhibitor: benzoylcigonine, benzoyltropine, eugonine, cinnamiolcocaine.
- • Blood sugar lowering: 13-hydroxylupanine, kasimiroedin, N-methylhistamine, tekomine, trigonellin.
- • Liver poison / carcinogenic: Pyrrolizidine alkaloids (angularin, echimidin, heliosupin, heliotrin, heliotridin, indicin, isatidine, jacobin, lasiocarpine, monocrotaline, retrosin, riddelin, senecionin, senecifillin).
- • Promotes the development of hair: Reticuline.
- • Cholinergic-muscarinic receptor agonist: Slaframine.
- • Cholinergic-muscarinic receptor antagonist (atropine-like effect): Anisodamine, apoatropin, atropine, benzoyltropine, hyosine (scopolamine), lithotin, tiglodine, tropine, tropacocaine, usambarenin.
- • Cholinergic-nicotinic receptor agonist: Anabasin, anabasin, anatoxin-□, arecaindin, arecolin, coninide, konicein, lobelanin, lobelanidine, lobelin, lobinin, N-methylconidine, N-methylcytidine, myosin, nicotine, pilocarpine, pilocin, cytosine.

- • Cholinergic-nicotinic receptor antagonist (curative-like effect): Daurisin, elatin, erythrine, erythrothrin, erythratin, □-, □-erythroidin, codelfin, condondine, curar, magnofluorine, methylaconitin, rodiacin, serpin, toxiferin.
- • Vomit: Apomorphine, emetine, psychotrine.
- Na-channel blocker: Lupine, lupinein.
- • Na, K-ATPase activity inhibitor: Eritropleguin, kassaine, casassin, shihunidine, shihunin.
- • Narcotics: Heroin, codeine, morphine, rhoeadin.
- Mannosidase: Swainsonin.
- • Microsporidium effective: Pancratistatin.
- • iNOS inhibitor: Tryptantrin.
- • Cough cutter: Codeine, narcein.
- Protein kinase inhibitor: Scheringgrin.

- • Psychoactive: Haplofilidine, cocaine, robustine.
- • Ryanodine receptor stimulant: Caffeine
- • Effect on Schizophysis: Cucurbitin
- • Inhibition of sAMP-FDE activity: caffeine, papaverine, theobromine, theophylline.
- • Effective against: Augustin, febrifugin, isofebrifugin, quinine, kinkonin, kinkonidin, krinamin, lycorin.
- Teratogenic effect: Amiodendrin, anabasin, anagirine, N-acetylhistrin, 3-O-acetylgervine, O-diacetylgervine, 13a-dihydroergin, elimoclavine, N-formylgervine, jervine, N-coneine, conicide, N-methylamodendrin, methyljervine, , Rubijervin, caconidine, monocrotaline, senecionin, cyclopamine, cyclopocine, cytisine, solanidine, solasodin, usaramin.
- • Topoisomerase I inhibitor: Camptothecin
- • Platelet activity inhibitor: Cocusaginin, confucamelin, β-phagarin.
- • Tumor suppressor / inhibitor: Ambelline, acetylcarbinine, docetaxel, komptothecin, taxin, taxol (paclitaxel), vinblastine, vincristine.
- • Tuberculosis and leprosy are effective: Sefarantin.
- • Anti-inflammatory: Achillein, gentianin, gentianamin, gentianin.

- 2. Glycosides
- • Hydroxyl or sulphydryl group are the compounds made with sugar.
- O Sugar (known as glycone) and non-sugar portion (known as genus or aglycone) are linked to each other by an ether linkage (glycosidic link, oxygen bridge).
- The part that is effective / effective is the non-sugar part (genetically or aglycone).

- • Bond; Enzymes (such as β-glucosidase, β-galactosidase) found in the digestive tract of plant tissues or animals are easily hydrolyzed under hot, UV light, humidity, extreme acidic or alkaline conditions.
- O The glycoside dissociates itself into the constituent parts.
- This significantly changes the pharmacokinetics and pharmacodynamics of glucoside.
- Care should be taken when preparing or using the plant.

- • Glycosides, which are broadly active, usually dissolve in water and alcohol solutions.
- • Glycosides are usually named after the active substance in -in or -inum (Latin).

- • Glycosides in the digestive tract (usually the strong alkaline medium of the large intestine) are exposed to hydrolysis and break down into their constituent parts.
- □ Some of the agglissons are subject to change here (loss of influence)
- □ Some are absorbed and form their influence.

- • Saponic glycosides (ginsenosides) found in ginseng (Panax gingeng) are decomposed by digestive tract bacteria.
- □ The release of aglycones (panaxadiol, panaxatriol) produces a stronger effect (such as an anti-cancer effect) than parenterally administered glycosides.

- • Important glycosidic substances in terms of pharmacology and toxicology.
- O Cardiac glycosides
- O Glucosinolates
- O Saponin glycosides
- O Solaninler
- O Coumarin glycosides
- O Antaglycosides
- O Cyanogenetic glycosides
- O Calcinogenic glycosides
- O Bitter glycosides
- O Flavonoids
- O Nitropropanol glycosides

- 2 a. Cardiac glycosides (Table 4a)
- • There are hundreds (> 300) plant species in the constructions containing cardiac glycosides.
- O Gullworms (Digitalis species),
- O Strofantus (Strophanthus species),
- O Adash (Urginea maritima),
- O Pearl (Convallaria majalis),
- O Oleander (Nerium oleander),
- O Helicobacter (Helleborus orientalis) glycosides are of pharmacological importance.

- All of the cardiac glycosides have a group of β-OH in C3 and C14; If the OH group is more than 5, these also depend on C5, C11 and C16.
- • In glycosides, the sugar molecule is linked to the C3 by an oxygen bridge (glycosidic bond).
- • Cardiac glycosides are triterpenic; They are divided into two according to their agricons.
- O Cardenolids (such as digitoxigenin, gatifoxygen, gitaligenin, strophanidin)
- O Bufadienolidler (hellebrigrin, convallatoxin, such as sillarenin)
- O The two structures are often similar, with little difference between them.
- O Lakton ring;
- In cardenoid glycosides (such as digitalis, strofantus) 5-member,
- Bufadienolid is a 6-member in glycosides (such as bufatolin, sillaren).

- • Cardiac glycosides increase the contraction power of the heart muscle by inhibiting the activity of the Mg-dependent Na, K-ATPase (the protein or pump that carries the sodium in the cell and the potassium outside the cell) in the heart muscle cell membrane; This is known as the cardiotonic effect.
- O Blocking the effectiveness of the pump increases the sodium concentration in the heart chambers.
- This activates another pump (Ca / Na exchange system, Ca / Na-TR) in the cell membrane.
- The system exchanges sodium in the outside with calcium in the outside.

- O Increasing concentrations of calcium ions in the cell allow the heart muscle to contract more strongly.
- O Heart rate under the influence of heart glycosides;
- Slower but stronger stiffness,
- Increase in heart rate,
- The heart uses energy-saving; That is, it does more work than the energy you're spending.

- 2b. Saponins
- • Saponin name comes from sapo name in Latin.
- • Saponin-containing plants (such as Saponaria officinalis, Panama tree-Quillaja saponaria) or plant parts have been used especially for washing clothes.
- • They are considered as a subgroup of glycosides.
- • The aglycon is called sapogenol (or sapogenin).
- O According to Aglikona;
- □ Steroidal saponins (Figure 4ba),
- □ Triterpenoid saponins (triterpenic saponins, Figure 4bb).
- □ There are also steroidal saponin-like substances; They are known as phytosterols (such as campesterol, sitosterol, stigmasterol).

- O Steroidal saponins (such as dioscin, protodioscin) are prepared from acetyl-CoA.
- The steroidal saponins are 4-ring (also, in C17 there are 5- and 6-membered lactone rings, both of which are oxygen).
- They are found in more monocotyledons.
- • In some plants (such as Dioscora species, Agave species, Yucca species) of monocotyledonous plants, Negisgiller / Amaryllidaceae, Karaasmagiller / Diosporaceae, Liliaceae,
- • Dicotyledons are found in some plants (such as Trigonella faenum-graecum) in Leguminous plants (Fabaceae / Leguminosae).
- They are neutral reactions.
- Yellow with sulfuric acid (Salkowski reaction) gives color.