Ministry of Higher Education& Scientific Research

Middle Technical university

Institute of Medical Technology

Learning package in field of

Pharmacology

Presented to the second class students

Institute of Medical Technology-Baghdad

Nursing Department of nursing, first aid branch

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INTRODCTION

Pharmacology:

Science deals with the properties and effects of drugs, in amore general with the interactions of chemical compounds and living systems.

Drugs

Are chemical compounds used for prevention, diagnosis, and treatment of many diseases, and effective in a small quantities, the action of drugs on living systems are called drug effects e.g. analgesic, analgesic, antipyretic.....etc.

Drug Receptor: Any part of a cell, usually a large protein molecule, on the cell surface or in the cytoplasm with which a drug molecule interacts to trigger a response or effect.

Pharmacodynamics:

IS the study of the mechanism of action of drugs. There are three mechanisms

Drug-receptor interaction ---the drug combines with cellular receptors.

Drug-enzyme interaction---the drug interacts with cellular enzyme systems

Non specific drug interaction ---the drug alters physical and chemical properties of the outer cell membrane and intracellular structures.

Pharmacokinetics

The study of drug movement through the body over time, helps predict drug action (therapeutic and adverse drug effects), 4 basic processes a drug undergoes after it enters the body.

Absorption

Distribution

Metabolism

Excretion

The magnitude of a drugs effect depends on the drug concentration at the site of action.

A drug must move from the administration site to the target tissues in which it will act

By distributing through numerous tissues. Some tissues such as the liver may biotransform

(metabolize) the drug as it moves through them. After metabolism, the drug is eliminated.

Absorption: the 1st process

Absorption: the 1st process

Take the drug from the administration site into the blood stream (systemic circulation). I.V. or intra -arterially enters the blood stream directly and therefore dose not undergo absorption the entire dose is 100% bioavailable immediately, ready for distribution to its receptor site.

Drugs administered by all other routes [oral(P.O., I.M., rectal (P.R.), subcutaneous(S.C.), sublingual (S.L.), buccal, nasal, intratracheal, intradermal, and topical] must be absorbed before they can become available to target tissue. Special formulations of oral drugs (such as sustained- release tablets) can change the rate at which a drug dissolves in the stomach or small intestine, therefore slaw the rate of absorption.

Distribution

Once the drug reaches the blood stream it distributed throughout the body blood flow play a role in drug distribution, determine how quickly a drug reaches its receptor sites highly perfusion tissues, heart, liver, kidneys, and brain received most drug before it distributes to other tissues, (skin, fat, muscle, and viscera) is slower.

Metabolism

By changing drugs chemically, the body bio transforms (metabolizes) them so it can eliminate them. It does this through the action of enzymes that change a drug's structure

To a more water- soluble form less likely to cross semi permeable membranes and remain in the plasma to undergo filtration by the kidney. The metabolites may or may not be pharmacologically active. Liver is the 1st site of drug metabolism, it could be in lungs, kidneys, skin, placenta, blood-brain barrier each of this have enzymes act on several chemical substances

Excretion

Drug removal from the body through an eliminating organ- usually occurs via the kidneys into the urine. Some drugs are excreted hepatically (via the bile into the faeces) and a few by minor routes(the lungs, saliva, sweat, and breast milk).

The dose

Dose: The quantity to be administer at one time, as a specific amount of medication (drug), it depend on the type of the drug.

Effective dose

Amount of drug given to patient to exert therapeutic effect

Minimal dose

Smallest amount of drug given to patient to exert therapeutic effect

Maximal dose

Largest amount of drug given to patient to exert therapeutic effect

Toxic dose

Amount of drug more than maximal dose, exert toxic effect

Fatal dose

Amount of drug more than toxic dose cause death of patient (kill the patient)

Important factors that affecting the dose of drug

- Type of the drug
- Route of administration of the drug
- Time of drug taken
- Age
- Sex
- General health of the patient(as fever)
- Habitual use(common use of the drug)

Estimation of the dose

According to:

Age of the patient child age

Young's role Child dose=----------X Adult dose

child age+12

Dilling;s role

Child age

Child dose=----------X Adult dose

20

Weight of the patient

Wt. Of child (pound)

Child dose=----------X Adult dose

150

The Dosage form

Dosage form

Is the physical form of a dose of medication, such as capsule, injection , the route of administration is depend on the dosage form of a given drug various
dosage forms may exist for the same compound e.g. metechlopromide can be exist in
solution for injection, tablet, syrup….etc.

Inhaled dosage forms

1- Aerosol e.g. Albuterol aerosol (preventing breathing problem in pt. with Asthma)
2- Gas e.g. Nitrous oxide, oxygen
3- Inhaler e.g. Becotide inh.
4- Solution for nebulizer e.g. Salbutamol solution for nebulizer

Ophthalmic dosage forms

1- Eye drop (solution or suspension): Hydrocortisone eye drop (susp.), Genedine eye drop (solution)
2- Ophthalmic gel: Polyvinyl alcohol ophth. gel
3- Ophthalmic ointment: Tetracycline eye oint, genedine eye oint.

Oral dosage form

1- Capsule Cephalexin cap.
2- Powder Eno powder
3- Solution Butadin syrup
4- Suspension Erythromycin
5- Tablet Acetaminophen
6- Buccal or sublingual tablet Angised sublingual tab.
7- Thin film Benzocain for dental pain, Rizatriptan thin film for migrain

Parentral dosage form

1- Solution or suspension for injection: Metronidazole sol. For inj., Decadron inj. (susp.)

Rectal dosage forms

1- Enema Barium enema
2- Suppository Dulcolax laxative supp., Glycerine rectal supp.

Topical dosage form

1- Cream: (emulsion of oil and water in equal proportions)
Betnosam cream
2- Ointment: (combines oil 80% and water 20%) Hydrocortisone oint.
3- Gel: Voltarin gel
4- Paste: Tooth paste
5- Powder: Nystatin topical dosage
6- Liniment: Methyl salicylate (Healing pads)
7- Lotion: Acne aid lotion
8- Transdermal patches: Ibuprofen patch, Methyl salicylate patch

The route of drug administration

Oral Administration

Advantages:

Most convenient, most economical

Disadvantages:

1- emesis (drug irritation of the gastrointestinal mucosa)

2- digestive enzymes/gastric acidity destroys the drug

3- unreliable or inconsistent absorption due to food or other drug effects

4- metabolism of the drug by gastrointestinal flora

Factors determining rate of drug effect onset

Primary factor:

Rate & absorption extent by GI tract

Absorption Site:

mainly small intestine because of large surface area

Drug ionization state:

no ionized (lipid-soluble) forms favor absorption

weak acids may be highly ionized in the alkaline intestinal pH (not favoring absorption) but this effect is counterbalanced by the large surface-area effect

drugs which are weak acids are readily absorbed in the stomach

First-Pass Effect

Drugs absorbed from the GI tract passes through the portal venous system then through the liver and finally into the systemic circulation when drugs interact with receptors in target tissues.

Extensive hepatic metabolism/extraction result in minimal drug delivery to the systemic circulation for certain agents.

Drugs with large first pass effect exhibit significant differences in pharmacological effects comparing oral vs. IV administration

Examples:

propranolol

lidocaine

Transdermal Administration

Advantages:

1- sustained, therapeutic plasma levels (reduced peaks/valleys associated with intermittent drug administrations)

2- Avoids continuous infusion technique difficulties

3- Low side effect incidence (smaller doses)

4- Generally good patient compliance

Factors contributing to reliable transdermal drug absorption:

1- molecular weight < 1000

2- pH range 5-9 in aqueous medium

3- no histamine-releasing action

4- daily drug requirement <10 mg

Example of drugs available for transdermal delivery:

1- scopolamine:-tolerance may eventually occur; resulting in loss of therapeutic action

2- fentanyl (Sublimaze)

3- clonidine (Catapres)

4- nitroglycerin-tolerance may eventually occur; resulting in loss of therapeutic action

Rectal Administration

1- Proximal rectum administration: Absorption into superior hemorrhoid veins then enters the portal venous system then to the liver (possible first pass hepatic effect) and finally into the systemic circulation

2- Low rectal administration of drug may allow the drug to enter the systemic circulation without passing through the liver

3- Generally unpredictable pharmacological responses for the above reasons

4- Rectal mucosal irritation possible

Parenteral Administration

1- Ensures active drug absorption

2- subcutaneously intramuscular injection: more rapid/predictable than oral administration route

3- only route of administration acceptable for:

a- uncooperative patients

b- unconscious patients

Factors the determine rate of systemic absorption:

1- absorbing capillary membrane surface area

2- drug solubility in interstitial fluid

3- aqueous channels (vascular endothelium) promote high diffusion rates of drugs, independent of their lipid solubility

Advantages of IV administration

1- rapid/precise blood drug levels obtained (e.g., no first-pass effect)

2- Irritant drugs: more comfortably administered (blood vessels relatively insensitive); drug rapidly diluted (particularly if administered into large forearm vein)

Ear drops

Are the a solution containing a medication which is used in treatment of localized infection and inflammation of the ear medications used for ear treatment should be labeled otic drops.

Eye drop and ointments

Medication used for eyes. In case operation after surgery or during it. Inflammation and allergic cases.

The medication used for eyes should be labeled ophthalmic drop or ophthalmic ointment. Ointment has long duration action more than solutions preparation of ear drops. rx. Sodium bicarbonate. D.W.

Procedure: add gm of sodium bicarbonate to 1ml of D.W. mixing the powder with D.W. until complete dissolution. Use for ear cirrhosis.

Dosages forms:

Capsules are small cylindrical gelatin containers.

hold dry powder or liquid medicinal agents they are available in a variety size and they are a convenient way of administering drug with unpleasant odor or test the color shape manufacturers symbols on capsule surface are identifying the product

Tablet are dried powdered drugs have been compressed in to small disks and tablets also contain one or more of the following ingredients

1-Binders 2- Disintegrator substance 3-lubricant 4- Filers

An enteric coated tablet has a special coating that resists dissolved in acidic pH of stomach but dissolved in alkaline pH of intestine. It tablet must not crushed or chewed or active ingredients will be released prematurely and be destroyed in stomach.

Elixirs:

are clear liquids made up of drugs dissolved in alcohol and water after the drug is dissolved in elixir flavoring agents are frequently add dissolve to improve test.

Emulsions:

Are dispersions of small droplets of water in oil or oil in water the dispersion maintained by emulsifying agent such as sodium lauryl sulfate gelatin or acacia.

Emulsions are used to mask bitter testes or provide better solubility to certain drug.

Suspensions:

Are liquid dosage forms that contain solid. Insoluble drug particles disappeared in a liquid base.* It should shake well before administer to ensure mixing of the particles.

Syrups:

Contain medicinal agent dissolved in a concentrated solution of sugar. Sucrose. Many preparations for pediatric patients are syrups.

Parenteral Dosage:

Ampoules: are glass containers usually contain a single dose of a medication, may be scored or have a darkened ring around the neck in it. Ampoule is broken open for withdrawing the medication.

Vials: are glass containers contain one or more doses of a sterile medication mouth of it covered with a thick rubber diaphragm through it a needle must be passed to remove the medication. This rubber is sealed by metal lid the medication may be solution, sterile powder.

A\ Large volume solution containers I.V. solutions are available in both glass& plastic containers in various types& concentrations. The volume ranging from 100-2000 ml, both glass& plastic containers& vacuum sealed.

Suppositories: Are a solid form of medication designed for introduction into a body orifice, at body temperature the substance dissolves& absorbed by M.M. if it soft can put in cold water or place in ice.

Autonomic nerves system:
are classified to:

1- Parasympathetic nerves system

2- Sympathetic nerves system

Parasympathetic nerves system

Also called

cholinergic = parasympathomimetic

Acetyl choline

An acetic acid ester of choline, normally present in the body. It is a neurotransmitter at the neuromuscular junction, in sympathetic and parasympathetic ganglia, and at parasympathetic nerve endings.

Autonomic nervous system: portion of the nervous system that controls the involuntary visceral functions of the body.

Cholinergic: stimulated, activated, or transmitted by acetylcholine or a similar substance

Neurotransmitter: chemical substance secreted by the neuron at the synaps that acts on receptor proteins in the membrane of the adjacent neuron or muscle to stimulate, inhibit, or modify its activity.

Parasympathetic nervous system: cholinergic division of autonomic nervous system.

Parasympathomimetic: agent that produces effects similar to those from stimulation of the parasympathetic nerves; also called cholinergic or muscarinic.

Nerves that innervate skeletal muscle also release Ach when stimulated.

The released Ach binds to specific sites in skeletal muscle, triggering contraction.

Disordered release of acetylcholine from these nerves or impaired binding with skeletal muscle leads to profound muscle weakness (myasthenia gravis).

Cholinesterase inhibitors (e.g. neostigmine) improve muscle performance in patients with this disease.

Cholinergics are classified primarily into the **cholinestrase inhibitors** and the **parasympathomimetic agent.**

Parasympathetic nerve ending secret Ach , which inhibit by the effect of enzyme cholinestrase as well as it play its action, Ach is bound to named muscarinic receptor

Drug mimic Ach.

1. Edrophonium
2. Neostigmine
3. Physostigmine
4. Ambenonium
5. Bethanechol

Major uses

1. Ambenonium, neostigmine, physostigmine, and pyridostigmine are used to treat symptoms of myasthenia gravis.
2. Edrophonium and neostigmine aid differential diagnosis of myasthenia gravis.

3. Neostigmine is used to prevent and treat postoperative urine retention.
4. Neostigmine and pyridostigmine reverse the effect of neuromuscular blocking agents used in surgery.
5. Physostigmine is antidote in anticholinergic poisoning,such as poisoning caused by caused by tricyclic antidepressants(TCAS).
6. Bethanechol is used to prevent and treat postoperative urine retention, postoperative gastric a tony and retention, abdominal distension and megacolon

Mechanism of action

1. Ambenonium, edrophonium, neostigmine physostigmine and pyridostigmine inhibit the destruction of Ach released from the parasympathetic nerves. Ach accumulates increased the stimulation of the receptor.
2. Bethanechol directly, binds to muscarinic receptors, mimicking the action of Ach.

All cholinergics except physostigmine are poorly absorbed orally. They are widely distributed to organs innervated by the parasympathetic nervous system, metabolized in the liver, and excreted by the kidneys as water soluble metabolites.

Physostigmine the only cholinergic that effectively crosses the blood - brain barrier is useful for tricyclic antidepressant (TCA) and anticholinergic poisoning.

Adverse reaction

Increase level of Ach directly or indirectly but symptoms of increase cause adverse reaction which is:

1. Sweating
2. GI disturbances (nausea, diarrhea, abdominal cramping).
3. Cardiac problems

4. Bradycardia, hypotension and arrhythmias.
5. Respiratory difficulties due to increase airway secretions.
6. CNS reactions
7. Headache, confusion, nervousness in high doseage seizures
8. Visual reactions (effect on eyes)
9. Problem of accommodation, miosis, excessive lacrimation and diplopia.

2- Sympathetic N.S.

Also called: **Adrenergics**

Sympathetic N.S.

Also called sympathomimetics produce their effect either by mimickin g the actions of dopamine, epinephrine, or norepinephrine at recepto r sites in the sympathetic N.S. or by displacing natural norepinephrine from neural storage sites. These drugs do not stimulate all types of a drenergic receptors equally, their effects and indications for use differ .their action is not organ- or site- specific and may occur at other tha n the desired sites.

Three major types of receptors within sympathetic N.S.

Alpha, beta, and dopaminergic

The sympathetic nerves system innervates numerous organs (e.g. hea rt, blood vessels, respiratory tract, liver, urinary bladder, and intestine s, regulate of many body functions. When stimulated, sympathetic ne rves release norepinephrine except for sympathetic nerves that inner vate sweat glands, which release Ach. Norepinephrine combines with receptor sites on the innervated organ to elicit a response. Stimulatio n of alpha receptors causes vasoconstriction and uterine and sphincte r contraction.

Beta divided into $B_1$and B_2

$Beta_1$ receptors are largely in the heart; when stimulated, they increas e the rate and force of contraction and the rate of AV node conductio n.

$Beta_2$ receptors are primarily in bronchi, blood vessels, and uterus; sti mulation produce bronchodilation, vasodilatation and uterine relaxati on.

Dopaminergic receptors in splanchic blood vessels; stimulation dilates these vessels.

The adrenal medulla is a major part of sympathetic nervous system. D

uring times of danger or acute stress, the sympathetic N.S. can activat e the adrenal medulla to release epinephrine into the systemic circula tion.

Epinephrine activates alpha and beta receptor, producing physiologic and metabolic effects that prepare the person to cope with the stress (as in the fight- or-flight response).

Drug used as adrenergic stimulant

1. Albuterol
2. Adrenaline and noradrenaline
3. Ephedrine
4. Phenylephrine
5. Pseudoephedrine

Uses of adrenergic drug

1. Raise blood pressure and cardiac output.
2. Relieve bronchoconstriction.
3. Treat heart block and certain arrhythmias and to restore cardiac rhyth m in cardiac arrest.
4. Epinephrine and phenylephrine are used to treat anaphylaxis and oth er allergic reactions.
5. Pseudoephedrine are nasal decongestants.
6. Phenylpropranolamine is used in weight- control aid by increase the r elease of glucose from the liver, increase the heart rate and ventricula r contractility.

Drugs acting on digestive system

a- Antacid

Neutralize gastric acid and help control ulcer pain. They don't seem to ha ve coating effect on ulcers. Drugs used as antacid are:

1- Aluminium carbonate

2- Aluminium hydroxide

3- Calcium carbonate

4- Magnesium trisilicate

Magnesium containing antacids have laxative effect and cause diarrhe a. In patients with renal failure,they may cause hypermagesemia.

Aluminium- containing antacids cause constipation, may lead to osteo malacia and hypophosphatemia.

a- Digestants:

Digestant promote digestion in the gastrointestinal tract, used in patient lacking such digestive substances as bile salts, gastric acid, and pancreati c enzymes most widely used digestant are:

1- Bile salts and hydrochloric acid: stimulate bile flow from the liver, promote digestion and absorption of fats, fat- soluble vitamins, an d cholesterol.

2- Pancreatin

3- Pancrelipase

4- Glutamic acid Hcl>>> replaces gastric acid, inhibit growth of putref active microorganisms in ingested food.

Pancreatin and pancrelipase replace endogenous exocrine pancreatic enz ymes and aid intestinal digestion of starches, fats, and proteins.

b- antidiarrheals

Reduce the fluidity of the stool and frequency of defecation. Dia rrhoea may be caused by foods or drugs, laxative abuse, allergies, endocr ine dysfunction, malabsorption, neurological or inflammatory diseases, mechanical obstruction parasitic infection, gastric resection, or radiation poisoning.

Drugs used as antidiarrhoea

1- Bismuth subgallate

2- Diphenoxylate Hcl

3- Kaolin & pectin

4- Loperamide Hcl

*Bismuth salts have a mild water- binding capacity; may absorb toxins an d provide protective coating for intestinal mucosa

*Diphenoxylate and loperamide: increase smooth muscle tone in GI tract, inhibit motility and propulsion, and diminish digestive secretions

*Kaolin and pectin: decrease the stool's fluid content by adsorption of ba cteria and toxins that may cause diarrhoea.

d- laxative

They prevent constipation, evacuate the bowel before the bowel examin ation, exposure of abdominal X- ray films, barium enema and various sur gical procedures.

Drugs used

1- Bisacodyl

2- Cascara sagarada

3- Castor oil

4- Glycerine lactulose

5- Magnesium salts

6- Methyl cellulose

7- Mineral oil

*glycerine lactulose is also used to treat hepatic encephalopathy.

Mechanism of action:

1- Bulk- forming laxative

2- Stool softeners increase liquidity of stool.

3- Absorption water from intestine osmotic laxative.

4- Increase intestinal movement.

c- Antiemetics

Drug that relieves nausea and vomiting

Classify into three groups

1- Antihistamines

2- Phenothiazines

3- Miscellaneous agents

Antihistamine

1- Cyclizine Hcl

2- Dimenhydrinate

Phenothiazines

Prochlorperazine maleate

Miscellaneous

1- Metoclopramide

2- Diphenidol Hcl

3- Scopolamine

Most of these act on the CNS on the region known as chemoreceptor trig ger zone(CTZ)

d- <u>Antiulcer agents</u>

Ulcer diagnosis by endoscopy.

Classified into 3 groups:

1- Histamine$_2$ receptor antagonist (H_2receptor antagonist)

2- Protectants

3- Acid pump inhibitor

H_2 R antagonist e.g. Cimetidine, ranitidine, famotidine, treat peptic ulc ers; they promote healing of duodenal and gastric ulcers.

Protectants e.g. sucralfate, misoprostol

Acid pump inhibitor e.g. Omeprazole

Anticholinergic drugs

1- Atropine sulphate

2- Scopolamine hydrobromide

Cholinergic blockers (also called parasympatholytics) inhibit the action of acetylcholine released by parasympathetic and some sympathetic nerve s. The effects of parasympatholytics are typically opposite those of paras ympathetic stimulation parasympathetic (vagal) stimulation of the heart decreases heart rate. Whereas atropine, a parasympatholytic drug, incre ase heart rate. parasympatholytic drugs are not organ- specific.

The administration of atropine to reverse severe bradycardia can dry oral and respiratory secretions; the use of glycopyrrole preoperatively to dry oral secretions can produce urine retention, especially in men with prost atic hypertrophy.

Major uses

1. Atropine may be used for treatment of poisoning by organic phosp hate insecticides and certain mushrooms.
2. As preanaesthetic medications, atropine, glycopyrrolate, and scop olamine are used
3. To reduce salivary and respiratory secretions.
4. Scopolamine may be used to prevent motion sickness.

   Mechanism of action

   Cholinergic blockers inhibit the effect of acetylcholine (as the neur otransmitter for impulses in parasympathetic nervous system) at t he junction between postganglionic parasympathetic nerve ending s and effector organs.

   These receptor sites are also called muscarinic sites.

Adverse reactions

Anticholinergic reactions include

1- GI reactions

Dry mouth, thirst, constipation, nausea, and vomiting.

2- Urinary symptoms

Hesitancy and retention

3- Cardiovascular reactions

Tachycardia, palpitations, and activation of angina

4- Dermatologic reaction

Hot, flushed skin

5- Visual changes

Mydriasis, blurred vision and photophobia.

6- CNS reactions

Headache, restlessness, ataxia, disorientation, hallucination, delirium, agitation, mental confusion, insomnia and coma with excessive dosage.

Inotropic agents

Cardiac glycoside

Digitalis or cardiac glycosides

Digoxin, Lanoxin

Derivative of digitalis, influence the force of myocardial contractility, it is extracted from plants of genus Digitalis or chemically synthesized, are us ed to treat congestive heart failure and tachyarrhythmias.

The range between therapeutic and toxic doses is extremely narrow.

Its toxicity may be due to:

a- Altered absorption

b- Serum electrolyte level

c- Renal or hepatic dysfunction

d- Drug interactions

e- Other factors

Major uses

a- Increase cardiac output in acute or chronic congestive heart failure.

b- They control the rate of ventricular contraction in atrial flutter or fi brillation.

c- They are used to prevent or treat paroxysmal atrial tachycardia an d angina associated with congestive heart failure.

Mechanism of action

1- Influence both mechanical and electrical activity of the heart it depen ds on:

a- Drug concentration

b- Cardiac status

Increase force of contraction no effect on normal heart but in present of congestive heart failure it produce beneficial slowing of heart rate acc ording to severity of tachycardia.

2- The increase force of contraction is caused by increase (Ca^{++}) availa bility to the contractile proteins actin and myosin.

3- The range between therapeutic and toxic doses is narrow.

4- Digitalis glycoside also act on CNS to decrease sympathetic activity and increase vagal activity, this increase results in a slower firing rate of the Sinoatrial node (SA) and slower conduction velocity through th e Atrioventricular (AV) node.

Adverse reaction full into 4 groups

a- Cardiac

b- Neurologic

c- Gastrointestinal

d- Visual

a- Cardiac reactions

Caused by drug toxicity secondary to excessive blood levels which may r esult in arrhythmias, most commonly premature ventricular contraction, AV node conduction block.

b- Neurological reactions

1- Headache, fatigue, depression, confusion, and insomnia.

2- Less common include psychosis, delirium and neuralgia

C- Gastrointestinal reactions

Anorexia, nausea and vomiting and, less commonly, diarrhea and a bdominal pain.

d- Visual reactions

Blurred vision and abnormal color vision, green and yellow halos.

Antiarrhythmic drugs

Used to prevent atrial fibrillation, including those secondary to MI(myoca rdial infarction) or digitalis toxicity.

Drug used	mechanism of action
1. Procainamide	block transport of sodium
2. Mexiltene, lidocain, and Phenytoin	block transport of sodium
3. Acebutolol	for supraventricular arrhythmia
4. Amiodarone	alpha and beta inhibition
5. Verapamil	Ca++ channel blocker

Antilipimics

1. Cholestramine
2. Clofibrate
3. Lovastatin

Lowering cholesterol levels or triglycerides or both, may reduce the risk of coronary artery disease and myocardial infarction

Mechanism of action

Cholestramine combine with bile acid to form insoluble compound that i s excreted

Clofibrate

Inhibit cholesterol biosynthesis at an early stage

Lovastatin

Inhibit the hepatic synthesis of cholesterol

The haemorrhagic agents also call control bleeding agents.

Tranexamic acid (cyclocapron)

Reduction or prevention of hemorrhage in hemophilia patients.

Blood derivatives.

Albumin 5%

Albumin 25%

Plasma protein fraction

Blood derivatives act as plasma expanders in hypovolemic shock caused by burns, trauma, sepsis or surgical procedures also treat hypoproteinem ia associated with malnutrition, toxaemia of pregnancy, or prematurity.

• Albumin is used to treat hypoproteinemia associated with hepatic cirrh osis and nephritic syndrome.

• Some blood derivatives (antihemophilic factor, factor IX complex) are u sed to replace missing clotting factors in patients with hereditary coagulo pathies.

Anticoagulants

1. Heparin

2. Warfarin

Anticoagulants, drug used to prevent fibrin formation also prevent clot e nlargement.

Heparin is not active after oral administration.

Warfarin is oral anticoagulants.

Thrombolytic agents are effective in treating acute and extensive episod es of thrombotic disorders. Before administrating these agents, be aware

of increased risk of hemorrhage that attends their use, thrombolytic therapy should be accompanied by close laboratory monitoring.

Uses

1. Treatment pulmonary emboli and deep vein thrombosis.

2. Reduce thrombus after cardiac valve replacement surgery.

3. Heparin is administered subcutaneously in low doses to prevent deep vein thrombosis and pulmonary embolism.

4. Oral anticoagulants used in rheumatic heart disease with valvular damage and in atrial arrhythmias that impair hemodynamic.

Mechanism of action

1- Heparin inactivates thrombin and prevents conversion of fibrinogen to fibrin.

2- The oral anticoagulants inhibit vitamin K dependent activation of clotting factor II, VII, IX, and X which are formed in the liver.

Antihypertensive

Antihypertensives

Classified into:

1-Angiotensin converting enzyme inhibitors
   a- Captopril
   b- Lisinopril

2-Beta- adrenergic blockers
   a- Atenolol
   b- Propranolol

3- Calcium channel blockers
  a- Nifedipine
  b- Verapamil

4-Alpha adrenergic blockers
   a- Phenoxybenzamine
   b- Phentolamine

5-Vasodilators
   a- Minoxil
   b- Nitroprusside

Hypertension

Systolic blood pressure 160mmHg or higher

Diastolic blood pressure 95mmHg or higher

Two or more antihypertensives (with different mode of action) may be n eeded, untreated hypertension can lead to stroke and cardiac or renal dis ease

Diuretics

Reduce the body's total volume of water and salt by increasing their excr etion in urine. Most diuretics are used to treat essential hypertension (ex cept miscellaneous diuretics.

Diuretics

Classified into 4 groups

1. Thiazide and thiazide- like diuretics
   a. Benzthiazide
   b. Chlorothiazide
2- Potassium- sparing diuretics
   a. Amiloride reduce the loss of potassium ions in urine
   b. Spiranolactone = = = = = =
3- Loop diuretics
   a. Ethacrynic acid
   b. Furosemide
4- Miscellaneous diuretics
   a. Acetazolamide
   b. Mannitol
   c. Urea

Mannitol and urea: are used to reduce intracranial pressure in patient wi th hydrocephalus or head injury, also used to rapidly decrease intraocula r pressure in patient with glaucoma.

Diseases that affect urinary tract.

Dysuria: discomfort or pain on urination, usually resulting from a bacteri al infection or obstruction in urinary tract.

There are many methods to treat urinary tract infection.

1st of all there must be done sensitivity test and culture of urine and acc ording to sensitivity test, that uses antibiotic disc like penicillin, ampicillin, cephalosporin, erythromycin and gentamycin. Choosing antibiotic that s uitable for the infection depend on its sensitivity test.

The uses of samafurantin 50mg, 100mg it has antiseptic effect on urinary tract (uvamin) R .

Phenazopyridine HCl 100mg (urisept)R , It has analgesic effect decrease the pain that associated with frequent urination (burning and urgency) a ssociated with cystitis, prostatitis, and urethritis, once thought to have a ntiseptic properties, these agent are ineffective against microorganisms r esponsible for urinary tract infections.

Antigout agents.

Uricosurics.
1• Probenecid
2• Sulfin pyrazone
3• Allopurinol
4• Colchicines
Gout a hereditary disease involving an error in metabolism, leads to hype ruricemia and the formation of monosodium urate crystals.
Deposits of these monosodium urate crystals in and around a joint cause the inflammation and resultant pain of the disease.
• Allopurinol is used to treat primary gout and gout associated with bloo d disorders, such as leukemia and polycythemia, cancer, and cancer che motherapy.
• Colchicine is used to relieve acute attacks of gouty arthritis.
• Probenecid and sulfinpyrazone act to increase uric acid excretion in the urine by competitively inhibiting the active resorption of uric acid at the proximal convoluted tubules of the kidney.
Probenecid also blocks active secretion of penecillins into the urine. It is used to prolong high serum drug levels during antibiotic therapy.
Allopurinol lowers serum and uric acid levels by inhibiting xanthine oxida se, the enzyme that catalyzes the formation of uric acid from xanthine.
Urinary acidifier and alkalinizers
Acidifier e.g. ammonium chloride
Alkalinizers e.g.
1• Sodium bicarbonate
2• Sodium lactate
3• Troinethamine
Correct acid- base imbalances in metabolic disorders.
In sever metabolic alkalosis; acidifiers may be given to lower blood PH
Adverse reactions to ammonium chloride result from too- rapid I.V. infusi on or ammonia toxicity. Severe reactions include hypocalcemic tetany, EEG abnormality alternating episodes of depression and excitation.

Histamine and antihistamine

(H_1 and H_2 receptor antagonist)

Histamine and antihistamine

Histamine is organic compound composed of histidine molecule.it is pres ent in animal tissues, cells and plants in abound form. So it is inactive for m but in certain circumstances

Histamine released and then will have pharmacological effect.

It has two types of receptors

H_1 receptor (smooth muscle)

H_2 receptor (gastric secretion)

Allergic symptoms appear due to histamine release includes:

1. respiratory symptoms: as sinusitis, asthma, increase nasal secretion, n asal congestion
2. skin symptoms: as redness, urticaria, odema
3. cardiac symptom: as palpitation, hypertension, hypotension,
4. neurological system: as headache, vertigo
5. digestive symptoms: as colic, indigestion, nausea, vomiting, diarrhea, due to gastric secretion so antihistamines found to treat these sympt oms of allergy and anaphylaxis, also acts as antiemetics for motion sickness

Examples:

Diphenhydramine ((Allermine)) H_1 receptor antagonist

It has sedative effect and cause drowsiness used as antiemetics an d for motion sickness in a derivative of it called

1. Dimenhydrinate (Dramamine(R)), and travimine(R)
2. Chlorphenhydramine
3. Cyproheptadine: periactin(R)
4. Promethazine: phenergan(R)
5. Promethazine thiocolate: Avomine(R)

H_2 receptor antagonist

1. Cimetidine: Tagamate(R)
2. Ranitidine: Zantac(R)

Potent antihistaminic used to decrease gastric secretion, used in treat ment of peptic

Ulcer used as tablets can be given I.V. injection

Antibiotics

Antibiotics

Are compound that produced by microorganisms with an inhibitory actio n on other

Microorganisms and have a favorable therapeutic index differences from each other by:

1- Potency

2- Antibacterial spectrum

3- Metabolism

4- Mode of action

(1) Antibacterial

Antibacterial spectrum:

A- Some antibacterial have inhibitory effect on G (+Ve) bacteria (penicillin), while streptomycin has effect on G (-Ve) so these two anti bacterial have narrow spectrum.

B- Some antibacterial have inhibitory effect on both G (-Ve) and G(+V e) bacteria, in addition to their effect on viruses so they are called (br oad spectrum antibacterial) like Ampicillin, Cephalexin and Cephalothine.

Antibacterial are of two types

1- Bactericidal: which kill the microorganism like Cephalosporin, penicilli n, Aminoglycosides

2- Bacteriostatic: which inhibit growth of microorganism like tetracycline, chloramphenicol, erythromycin (in low dose) and lincomycin.

Penicillin:

Is very effective antibacterial with low toxicity its action results from i nhibition of cell wall synthesis of growing bacteria.

Types of penicillin

1- Penicillin G (P.G) Benzyl penicillin:

- Effective against G (+Ve) bacteria.
- Destroyed by penicillinase enzyme that present in bacteria whi ch are resistant to penicillin (I.M. and I.V)

2- Penicillin V (P.v) phenoxymethyl penicillin

Not hydrolysis by gastric secretion (given orally) 400,000 I.U. every 6hrs.

3- Procain penicillin

Long duration of action because of its low absorption after I.M. 30 0,000 I.U every 12hrs.

4- Benzathine penicillin (B.P):

Slowly soluble in water it's effective concentration in the blood re mains for weeks or more after I.M injection 600,000 or 1,200,000 usp.

Penicillinase resistant penicillin

1- Cloxacillin

2- Oxacillin

3- Methicillin

4- Dicloxacillin

Broad spectrum penicillins

1- Ampicillin

2- Amoxicillin sensitive to destruction by penicillinase

3- Carbencillin

4-Piperacillin

1- Ampicillin: broad spectrum G (+)ve and G(-)ve dose 250-500mg, pedia tric suspension.

2- Amoxicillin :

a. Differs from ampicillin, it produce higher serum concentration
b. Less incidence of diarrhea (due to its rapid absorption).
c. Can be given every 8 hr.
d. Resistant to penicillinase useful against staphylococcus aureus which resistant to penicillin G.

Side effect of penicillin

1- Hypersensitivity reaction
2- Leucopenia
3- Diarrhea.

Cephalosporins:

Same mechanism as penicillins, but differ in spectrum, resistance to B- la ctamase and pharmacokinetics.

Types:

A-:

1- Cephalexin broad spectrum G(-)ve and G(+)ve resistant to en zyme produce
2- cephalothin by bacteria
3- cefazolin = = = = = =
4- cephapirin = = = = = =

B-: Maxalactam and cefataxamine with sufficient penetration into cerebr ospinal fluid (use in treatment of meningitis).

Aminoglycosides:

Bactericidal drugs, use to treat serious infection caused by G(-)ve bacilli a nd some G(+)ve it includes:

1- Streptomycin

2- Gentamycin

3- Tobramycin

4- Amikacin

5- Spectinomycin

6- Neomycin

Poor absorbed orally, not reach CNS use I.M or I.V

1. Streptomycin:

Useful in treatment of Tuberculosis (T.B) and brucellosis side effect ototoxicity and Nephrotoxicity

2. Gentamycin:

Useful in treatment of systemic infections caused by G (-)ve bacter ia.

Side effect nephrotoxicity, ototoxicity in solution 10- 40 mg/ml

(2) Antifungal

- Nystatin: (Mycostatin) antifungal 500,000 to 1 million units oral t ablets t.i.d G.I infection.

Oral, vaginal and intestinal infection caused by Candida albicans(M onilia) and

Other Candida species.

- Amphotericin B:

indication:

a. Systemic fungal infections and meningitis.

b. G.I.T. infection with Candida albicans.

- Clotrimazole: fungicidal agent for local infection.

(3) Antiviral agent:

Acyclovir (Zovirax) for mucocutaneous herpes simplex virus (HSV-1 and HSV-2).

(4) Amebicidal and Trichomonacide

Metronidazol(flagyl): Amebicidal and Trichomonacide at both intestinal and extra intestinal.

Anti-diabetic agents

Antidiabetic agents

Diabetes mellitus:

Metabolic disorder due to decrease insulin secretion from Beta cell of pa ncreatic islets (Langerhans) characterize by hyperglycaemia, glycosurea, polyurea, polydipsia, polyphagia, Emaciation and weakness.

There are 2 types of D. M.

Type 1: insulin dependent D.M.

Type 11 : non-insulin-dependent D.M.

Insulin- dependent D.M.

.Exogenous insulin important for this patient.

There are 4 types of insulin

1- Rapid acting insulin

2- Intermediate acting insulin

3- Long acting insulin

4- Extended insulin

1-Rapid acting insulin

Preparation	onset	peak	duration
Insulin injection (regular, crystalline zinc)			
Novolin regular	½ hr.	2 ½- 5 hr.	8 hr.
Humulin regular	½- 1 hr.	2- 4 hr.	6- 8 hr.
Purified pork insulin	½ hr.	21/2- 5 hr.	8 hr.

Velosulin	½ hr.	1- 3 hr.	8 hr.

2- Intermediate – acting insulin

Isophane insulin suspension (NPH)

Novolin N	1 ½ hr.	4-12 hr.	24 hr.
Humulin N	1-2 hr.	6- 12 hr.	18- 24 hr.
Insulatard NPH	1 ½ hr.	4- 12 hr.	24 hr.

3- Long –acting insulin

Protamine zinc insulin suspension

Preparation	onset	peak	duration
Protamine zinc & lletin1	4-8 hr.	14- 24 hr.	28 - 36 hr.
Beef protamine zinc& lletine11	4-8 hr.	14- 24 hr.	28 -36 hr.
Pork protamine zinc& lletine 11	4-8 hr.	14- 24 hr.	28 -36 hr.

4-Extended insulin zinc suspension (ultralente)

Ultralente 1	4-8 hr.	14- 24 hr.	28 - 36 hr.
Ultralente insulin	4 hr.	10- 30 hr.	36 hr.
Ultralente purified	4 hr.	10- 30 hr.	36 hr.

Type 11 non– insulin dependent D.M.

Sulfonylureas	onset	peak	duration
Acetohexamide	1 hr.	4-5 hr.	12-24 hr.

Glibizide	½ -11/2 hr.	1- 3 hr.	10- 24 hr.
Glyburide	2- 4 hr.	2- 4 hr	24 hr.

Metformine oral antidiabetic drug used to decrease glucose absorption f rom GIT system

For diabetes insipidus chlorpropamide 1 hr. 3- 6 hr. 40-60 hr.

Therapeutic regimen prescribed and adjusted according to patient's bloo d and urine glucose Concentrations (5oo units/ml) I.V.of concentrated re gular insulin is contraindicated

Adverse reactions

Metabolic: hypoglycaemia, hyperglycaemia

Skin: urticaria

Local: lipoatrophy, lipohypertrophy, itching, swelling, redness, stinging ot hers anaphylaxis Interactions

Alcohol, beta blockers, clofibrate, MAO inhibitor, corticosteroids there m ust be monitor for, Hyperglycaemia

Analgesic and antipyretic

There are 3 groups

1. Salicylates (Aspirin)
2. Urinary tract analgesic (phenazopyridine)
3. Nonsalicylates (acetaminophane) paracetamol

Medical uses

1. Relieve mild to moderate pain
2. Decrease inflammation or rheumatoid arthritis, osteoarthritis and reduce fever
3. Aspirin inhibits platelet aggregation decrease coagulation
4. Phenazopyridine (urinary tract analgesic) decrease the pain of freq uent urination
5. Associated with cystitis prostitis and urethritis
6. Acetaminophane (paracetamol) relieve mild to moderate pain and fever

Analgesic combination

Anacin (aspirin +caffeine)

Acetaminophane + aspirin +caffeine

Non steroidal anti inflammatory

1. Voltarine (diclofenac)
2. Indocid (indomethacin)
3. Brufen (ibuprofen)
4. Ponstan (mefenamic acid)
5. Naprox (naproxen)
6. Felden (piroxicam)

Steroidal anti inflammatory

1. Cortisone (hydrocortisone)
2. Dexamethasone (Dexone)
3. Celestone (Betamethasone)
4. Prednesolone (presolone) anti inflammatory and immunosuppressant

Opioid analgesic

1. Codeine indication for mild to moderate pain
2. Morphine indication for sever pain

They cause addiction

Sedative- hypnotics

A- Barbiturates

1. Pentobarbital
2. Phenobarbital
3. Secobarbital

B- Benzodiazepines

1. Flurazepam hydrochloride
2. Temazipam
3. Trizolam

C-Miscellaneous agents

1. chloral hydrate
2. paraldehyde
3. ethchlorvynol

The hormones

Hormones: Are substances secreting by ductless secretary organ directl y into the blood.

Functions of hormones

1. Regulation of metabolic process (insulin).
2. Growth(GH)
3. Development of organs(sex hormone)

Source of hormones:

1. Animal (caw-sheep's): extracted and purified example (Testosterone-T yrosine).
2. Synthetic: in same characters of natural hormone example (Epinephri ne, Stilbesterol, Thyroxin and cortisone.

Disturbance in function of glands lead to diseases

1. Decrease secretion of hormone>>lead to>>>>>Hypofunction can be tr eated by giving hormone as injection or tablet.
2. Increase the secretion of hormone>>lead to>>>>Hyperfunction treate d by given antagonist or surgery.

Pancreatic secretion

Pacreas >>> >>>> Alpha cell secret glucagon hormone.

= >>>>>>>>Beta cell secret insulin hormone.

Glucose ^{insulin} glycogen stored in liver and tissues.

Increase blood glucose >>>>>>excretion in urine

Glucose cannot enter the cells of the body tissues in absence of insulin.

Decrease insulin ->>>>> Diabetes mellitus (D.M.) Characterized by hyper glycaemia

due to :1- Relative deficiency.

2- Insulin resistance.

Glycogen >>>>>>glucagon>>>>>>>>>> glucose (glycogenolysis). In case of fa sting or hypoglycaemia

Pituitary secretion >>>>a-Blood vessels

b- Nervous system

c- Secretary cells

Pituitary gland is complex structure of secretary organ composed of 2 lob es:

1. Anterior lobe
2. Posterior lobe

Posterior lobe secret 2 hormones:

1. Oxytocin: which stimulate the contraction of uterine muscles so it is u sed to induce the labor, to stop the bleeding and reduce the uterine si ze to normal size, also it stimulate milk secretion.
2. Vasopressin (Antidiuretic hormone)(ADH) injectable solution, it has a ntidiuretic effect, deficiency of this hormone lead to diabetes insipidu s.

Anterior pituitary secretion:

1. Growth hormone (GH).
2. Prolactin hormone (PL).
3. Thyroid stimulating hormone (TSH).
4. Follicle stimulating hormone (FSH).
5. Luteinizing hormone (LH).

6. Adrenocorticotropic hormone (ACTH).

Growth hormone (GH):

Function:

a. It is essential for normal growth.

b. Increase protein synthesis.

c. Hepatic glucose production.

d. Lipolysis.

Deficiency leads to dwarfism.

Prolactin hormone: stimulate milk secretion

Increase prolactin hormone lead to infertility.

Thyroid stimulating hormone TSH

It stimulate thyroid hormone synthesis if thyroid hormone levels increase

TSH secretion is suppressed.

TSH deficiency leads to hypothyroidism

TSH stimulate thyroid gland to secret thyroxin

Increase thyroxin lead to decrease TSH

Decrease thyroxin lead stimulation of TSH to secret

Luteinizing hormone LH

Stimulate testosterone secretion by leyding cells so increase secretion

Follicle stimulating hormone FSH

1. In male(FSH) stimulate spermatogenesis
2. In female (FSH) increase estrogen secretion by ovary especially in first part of menstrual cycle.

Thyroid gland (T.G): secrets 3 hormones

1. Thyroxine T_4

2. Tri-iodothyronine T_3
3. Calcitonin.

Deficiency of I_2 (iodine)>>>>>>>>>>>hypothyroidism characterized by goi tre, I_2 important for synthesis of thyroxine.

Hypothyroidism in childhood may cause cretinism symptoms:

1. Mental retardation.
2. Obesity.
3. Fatigue.

Treatment:

Thyroxine oral 50- 100mg/day.

Hyperthyroidism:

<u>Symptom of increase metabolic rate.</u>

1. Hypertension.
2. Weight loss.
3. Hyperactivity.
4. Tachycardia
5. Weak muscle.

Treatment: by surgery or neomercazole drug.

Adrenal glands:

Adrenal gland has 2 parts.

a. Adrenal cortex.
b. Adrenal medulla>>>>>>>>>>>>>epinephrine (part of sympathetic ner ves system). Cortex necessary for life but medulla not.

<u>Adrenal cortex:</u>

Produce 3 classes of steroid hormones.

a. Glucocoticoids.
b. Mineralocorticoids.
c. Androgens.

Adrenal medulla:

Functionally part of sympathetic nerves system, secret adrenalin or epin ephrine.

Uses of epinephrine.

a. Bronchodilator.
b. vasoconstrictor.(use in anesthesia)
c. Cardiac arrest (pericardium injection).
d. Eye drop to reduce intraocular pressure in glaucoma.

Adrenal hyperfunction>>>>>>>>>>>Cushing syndrome

Increase glucocorticoids through mineralocorticoid and androgen produc tion may also excessive.

Adrenal hypofunction>>>>>>>>Addison disease

Androgens

1- Testosterone: powerful anabolic hormones. It's vital for development of 2ndary sexual characteristic in the male and essential for spermatogen esis.

Uses : a- Treatment of hypogonadism (defective in spermatogenesis or testosterone production).

b- Treatment of prostate enlargement in elderly patients.

c- In female: treatment of uterine bleeding, for cessation of lactation an d for anabolic and weight gain.

Estrogens: responsible for development of female secondary characters, also they stimulate the growth of ovarian follicles and proliferation of ute rine endometrium during the 1st part of menstrual cycle.

Uses :

a. Treatment of amenorrhea
b. Treatment of postmenopausal symptoms by given estrogen and andr ogen.
c. Treatment of prostate cancer.

Progesterone:

It’s produce excessively during pregnancy, where as it is essential for mai ntain pregnancy.

Vitamins

Organic compound that necessary for normal growth and survival. They give no energy but they are essential for regulation of metab olism. Deficiency of vitamin in the diet leads to development of ce rtain diseases.

- Malabsorption e.g megaloplastic anaemia
- Malnutrition e.g fat soluble vitamin

Source: plant- animal- synthetic

Groups of vitamin

- Water soluble vitamin. (Vitamin B groups- vitamin c)

Many of them are coenzyme or essential part of coenzyme and thus have a function in the cells. Example (thiamine- nicotinic acid - riboflavin- pyridoxine- ascorbic acid).

- Lipid soluble vitamin. (A, D, E, K)

Water soluble vitamin

Thiamine or vitamin B1:

- Light and heat resistant
- Loss some activity upon cooking
- Important for metabolism of carbohydrates
- Excreted by urine

Source: yeast- wheat- egg

Deficiency: Beri- Beri which characterized by heart failure, periphe ral polyneuritis, anorexia, nausea and mental disorders

Riboflavin vitamin B2 or Lactoflavin

- Thermal stable but high sensitive
- Daily requirement 3mg/ day-10mgs in deficiency of it

Source: yeast- green vegetables- liver- meat- milk- egg yolk

Deficiency: chellosis, stomatitis, keratitis

Nicotinic acid or niacin but not nicotinamide

Produce vasodilation of small vessels.

- Experimentally lowering serum cholesterol and as vasodilat or but it is not definitely useful Vasodilator and decrease serum ch olesterol.

Deficiency: pellagra>>>>>>>skin lesion, gastrointestinal mucosa ch anges diarrhoea and mental disorders.

Pyridoxine vitamin B6

- Coenzyme in much reaction
- 100mg injection necessary for metabolism of amines.

Deficiency: dermatitis- convulsions

INH may cause pyridoxine deficiency

Source: yeast- liver- rice- wheat

Pantothenic acid

Deficiency in animal cause dermatitis, adrenal degeneration and C NS symptoms, in human not well recognized

Decrease cortisone >>>>>>lead to death

Source: yeast- bran- egg yolk, liver

Inositol:

Used in case of liver diseases in a dose of 2mg/day.

Source: fruit- juice- milk- yeast- meat- liver

Biotin vitamin (H)

No definite deficiency in human, essential for maintain the health

Deficiency: Arthritis- Anxiety and dandruff

Source: liver – kidney- milk- yeast.

- Choline
- Important for metabolism of lipid and carbohydrate

Deficiency: nephropathy- bleeding

It is used to treat liver cirrhosis in a dose of 2 gm

Source : egg yolk – heart - liver – fish- milk – vegetables and fruits.

Vitamin B12 (Cyanocobolamine)

Source: it is obtained from liver extracts

It is important in treatment of pernicious anemia in dose 100mg/ week I.M

Or orally as preparation contain the intrinsic factor combine with v itamin B12 and increase its absorption.

Folic acid

Deficiency: anemia (Macrocytic anemia)

It is given in a dose 5mg/day orally

Over dose >>>>>>>>>>>bone marrow destruction especially in ane mic patients

Vitamin C (Ascorbic acid)

- It's reducing agent (Antioxidant)
- It is important for healing of wounds

- For maintain tooth and bone
- Important for adrenal cortical function

Fat soluble vitamin A, D, E, K

(1)Vitamin A (Retinol)

Action

- Coenzyme stimulates retinal function.
- For bone growth
- For reproduction
- Integrity of epithelial and mucosal tissues

(2)Vitamin D Cholicalciferol (vitamin D3)

Action

A- Promotes absorption and utilization of calcium and phosphate.

B- Helping to regulate calcium homeostasis.

Deficiency: (1) Rickets

(2) Renal osteodystrophy

(3) Vitamin E (Tocopherol)

As an antioxidant and protect RBC membrane against haemolysis

Vitamin E deficiency in premature in premature neonates and in p atients with impaired fat absorption

(4) Vitamin K phytonadione

Action

Antihaemorrhagic factor, promotes hepatic formation of active pro thrombin, hypoprothrombinemia occur secondary to vitamin K

Malabsorption, also occur in drug therapy.

Hematinics

Haematinics

a. Ferrous fumarate
b. Ferrous gluconate
c. Ferrous sulfate
d. Iron dextran

Hematinic are iron containing compounds that increase both the hae moglobin level and the number of RBC_s. Iron is necessary for formation o f haemoglobin, which transports oxygen within the RBC_S from the lungs t o the tissues. Iron deficiency, which can lead to decreased haemoglobin s ynthesis and decreased RBC production, may result from blood loss or in adequate iron intake during accelerated growth or pregnancy.

Although many expensive form of iron therapy are available, ferrous sulp hate is the cheapest and most effective.

Major uses

Iron preparations supplement depleted iron stores daily dietary supplem ent, 10 to 18 mg patients with iron deficiency may require 90 to 200mg o f elemental iron daily

Mechanism of action

After absorption into the blood, iron is immediately bound to transferrin, a plasma protein that transports iron. Transferrin carries iron to bone m arrow, where it's used during haemoglobin synthesis. Some iron is also u sed during synthesis of myoglobin or other non haemoglobin heme units.

Anaemia: disorder characterized by a decrease in haemoglobin in the blo od to levels below the normal range.

Erythropoiesis: production of RBC_S.

Erythropoietin: glycoprotein produced by the kidneys that stimulates RB C production.

Ferritin: one of the complexes in which iron is stored in the body.

Adverse reactions

The usual dosage of oral iron commonly produces constipation, dark sto ols, diarrhea, and nausea or epigastric pain. These reactions can be mini mized by taken the drug between or after meals or by administrating low er doses at shorter intervals.

Fatal anaphylaxis has been reported with parenteral administration (I.M. OR I.V.) of iron dextran, commonly within the first few minutes of admini stration; this reaction is most often associated with sudden respiratory di fficulty sometimes with CV collapse.

Other reactions to iron dextran may include local reactions at injection si te; nausea, vomiting, and disturbances in taste; headache, weakness, diz ziness, arthralgia and myalgia; and flushing and hypotension with rapid I. V. administration.

Ferrous sulfate

Contraindications and precautions

In patients with haemosiderosis and haemochromatosis use cautiously in peptic ulcer, ulcerative colitis, and regional enteritis. Also use cautiously on long- term basis.

Heavy metal poisoning Mercury, Lead and Silver

MERCURY

Is one of the oldest industrial poisons low level mercury exposure may ca use unrecognized renal damage.

Characteristics of mercurial poisoning

- Swelling and ulceration of gums
- Loosening of the teeth, fetid breath, and abnormal flow of saliva.
- Shaking palsy of the limbs
- Slight abnormalities in speech.
- Psychic disturbances
- Increase of systolic blood pressure, albumin urea, and hematuria were also noted

Mechanism of action

Organic mercuric ion act to precipitate protein and inhibit sulfhydral enzy mes, it's reversible following removal of heavy metal. This is the basis for the success of British antilewisite (BAL) in treating mercury poisoning. On ce mercury enters the circulation it is rapidly taken up. Although the for m of mercuric ion circulated and deposited is unknown. Mercury in tissu e is found in varying quantities from the largest amount in the kidney an d decreasing amount in liver, spleen, wall of the intestine, heart, skeletal muscle, and lung. Excretion starts immediately through kidney and colon.

Treatment and prevention of mercury poisoning.

- Proper ventilation.
- "Sweating them out" method of choice before chelating agents

is used.

British antilewisite(BAL) adimercaprol and chelating drug, N-acetyl- D- pe nicillamine.

BAL is 3mg/kg injected every 4hrs. For 2days the same dose every six hrs. on third day and then daily for ten days. Penicillamine chelate iron and c opper as well as mercury.

Contraindication

(EDTA) Calcium ethylenediaminetetraacetic acid

Silver

Is used as a coating for steel in aviation, bearings, in processing. Silver wa re and

jewellery silver soldering caused unrecognized pulmonary irritation. Inte nse exposure cause pulmonary oedema and repeated exposures may res ult in irreversible damage to lung function.

Argyria, a bluish black deposit of metallic silver in the skin, it is localized i n areas of the skin come in contact with silver. Generalized argyria may f ollow ingestion or inhalation.

Condition developed slowly requiring from 2-25 years. Silver converted t o silver

Sulphide deposited in the elastic fibers of corium to give grey blue pigme ntation.

Argyrosis of eye conjunctiva, cornea, and rarely the lens, reported as disc oloured Causing no loss of vision but disturbance in dark adaptation. Silv er deposited throughout the body as seen at autopsy following death fro m other causes.

Therapy and control

Silver is excreted almost entirely in the feces, such excretion prevents silv er storage. British anti-lewisite (BAL) is of value in trying to remove silver from the body

Lead

Arabian physicians knew that lead would cause colic if swallowed, paraly sis also

breathing lead fumes would cause the same disorder.

In industry, the toxicity of lead compound depends on:

- The solubility in the body fluids
- The size of the particle

Toxic effect of lead

- G.I.T
- Kidney
- Liver
- Joint involvement
- Palsy
- Lead encephalopathy

Note: painter and printer suffer from wrist drop the earliest sign of wrist drop is dropping of the two middle fingers when the hands are stretched out.

Treatment of lead poisoning

1. Freedom from exposure to lead
2. High intake of milk because lead follows calcium into bone in acute

case.

3. Cathartic is given to hasten excretion of any lead in the intestinal tract
4. I.V. Calcium relief from the pain of lead colic.
5. Calcium ethylenediaminetetraacetic acid (CaEDTA).
6. British anti- lewisite (BAL) is contraindicated in adult lead poisoning.

Digoxin toxicity

The adverse drug reactions associated with digitalis glycosides fall into fo ur groups:

1- Cardiac.

2- Neurologic

3- GI

4- Visual.

5- Cardiac reactions

Cardiac reactions: Usually caused by drug toxicity secondary to excessive blood levels. Digoxin levels above2mcg/litre or digitoxin levels above 35 mcg/litre may result in arrhythmias, most commonly ventricular tachycar dia, and bigemany.

Neurological reactions

Commonly associated with digitalis glycoside intoxication are headache, f atigue, depression, confusion, and insomnia less common reactions inclu de psychosis, delirium, and neuralgia.

Gastrointestinal reactions

Include anorexia, nausea and vomiting and less commonly, diarrhea and abdominal pain.

Visual reaction

The most common visual reaction is blurred vision.

But other signs of digitalis intoxication may include abnormal colour visio n, green and yellow halos, scotomata, and amblyopia

a- Excessive slowing of the pulse rate (60 beats/minute or less) may b e sign of digitalis toxicity. Withhold drug and notify doctor.

b- Do not administer calcium salts to patient receiving digoxin; calciu m affects cardiac contractility and excitability and may lead to seri ous arrhythmias.

c- Institute safety precaution if CNS reactions occur.

d- Obtain an order for an antiemetic or antidiarrheal agent if GI reacti ons occur. Obtain a digoxin blood level to determine if symptoms a re a result of toxicity.

e- Keep all members of the health care team in front of the patient's response to the drug.

Patient teaching

1- Inform the patient and family about digoxin, including the dosage, frequency, action, and adverse reactions.

2- Teach the patient and family how to take a pulse before each dose.

3- Stress importance of notifying the doctor if digitalis toxicity is susp ected.

4- Encourage the patient to eat potassium- rich foods.

5- Follow-up and periodic laboratory tests will be needed to evaluate the effectiveness of the drug.

Acetaminophen

Acetaminophen poisoning is becoming common in the USA and in Great Britain more than 5000 patients with acetaminophen poisoning are admi tted annually to hospitals, and 50-100 die. Most fatalities from acetamin

ophen have occurred in adults who have intentially taken 10g or more 14 0mglkg.

Antihistamines

Antihistamines drugs in toxic doses produce a complex of central nervou s system excitatory and depressant effects cerebral and kidney damage h ave been observed at autopsy.

Chlorpromazine and related drugs: acute fatal dose for these compounds in the range of 15-150mg/kg, sever symptoms have occurred with dose l ess than 1mg/kg.

Anaesthetics

Cocain

In toxic dose cocain first stimulates and then depresses the CNS in desce nding order from the cortex to the medulla. The pathologic findings in fat al cases of cocaine poisoning are congestion of the gastrointestinal tract, brain and other organs. Death may occur almost immediately after the u se of cocaine or may be delayed 1-3 hours.

Fatal pulmonary edema has occurred after intravenous administration of free cocain base.

Thiocyanate insecticide: thanite, lethane

One adult patient died after ingestion a mixture containing approximatel y 5g of lethane-384 and 14 g of lauryl thiocyanate. The toxicity of ethyl a nd methyl thiocyanate are reaching 10mg/kg in experimental animals, be cause they are converted to cyanide in the body. In rats, thanite has an L D50 of 1500mg/kg it cause convulsions.