MLT 2nd
Course Title: General Pharmacology I

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Note:
Attempt all questions
Each question carry equal marks
Pay attention to every point of question
Give to the point answers
Extra detail may leads to marks deduction

Q1.

(a) What does drug interactions mean and enumerate its various types.
(b) Write down a detail note on pharmacodynamic drug interaction.

Q2.

(a) Differentiate between hypoglycemic and hyperglycemic agents with examples.
(b) What is emesis and antiemetic drugs, give examples
(c) What kind of drugs are used for cough and sputum, give examples

Q3.

(a) Enumerate different targets for antibiotics
(b) Explain viral replication process in detail

Q4.

(a) Classify antihypertensive drugs with example
(b) What are the causes and drug therapy of various kinds of angina pectoris

Q5.

(a) Differentiate between general and local anesthetics, explain various stages of general anesthesia

(b) Write down the mechanism of action of narcotic and non-narcotic analgesics

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ANS 1: (a)

DRUG INTERACTION

A drug interaction is a situation in which a substance affects the activity of a drug when both are administered together. This action can be synergistic (when the drug's effect is increased) or antagonistic (when the drug's effect is decreased) or a new effect can be produced that neither produces on its own. Drug interactions may be the result of various processes. These processes may include alterations in the pharmacokinetics of the drug, such as alterations in the absorption, distribution, metabolism, and excretion of a drug.

Definition

It is defined as "an alternation in the duration or magnitude of pharmacological effects of one drug produced by another drug, food, or any other substance".

Types of drug interaction

1. (drug-drug interaction) interactions between drugs come to mind
2. (drug-food interactions) interactions may also exist between drugs and foods
3. (drug-plant interactions) drugs and medicinal plants or herbs
4. (drug-disease interactions)

But there are essentially two types of drug interactions.

5. Pharmacokinetics DI
6. Pharmacodynamics DI

(b)

Pharmacodynamics drug interaction

Pharmacodynamics are related to the pharmacological activity of the interacting drugs

E.g., synergism , antagonism, altered cellular transport effect on the receptor site.

These drugs are those in which the activity of the object drug at its site of action is altered by the precipitant. Such interactions may be direct or indirect. These are of two types
-Direct pharmacodynamics interactions.
-Indirect pharmacodynamics interactions.

-Indirect pharmacodynamic interaction:
In which both the object and the precipitant drugs have unrelated effects. but the latter in Some way alerts the effects but latter in some way alerts the effects of the former.
Example: salicylates decrease the ability of the platelets to aggregate thus impairing the Homeostasis if warfarin induced bleeding occurs.

Direct pharmacodynamic interactions:
In which drugs having similar or opposing pharmacological effects are used concurrently.
The three consequences of direct interactions are

1. Antagonism (Antagonism : 1-1 = 0)

The interacting drugs have opposing actions
Example: Acetylcholine and noradrenaline have opposing effects on heart rate.

2. Addition or summation (Additive effect : 1 + 1 =2)

The interacting drugs have similar actions and the resultant effect is the some of individual drug responses
Example:CNS depressants like sedatives and hypnotics,...etc

3. Synergism or potentiation Synergistic effect : 1 +1 > 2 and Potentiation effect : 1 + 0 =2 :

It is an enhancement of action of one drug by another
Example: Alcohol enhances the analgesics activity of aspirin.

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ANS 2: (a)

Hypoglycemia

Hypoglycemia is low blood sugar. The Latin word "hypo" means "below."
When your blood glucose levels drop, your body can no longer function normally and experiences a range of symptoms. The symptoms may be mild or very intense and even life-threatening.
Everybody is different, so your normal blood sugar level may be slightly different from someone else's. Generally, however, if your blood sugar is lower than 70 milligrams per deciliter (mg/dL), then your body is hypoglycemic.
Some people may not experience any symptoms, and others may have symptoms so severe they need immediate medical attention. Symptoms appear quickly after your blood sugar drops below your normal range. Hypoglycemia can be very dangerous because if your blood sugar is too low, your symptoms can render you unconscious or unable to get help.
Hypoglycemia is a common concern for people with Type 1 diabetes, who already struggle with maintaing proper blood level.
Agents of hypoglycemia

- Overdose of diabetes medications and insulin
- Not eating enough carbs
- Skipping a meal
- Sudden increased physical activity
- Drinking too much alcohol with not enough food

Hyperglycemia

The word "hyper" in hyperglycemia means "above normal." When your blood sugar is higher than the normal range (fasting plasma glucose ≥126 mg/dL) on two separate tests, your body experiences hyperglycemia. If you experience symptoms of hyperglycemia, it means that your body's insulin is not capable of removing enough sugar from your blood to keep it in a normal range. This can be because your body isn't producing enough insulin or because your insulin is not working properly due to insulin resistance. Many people with diabetes need to watch their blood sugar levels carefully. Certain medications and food choices make it difficult for a diabetic body to maintain healthy blood sugar levels

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Hyperglycemic Agents

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- Eating too much food at one time
- Not enough physical activity
- Skipped diabetes medication
- Not enough insulin
- Using insulin that has been spoiled by heat or cold
- Stress
- Illness
- Infection or injury
- An inaccurate blood glucose meter reading

(b)

Antiemetic Drugs

Antiemetic drugs are medicines used to treat and prevent nausea and vomiting. Some drugs are used entirely as prophylactics, whereas other are used to directly treat nausea and vomiting.

Examples
Drugs
Serotonin Antagonists: Zofran.

Dopamine Antagonists: Compazine, Phenergan, Inapsine, Reglan.
Cannabinoids: Marinol, Cesamet.

Emesis

is a medical term that means vomiting. Vomiting is when contents in your stomach come up and exit through your mouth. It is usually accompanied by nausea. Nausea is the feeling of having an upset stomach, and generally occurs before the actual vomiting. So why exactly do we vomit? It depends. Emesis can be associated with many different conditions.Emesis is associated with a variety of illnesses. You have probably even experienced one of these illnesses.

Examples

Apomorphine

Xylazine

Hydrogen peroxide

Syrup of ipecac

(C)

TYPES OF DRUGS FOR COUGHING

1. Hycodan
2. Mucinex
3. Hydromet
4. Dextramethorphan
5. Benzonatate
6. Diphenhydramine

DRUGS FOR SPURUM

7. Benylin
8. Mucinex
9. Benadryl
10. Zarbees.

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ANS 3: (a)

Antibiotic targets

There are several different classes of antibiotics. These can have completely different bacterial targets or act on the same target but at a different place. In principal, there are three main antibiotic targets in bacteria:

1. The cell wall or membranes that surrounds the bacterial cell
2. The machineries that make the nucleic acids DNA and RNA
3. The machinery that produce proteins (the ribosome and associated proteins)

These targets are absent or different in the cells of humans and other mammals, which means that the antibiotics usually do not harm our cells but are specific for bacteria. However, antibiotics can in some cases have unpleasant side effects.

(b)

VIRAL REPLICATION

The replication mechanism depends on the viral genome. DNA viruses usually use host cell proteins and enzymes to make additional DNA that is transcribed to messenger RNA (mRNA), which is then used to direct protein synthesis. RNA viruses usually use the RNA core as a template for synthesis of viral genomic RNA and mRNA. The viral mRNA directs the host cell to synthesize viral enzymes and capsid proteins, and to assemble new virions. Of course, there are exceptions to this pattern. If a host cell does not provide the enzymes necessary for viral replication, viral genes supply the information to direct synthesis of the missing proteins.

Adsorption.

Initially, the virus attaches or adsorbs to the surface of the host cell. Most viruses are attracted to the host cell because of the interaction between proteins on the outer surface of the virus and receptorlike proteins on the host cell membrane

Penetration and Uncoating.

The virus enters the host cell either by passing directly through the cell membrane or by fusing with the host-cell membrane and releasing the viral genetic material into the host cell

Biosynthesis.

When viral genetic material is released within the host cell, the virus takes control of the cell's molecular synthesizing machinery to initiate the biosynthesis of new viral enzymes and proteins

Maturation and Release.

The component parts of the virus (the genetic core and surrounding shell) are assembled into mature viruses

The last stage of viral replication is the release of the new virions produced in the host organism. They are then able to infect adjacent cells and repeat the replication cycle.

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ANS 4: (a)

Antihypertensive drugs

Antihypertensive drugs are used in the treatment of high blood pressure. Hypertension is not an insignificant diagnosis. It is linked to a substantially increased risk of heart attack and stroke. Studies show, though, that even a modest reduction in blood pressure can slash those risks by as much as a third.

CLASSES OF ANTIHYPERTENSIVE DRUGS

- ACE inhibitors

examples,

- Ramipril

-Lisinopril

-Perindopril

- Angiotensin II receptor antagonists

Examples,

-Candesartan

-Irbesartan

-Losartan

-Telmisartan

- Diuretics

Examles

- furosemide,
- bendroflumethiazide, hydrochlorothiazide, indapamide, metolazone
- amiloride, spironolactone

- Calcium channel blockers

Examples,

-Amlodipine

-Nifedipine

-Diltiazem

-Verapamil

- Beta blockers

Examples,

-Metoprolol

-Bisoprolol

Labetalol

-Nebivolol

- Alpha blockers

Examples,

-Alfuzosin

-Tamsulosin

-Doxazosin

- Alpha-2 agonists

Examples,

-Clonidine

-Methyldopa

-Moxonidine

- Renin inhibitors

Examples,

-Aliskiren

- Vasodilators

Examples,
-Sodium nitroprusside
-Hydralazine

(b) ANGINA

Angina is discomfort or pain in the chest that happens when not enough oxygen-rich blood reaches the muscle cells of the heart. The most common cause of angina is coronary artery disease. Coronary artery disease is usually caused by atherosclerosis. In this condition, fatty deposits (called plaque) build up along the inside walls of blood vessels that feed oxygen and nutrients to the pumping heart.

Angina occurs when one or more of the coronary arteries become narrowed or blocked. The discomfort of angina can be mild at first and gradually get worse. Or it may come on suddenly.

Causes

Angina is caused by reduced blood flow to your heart muscle. Your blood carries oxygen, which your heart muscle needs to survive. When your heart muscle isn't getting enough oxygen, it causes a condition called ischemia.

Treatment

You can help prevent angina by making the same lifestyle changes that might improve your symptoms if you already have angina. These include:

- Quitting smoking.
- Monitoring and controlling other health conditions, such as high blood pressure, high cholesterol and diabetes.
- Eating a healthy diet and maintaining a healthy weight.
- Increasing your physical activity after you get your doctor's OK. Aim for 150 minutes of moderate activity each week. Plus, it's recommended that you get 10 minutes of strength training twice a week and to stretch three times a week for five to 10 minutes each time.
- Reducing your stress level.
- Limiting alcohol consumption to two drinks or fewer a day for men, and one drink a day or less for women.
- Getting an annual flu shot to avoid heart complications from the virus.

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ANS 5: (a)

GENERAL ANESTHESIA

General anesthesia allows the patient to "sleep" with the use of anesthesia, completely unaware of the surgery.

LOCAL ANESTHESIA

Local anesthesia allows the patient to remain awake without feeling pain, which is the key difference between general and local anesthesia.

Stages of anesthesia:

- Guedel described 4 stages with reference as ether.
  - Note: IIIrd stage divided into 4 planes.
- Only observed in slow acting GA.
  - With faster-acting inducing agents, no clear cut stages observed with GA's.

Stage 1:

- Stage of analgesia.
- Extends from beginning of anesthetic inhalation to loss of conciousness.

Stage 2:

- Stage of delirium or excitement.
- Extends from loss of conciousness to beginning of regular respiration.
- Features:
  - Presence of roving eye ball (maximum movement of eye).
  - Pupil is partially dilated.
  - Loss of eyelash reflex -> 1st reflex to be lost.
  - No loss of eyelid reflex.

Stage 3:

- Stage of surgical anesthesia.
- Extends from beginning of regular respiration to cessation of spontaneous breathing.
- Divided into 4 planes.

Stage 4:

- Stage of medullary paralysis.
- Presence of respiratory arrest & apnea.
- Fully dilated & fixed pupil.

Recovery from anesthesia:

- Return of reflexes is in opposite sequence.
    - i.e., 1st – Carinal reflex.
    - Last – Eyelash reflex.
- Note: Cough should come first but swallowing comes first.
    - Because coughing requires diaphragm & respiratory muscles effort.

(b)

MECHANISM OF NARCOTIC ANALGESIS

Narcotic analgesic combinations are products that contain a narcotic analgesic in combination with at least one other analgesic; for example,Hhydrocodon, oxycodone.. Narcotic analgesic combinations should only be used to treat moderate-to-severe pain that is not responsive to other less potent analgesics. An analgesic is the name used to describe a medicine that relieves pain.

Experts believe that narcotic analgesic combinations have been overused, overprescribed, and misused in the past which has resulted in more than two million people .Narcotic analgesics work by binding to opioid receptors, which form part of the opioid system responsible for sensing pain and controlling pleasurable and addictive behaviors. Opioid receptors are more abundant in the brain and spinal cord but are also located elsewhere in the body such as the stomach and the lungs.

Mechanism of Non-norcotic analgesis

The non-norcotic analgesics are among the oldest class of synthetic drugs still in widespread clinical use. They can be divided into the non-steroidal anti-inflammatory drugs (NSAIDs), such as acetylsalicylic acid, and the non-acidic, antipyretic analgesics, paracetamol and dipyrone. The pharmacology of these various agents will be reviewed briefly.

Non-opioid analgesics can be classified due to their chemical characteristics as acid (NSAIDs = non-steroidal anti-inflammatory drugs such as ASA, ibuprofen, diclofenac, naproxen) and non-acid (paracetamol, metamizole). The common mechanism of action of these substances is their effect on prostaglandin synthesis.

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