Ministry of Higher Education & Scientific Research

Technical Institute of Mosul
Nursing Department

(Pharmacology)

For
Students of second class

By

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**General: the student must know**

1. basic science of pharmacology
2. the activity of drugs
3. absorption and excretion of drug
4. dose and dosage form

**Specific:**

1. routes of drug administration
2. effect of drug on the body
3. injection routes of drug administration
4. toxicity with drugs and metals
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1/ Over view

Introduction of Pharmacology, pharmacokinetics, pharmacodynamics, Pharmacognosy, drug, receptors

1/ A – Target population :-

This lecture is designed for second year Technical Institute students Department of nursing. It will be assumed that students have an adequate background in principles of pharmacology

1/ B – Rationale :-

Pharmacology is the science that is concerned with drugs regarding their pharmacokinetic, pharmacodynamic, uses, adverse effects and contraindications. Toxicology is the sciences refer to the toxins and drugs regarding their toxic or harmful effects on different body systems and the mechanisms to manage these toxicities

1/ C – Central Idea :-

1 - Definition

2-Know the Basic Pharmacology Principles:
   ▪ Pharmacodynamics.
   ▪ Pharmacokinetics.
   ▪ Pharmacognosy.

3. Adverse drug reactions and drug interactions.
4- Know half life of drug

1/ D – Instructions:-
1. Study over view thoroughly.
2. Identify the goal of this modular unit.
3. Do the pre test
4. After studying the text of this modular unit, do the post test

2/ Performance Objectives:

After studying the first modular unit, the student will be able to:

1. Define pharmacokinetics, pharmacodynamics, Pharmacognosy, drug.
2. Know the principles of Pharmacology.
3. Determine the mechanism of drug.
4. Determine the sources of drug.
5. Know about generic and trade name of drug.
6. Drug interactions: Synergistic & Antagonistic effect
3/ Pre test :-

Circle the correct answer :-

1. pharmacology mean :-
   a- study every thing about the drug . b- study absorption of the
   c- study origin of drug c- study shape of drug

2-Pharmacology word consist of
   a- one parts b- two parts
   c- three parts d- four parts

3-It refer to the way in which drug arrive to sites of action (receptor)by the circulating body fluid
   a- Distribution b- Metabolism
   c- execration d- absorption

4:- B.P mean:
   a- (BRITISH PHARMACOPIA) b- (U.S.A. Pharmacopoeia)
   c- Beirut PHARMACOPIA d- BRITISH people

5-Distribution of drug must determine concentration gradient between blood and organ:
   a- size of organ b- blood flow
   c- binding d- High lipid soluble

6-Half life's the amount of time require for to be eliminated from body
   a- 20% b- 40%
   c- 50% d- 100%

7-chloroquine is strongly bound to:
   a- balsam albumin b- tissue protein
   c- a& b c- no one
8-- Drug interaction is:

a- Occur when the action of one drug is altered by the action of another drug.
b- Occur when the shape of one drug is altered by the shape of another drug.
c- Occur when the concentration of one drug is altered by the concentration of another drug.
d- Occur when the trade name of one drug is altered by the trade name of another drug.

9- These drugs called medicine which are used for prevention and treatments of disease

a- Preventive drug  b- Drug

c- Therapeutic drug  d- Infectious treated

10- Factor effect drugs action depend one

a- Age  b- Illness

c- Body height (B.W)  d- All of them

Note

- Check your answers in key answer page 15.
- (1) degree for each.

4/ The text:

Pharmacology: It defined as that science which deals with study of drug and there action on the living organism.

Pharmacology consist of two parts
1: Pharmaco= drugs
2: Loges = study

Pharmacognosy: It is that science which deals the origin of the drug that is from plant or animal or chemical substances and there action.
Pharmacodynamic: - the study of the action of the drugs on the body includes dose, mechanism of the therapeutic and toxic action and chemical and physical effect.

Pharmacokinetics: - it is that science which deals with the study of body tissue effect on drugs including absorption. Distribution, metabolism and excretion

Drug: - it is alchemical substance that has effect on living organism

Pharmacopoeia
1: B.P (BRITISH PHARMACOPIA)
2: U.S.P (U.S.A. Pharmacopoeia)

Therapeutic drug: - these drugs called medicine which are used for prevention and treatments of disease

Chemical name: it is usually meaning to chemical which dealing with composition of the drug and place of action.

Generic name of drug: - it is common name used in British pharmacopoeia refer to chemical structure of drug, not capitalized also called approved name

Trade name (brand name): - usually followed by ® usually refer to manufactured company it product it capitalized, dark.

Absorption: - it is process by which a drug is made available to the body fluids for distribution so drug transfer from site of entry to circulating fluid (blood, lymph)

Rate of absorption depends on
1: route of administrate:
2: blood flow
3: solubility of drug

Quiz / 1

Define Pharmacology

Note

- Check your answers in key answer page 16

Regardless of route of administration a drug must be dissolved in body fluids before it can be absorbed in to body tissue

Distribution: - refer to the way in which drug are transported by the circulating body fluid to the sites of action (receptor)

It depend on :-
A- size of organ :- determine concentration gradient between blood and organ
EX, skeletal muscle takes up large amount due it large organ
EX, brain takes small amount due it small organ

B: - blood flow
*the most extensive blood supply like hart, liver, kidney & brain / rapid distribution
*the less extensive blood supply like muscle, skin, fat slowly distribution

C:- solubility : lipid solubility
Ex. High lipid soluble drugs dissolved more rapidly in brain tissue than low lipid soluble due to the brain have high lipid contain.

D: - binding:-binding of drug to macromolecule in blood or tissue will increase drug concentration in blood or tissue
* War farina is strongly bound to balsam albumin
Chloroqnine is strongly bound to tissue protein

Quiz / 2
How could you differentiate between :-
Pharmacognosy:k& Pharmacokinetics

Note
- Check your answers in key answer page 16.
Metabolism: - the enzyme system of the liver is the primary site of the metabolism of drugs Other tissue and organs metabolism certain drug minor
    * Some drug metabolism before excretion example local anesthesia

Other aren't metabolism like penicillin (G) they continue to act until they are excreted

ECRETION
THE PRIMARY RUOTE –
-though renal tubules (urine)
- Through skin tubules (evaporation)
  = lung Through ( exhalation)
-secretion into saliva motherly milk
Half life: - the amount of time require for 50% to be eliminated from body
- The long half life like digoxin at (36) hrs = admin once daily
- The short half life like aspirin at (5) hrs = give every (4-6) hrs to maintain therapeutic activity

Factor effect drugs action:-

1. age
2. body height (B.W)
3. METABOLIC rate
4. ILLNESS:
5. psychological aspects
6. tolerance: - occur when person starts requiring higher dose to produce the same effects
7. dependence: - inability of a person to control the ingestion of the drugs
8. cumulative effect: drug may accumulate if the next dose are administered before previously administered doses have been metabolism excreted accumulation of drug may result in drug toxicity ex alcoholic

Quiz 3
Fill in the blanks with suitable answer :-

1. Generic name of drug are ________, ________.
2. Trade name (brand name) are ________.

Note
- Check your answers in key answer page 16.

Tolerance

- *Tolerance* is the process whereby neuroadaptation occurs (through receptor desensitization) resulting in reduced drug effects. Tolerance is more pronounced for some effects than for others; tolerance occurs quickly to the effects on mood, itching, urinary retention, and respiratory depression, but occurs more slowly to the analgesia and other physical side effects. However, tolerance does not develop to constipation or *miosis* (the constriction of the pupil of the eye to less than or equal to two millimeters)

Magnesium and zinc deficiency speed up the development of tolerance to opioids
**Quiz4**

Mention factors effect on drug action

**Note**

- Check your answers in key answer page 16.

Dependence

*Dependence* is characterised by extremely unpleasant withdrawal symptoms that occur if opioid use is abruptly discontinued after tolerance has developed. The withdrawal symptoms include severe dysphoria, sweating, nausea, rhinorrhea, depression, severe fatigue, vomiting and pain. Slowly reducing the intake of opioids over days and weeks will reduce or eliminate the withdrawal symptoms. The speed and severity of withdrawal depends on the half-life of the opioid; heroin and morphine withdrawal occur more quickly and are more severe than methadone withdrawal, but methadone withdrawal takes longer.

Addiction

*Addiction* is the process whereby physical and/or psychological dependence develops to a drug - including opioids. The withdrawal symptoms can reinforce the addiction, driving the user to continue taking the drug. Psychological addiction is more common in people taking opioids recreationally.

Misuse

*Drug misuse* is the use of drugs for reasons other than what the drug was prescribed for. Opioids are primarily misused due to their ability to produce euphoria.

Drug interaction:-

Occur when the action of one drug is altered by the action of another drug additive effect tow drugs with similar action are taken for double effect. Propoxyphene + aspirin add analgesic effect.
Quiz5
Define Drug misuse

Note
- Check your answers in key answer page 16.

Quiz6
What the benefit of Synergistic effect of drug

Note
- Check your answers in key answer page 16

Synergistic: - the combined effect of two drugs is greater than the sum of the effect of each drug
Ex: aspirin + codeine = much greater analgesic
Antagonistic effect: - one drug interfere with the action of another
5/ Post test :-

Circle the correct answer :-

1- Pharmacodynamic are::

a- deals the origin of the drug       b- deals body tissue effect on drugs.
c- the study action of drugs on the body tissue   d- deals drug and there action on the living organism

2- name of drug follow by ® is

a- Generic name        b- trade name

c- chemical name       d- No one of them

3- Rate of absorption depends on

a- route of administrate       b- blood flow

c- solubility of drug          d- All of them

4- primary site of the metabolism of drugs:

a- liver                   b- stomach

c- mouth                    d- intestine

5- the less extensive blood supply like muscle, skin, fat:

a- rapid distribution       b- middle distribution

c- range between rapid - middle distribution   d- slowly distribution

6- THE PRIMARY RUOTE ECRETION

a- though renal tubules       b- Through skin

c- lung Through                    d- all of them

7- 8- Half life of digoxin:
a- (6) hrs=admin once daily  
b- (16) hrs=admin once daily  
c- (36) hrs=admin once daily  
d- (20) hrs=admin once daily  

**8- Half life of aspirin**  
a- at (5) hrs =give every (4-6) hrs  
b- at (35) hrs =give every (4-6) hrs  
c- at (24) hrs =give every (4-6) hrs  
d- at (2) hrs =give every (4-6) hrs  

**9- tolerance means :**  
a- occur when person starts requiring higher dose to produce the same effects  
b- inability of a person to control the ingestion of the drugs  

c- drug may accumulate if the next dose are administered before previously administered doses have been metabolism excreted accumulation of drug may result in drug toxicity ex alcoholic  
d- drug action interfere with another  

**10- Synergistic of aspirin + codeine give:**  
a- much greater laxative  
b- less greater analgesic  
c- much greater anesthesia  
d- much greater analgesic  

**Note**  
- Check your answers in key answer page 15 .  
- ( 1 ) degree for each .  

**6/ key answer :-**  

**1- Pre test :-**  
1. a 6- c  
2. b 7- b
3. d 8- a  
4. a 9- c  
5. a 10- d  

If you :-
• got 9 or more you do not need to proceed.
• got less than 9 you have to study this modular unit well.

2- Post test :-
1. c 6- d  
2. b 7- c  
3. d 8- a  
4. a 9- a  
5. d 10- b  

If you :-
• got 9 or more , so congratulation your performance , go on studying modular unit three .
• got less than 9 , go back and study the second unit ; or any part of it ; again, and then do the post test again.

Quiz 1
Pharmacology:-it defined as that science which deals with study of drug and there action on the living organism

Quiz 2
Pharmacognosy it is that science which deals the origin of the drug that is from plant or animal or chemical substances and there action while Pharmacokinetics it is that science which deals with the study of body tissue effect on drugs including absorption.
Distribution, metabolism and execration

Quiz 3
Generic name of drug: - it is common name used in British pharmacopoeia refer to chemical structure of drug, not capitalized also called approved name
Trade name (brand name): - usually followed by ® usually refer to manufactured company
it product it capitalized, dark

**Quiz 4**

Factor effect drugs action:-
1. age
2. body height (B.W)
3. METABOLIC rate
4. ILLNESS:
5. psychological aspects
6. tolerance: - occur when person starts requiring higher dose to produce the same effects
7. dependence: - inability of a person to control the ingestion of the drugs
8. cumulative effect: drug may accumulate if the next dose are administered before previously administered doses have been metabolism excreted accumulation of drug may result in drug toxicity ex alcoholic

**Quiz 5**

Drug misuse is the use of drugs for reasons other than what the drug was prescribed for.
Opioids are primarily misused due to their ability to produce euphoria

**Quiz 6**

Synergistic: - the combined effect of two drugs is greater than the sum of the effect of each drug

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**Sources :-

1- Basic & Clinical Pharmacology (Basic and Clinical Pharmacology)
2- Katzung and Trevor's Pharmacology Anthony J. Trevor (Author), Bertram G. Katzung (Author), Susan B. Masters (Author) : McGraw-Hill Medical; Latest edition 640 pages

3- Lippincott's Illustrated Reviews: Pharmacology (Lippincott's Illustrated Reviews Series) Richard D Howland (Author), Mary J Mycek (Author), Richard A Harvey (Author), Pamela C Champe (Author) Paperback: 559 pages Publisher: Lippincott Williams & Wilkins; Latest edition

4- Goodman & Gilman's The Pharmacological Basis of Therapeutics Laurence Brunton (Author), John Lazo (Author), Keith Parker (Author) Publisher: McGraw-Hill Professional; Latest edition

1/ Overview

Define doxology, Dose of the drug; dose estimation: factors effecting dose, dosage form.

1/ A – Target population:

This lecture is designed for second year Technical Institute students Department of nursing. It will be assumed that students have an adequate Knowledge in dosage of drug and how to calculate.

1/ B – Rationale:

A. The student shall be able to describe specificity of drug dose. 
B. The student shall be able to know type of dose calculation.
C. The student shall understand factors effect on drug dose.

1/ C – Central Idea:

1 - Definition

2 – calculation of drug dose according to:
   a- age.
   b- weight
   c- concentration
3- limited factors effect on drug dose estimation

1/ D – Instructions:
5. Study overview thoroughly.
6. Identify the goal of this modular unit.
7. Do the pre test
8. After studying the text of this modular unit, do the post test

2/ Performance Objectives

After studying the second modular unit, the student will be able to:
7. Define.
8. Know the principle of doxology.
9. Determine the methods to calculate dose of drug
10. Determine factors effect on drug dose

3/ Pre test

Circle the correct answer:
2. doxology mean:
   a- study action of drug.
   b- study types of the drug.
   c- study concentration of drug.
   d- study dose of drug.
2- toxic dose mean
   a- the dose when taken more than limited dose lead to poisoning effect
   b- the dose of the drug more than usual dose which known & lead to dead of person
   c- these drugs called medicine which are used for prevention and treatments of disease
   d- occur when person starts requiring higher dose to produce the same effects
3- Young's role to calculate
   a- young dose
   b- adult dose
   c- child dose
   d- women dose
4- Dose of drug depend on the following
   a- age
   b- metabolic rate
   c- body weight
   d- all of them
5- to calculate drug doses you need to memorize the following formula
   a- rate = dose X concentration
   b- dose = rate X concentration
   c- concentration = rate X dose
   d- dose = age X concentration
6- the metrology involve:
   a- metric measurement
   b- apothecary measurement
   c- weight measurement
   d- a&b
7- child.age X adult dose refer to
    child.age + 12
   a- Young's role
   b- Friends and Clark
   c- a& b
   c- no one
8- Friends and Clark rout of drug dose calculate for
   a- child less than 3 years
   b- child less than 2 years.
   c- child less than 1 years.
   d- child more than 1 years
9- Rate: the rate will always be in mg/min
   a- mcg/min
   b- m/hr
   c- mcg/kg/min
   d- mg/min
10- 1tbsp
   a- 15ml
   b- 25ml
Note

- Check your answers in key answer page 27.
- (1) degree for each.

4/ the module contents
Doxology: - is the science study doses of the drug in pharmacology
FETAL DOSE: - the dose of the drug more than usual dose which known & lead to dead of person

Toxic dose: - the dose when taken more than limited dose lead to poisoning effect of drug.

Dose of drug depend on the following
1:- age
2:- sex
3:- body weight
4:- metabolic rate
5:- psychological case
6:- illness

how you can calculate children dose
To calculate child dose

Young's role& Friends and Clark

Quiz / 1
Define Doxology

Note
- Check your answers in key answer page 28

Quiz / 2
Differentiated between fetal dose &toxic dose

Note
- Check your answers in key answer page 28
a Young's role

*more than one year*

children dose = child.age × adult dose

child.age+12

Friends and Clark

*more less one year*

child.dose = child.weigh × adult dose

150

**Quiz /3**

Enumerate factors effect on drug dose

**Note**

- Check your answers in key answer page 28

Calculating drug titration dosages

* Pharmacology agents used in critically ill patient are administered in a variety of doses.
  unit /hr
  mg/hr
  mg/min
  mcg/min
  mcg/kg/min
  mg=milligram
  mcg=

_to calculate drug doses you need to memorize the following formula_

DOSE = RATE × CONCENTRATION

**Quiz /4**

Differentiated between Young's role & Friends and Clark

**Note**

- Check your answers in key answer page 28

**DOSE:**
The drug you are administering determines the dose. You know from doctor the dose or need calculate.

- Rate: the rate will always be in m/hr
- Concentration: always be given the concentration. Can be found on label on the bag units/hr: 1 mg/min

Patient having chest pain and is receiving 30 ml/hr of Nitroglycerine (mcg/min) the patient is receiving.

\[
50 = 50,000 \text{mcg} \times \frac{30 \text{ml}}{50 \text{ml}} \times \frac{1 \text{hr}}{60 \text{min}} = 100 \text{mcg/min}
\]

**Quiz /5**

What is a Young's role formula

**Note**

- Check your answers in key answer page 288

4- Your patient’s blood pressure has been un acceptably low 70.5/40.5 he is receiving 800mg/250ml at rate of 5ml/hr you have increased the dopamine to 12ml/hr (note weight 70Kg)

\[
\frac{12 \text{ml}}{\text{hr}} \times \frac{1 \text{hr}}{70 \text{kg}} = \frac{800,000 \text{mcg}}{70 \text{kg}} \times 9.14 \text{mcg/kg/min}
\]

5- the physician orders you to start dobutamine at mcg/kg/min on bag

\[
\frac{500 \text{ml}}{1 \text{hr}} \times \frac{10 \text{mcg}}{50 \text{kg}} = \frac{100,000 \text{mcg}}{1 \text{hr}}
\]

House hold M. | Apothecary M. | Metric M.
---|---|---
2 tbsp | 1 oz (6.8 drams) | 30 ml
1 tbsp | 1/2 oz (3-4 drams) | 15 ml
2 tsp | 1/3 oz | 10 ml
1 tsp | 1/6 oz (1 dram) | 5 ml

**Quiz /6**

Fill in the blank

2 tbsp equal ----------- oz and equal ----------- ml
Circle the correct answer:

1- Patient having chest pain and is receiving 30 ml/hr of Nitroglycerine (mcg/min) the patient is receiving.
   a- 100 ml   b- 125ml.
   c- 150 ml   d- 300 ml

2- drams is
   a- Apothecary M   b- Metric M
   c- House hold M.   d- No one of them

3- factors effect on drug dose calculation
   a- route of administrate   b- blood flow
   c- solubility of drug      d- All of them

4- a Young's role formula is:
   a- child. weight X adult dose
      child.age+12
   b- child. long X adult dose
      child.age+12
   c- child. age X adult dose
      child.age+12
   d- child. weight X adult dose
      child. weight +12

5- the less extensive blood supply like muscle, skin, fat:
   a- rapid distribution   b- middle distribution
   c- range between rapid -middle distribution   d- slowly distribution

6- THE PRIMARY RUOTE ECRETION
   a- though renal tubules   b- Through skin
   c- lung Through   d- all of them

7- fetal dose effect as:
   a- paralytic   b- dead
c - addiction d - shock

8- rate of drug always
a - ml/hr b - mg/hr
c - hr/mg d - mg/kg

9-: Apothecary method mean .-
a - on rout of drug metrology in the house
b - on rout of drug metrology for fluid only
c - on rout of drug metrology for fluid and solid
d - on rout of drug metrology for solid only

10-: in Friends and Clark to calculate dose we depend on
a - weigh b - age
c - length d - a & b

Note

- Check your answers in key answer page 27.
- (1) degree for each
6/ key answer :-

1- Pre test :-

1. d  6. d
2. a  7. a
3. d  8. c
4. c  9. b
5. d  10. a

If you :-

• got 9 or more you do not need to proceed .
• got less than 9 you have to study this modular unit well .

2- Post test :-

1. a  6. d
2. b  7. b
3. d  8. a
4. c  9. a
5. d  10. a

If you :-

• got 9 or more , so congratulation your performance , go on studying modular unit three .
• got less than 9 , go back and study the second unit ; or any part of it ; again, and then do the post test again .
**Quiz 1**

Doxology: - is the science study doses of the drug in pharmacology

**Quiz 2**

FETAL DOSE: - the dose of the drug more than usual dose which known & lead to dead of person

Toxic dose: - the dose when taken more than limited dose lead to poisoning effect of drug

**Quiz 3**

Dose of drug depend on the fallowing
1:- age
2:- sex
3:- body weight
4:- metabolic rate
5:- psychological case
6:- illness

**Quiz 4**

a Young's role *more than one year* while Friends and Clark *more less one year*

**Quiz 5**

4- a Young's role formula is :

a- child. weight X adult dose

child.age+12

**Quiz 6**

2tbsp=1oz(6.8drams)= 30ml
References

1- Basic & Clinical Pharmacology (Basic and Clinical Pharmacology)

2- Katzung and Trevor's Pharmacology
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5-
1/ Overview

Routes of drug administration oral; injection, skin, rectal and other routes. Drug excretion.

1/A – Target population:

This lecture is designed for second year Technical Institute students Department of nursing. It will be assumed that students have an adequate knowledge different type of drug administration rout.

1/B – Rationale:

A. The student shall distinguish Routes of drug administration, and recognize variability on each rout.
B. The student shall designate advantage and disadvantage of each rout.
C. The student shall compare and contrast onset time of different routes of drug administration

1/C – Central Idea:

1 - Definition
2 – Routes of drug administration oral; injection, skin, rectal and other routes. Drug excretion.
1 / D – Instructions:-

1. Study over view thoroughly.
2. Identify the goal of this modular unit.
3. Do the pre test
4. After studying the text of this modular unit, do the post test

2/ Performance Objectives :-

After studying the third modular unit, the student will be able to:-

11. Define.
12. Know the Routes of drug administration.
13. Determine the advantage and disadvantage Routes of drug administration
14. Determine the onset of drug action according to Routes of drug administration.

3/ Pre test :-

Circle the correct answer: -

3. the Most convenient, most economical administration route
   a- Transdermal Administration       b- Rectal Administration
c- Oral Administration  

d- Parenteral l Administration

2- emesis is disadvantages of:

a- Transdermal Administration  
b- Administration Oral

c- Rectal Administration  
d- Parenteral l Administration

3- the drugs which are ready absorbed in the stomach are

a- weak acidity  
b- highly acidity

c- weak alkalinity  
d- highly alkalinity

4:- Factors determining rate of drug effect onset

a:- Drug ionization state  
b- Absorption Site

c- a&amp;b  
d- no one of them

5- Binders found in

a- tablet  
b- capsule

c-ointment  
d- eumalion

6- Absorption Site are mainly small intestine because of:

a- small surface area  
b- highly blood flow

c- a&amp;b  
d- large surface area

7- Avoids continuous infusion technique difficulties on advantage of

a- Transdermal Administration  
b- Rectal Administration

c- Oral Administration  
d- Parenteral l Administration

8- Factors contributing to reliable transdermal drug absorption:

a- molecular weight &gt; 1000  
b- molecular weight = 1000

c- molecular weight &lt; 100  
d- molecular weight &lt; 1000

9- daily drug requirement in transdermal administration is
a- equal 10 mg  
b- >10 mg  
c- <10 mg  
d- <100 mg

10- Low rectal administration of drug may allow the drug to enter the systemic circulation without passing

a- through the stomach  
b- through the kidney  
c- through the intestine  
d- through the liver

Note

- Check your answers in key answer page 40.
- ( 1 ) degree for each .

4/ the text :-

Routes of Administration

Oral Administration

☐ Most convenient, most economical
☐ Disadvantages:
☐ emesis (drug irritation of the gastrointestinal mucosa)
☐ digestive enzymes/gastric acidity destroys the drug
☐ unreliable or inconsistent absorption due to food or other drug effects
☐ 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:
  - Sustained, therapeutic plasma levels (reduced peaks/valleys associated with intermittent drug administrations)
  - Avoids continuous infusion technique difficulties
  - Low side effect incidence (smaller doses)
  - Generally good patient compliance
    - Factors contributing to reliable transdermal drug absorption:
      - Molecular weight < 1000
      - pH range 5-9 in aqueous medium
      - No histamine-releasing action
      - Daily drug requirement < 10 mg
- Example of drugs available for transdermal delivery:
  - Scopolamine: Tolerance may eventually occur; resulting in loss of therapeutic action
  - Fentanyl (Sublimaze)
  - Clonidine (Catapres)
  - Nitroglycerin: Tolerance may eventually occur; resulting in loss of therapeutic action

Rectal Administration

- 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
Low rectal administration of drug may allow the drug to enter the systemic circulation without passing through the liver. Generally unpredictable pharmacological responses for the above reasons. Rectal mucosal irritation possible.

Parenteral Administration

- Ensures active drug absorption
- subcutaneously intramuscular injection: more rapid/predictable than oral administration route
- only route of administration acceptable for:
  - uncooperative patients
  - unconscious patients
- Factors that determine rate of systemic absorption:
  - absorbing capillary membrane surface area
  - drug solubility in interstitial fluid
  - aqueous channels (vascular endothelium) promote high diffusion rates of drugs, independent of their lipid solubility
- Advantages of IV administration
  - rapid/precise blood drug levels obtained (e.g., no first-pass effect)
  - Irritant drugs: more comfortably administered (blood vessels relatively insensitive); drug rapidly diluted (particularly if administered into large forearm vein)

Ear drops are 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. Incase 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: Adhesive substance that allow the tablet to stick to together.
  2- Disintegrator substance that encourages dissolution in body fluid.
3-lubricant required for manufacturing.
4- Filters ingredients to make the tablet size convenient tablet sometimes second or grooved. Used to divide the dosage.

**Quiz /3**

Define capsule

**Note**
- Check your answers in key answer page 41

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 shaken will 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.

**Quiz /4**
tables also contain one or more of the following ingredients enumerate them

**Note**
- Check your answers in key answer page 39

Official syrups. Ax. Sucrose. Glucose 600
Procedure: weight sucrose and put it in a beaker .add to it purified water until find weight becomes 1000 ml. filter through a piece of a gauze or filter paper. Lotions are usually aqueous preparation that contains suspended materials. They common used as 3

Soothing agents to protect the skin and relieve rashes and itching.

**Ointment:** Are semi-sold preparation of medicinal substance in an oily base substance in an oily base such as lanolin or petroleum. Not removed by water, prolog contacts which skin or M.M.
Creams: Are semisolid emulsions containing medicinal agents for external application. Cream base is generally non greasy, removed by water.

**Quiz /5**
prepare Official syrups. Ax. Sucrose. Glucose 600

**Note**
- Check your answers in key answer page 39

**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 with drawing 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.

**Quiz /6**
Define ampule

**Note**
- Check your answers in key answer page 40

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.
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

**5/ Post test :-**

Circle the correct answer :-
1- only route of administration acceptable for unconscious patients:
   a- Transdermal Administration       b- Rectal Administration
   c- Oral Administration             d- Parenteral Administration

2- Factors the determine rate of systemic absorption:
   a- absorbing capillary membrane surface area
   b- aqueous channels
   c- drug solubility in interstitial fluid
   d- all of them

3- drug rapidly diluted (particularly if administered into)
   a- hepatic vein
   b- small forearm vein
   c- large forearm vein
   d- hemorrhoid vein

4- primary site of the metabolism of drugs:
   a- liver
   b- stomach
   c- mouth
   d- intestine

5- Advantages of IV administration
   rapid/precise blood drug levels obtained:
   a- rapid/precise blood drug levels obtained
   b- Irritant drugs: more comfortably administered
   c- a&b
   d- Avoids continuous infusion technique

6- Are semi-sold preparation of medicinal substance in an oily base
   a- syrup
   b- Ointment
   c- cream
   d- emulsion

7- are glass containers contain one or more doses of a sterile medication
   a- Vials
   b- ampoule
   c- a&b
   d- large glass container

8- Are a solid form of medication designed for introduction into a body orifice
   a- Suppositories
   b- capsule
   c- cream
   d- emulsion

9-: Many preparations for pediatric patients are syrups.
   a- Suppositories
   b- capsule
   c- syrup
   d- emulsion

10- solutions are available in both glass& plastic containers in various types& concentrations:
   a- Vials
   b- ampoule
   c- a&b
   d- large glass container
Note
- Check your answers in key answer page 40.
- ( 1 ) degree for each.

6/ key answer :-

1- Pre test :-
1. c       6-d
2. b       7-a
3. a       8-d
4. c       9-c
5. a       10-b

If you :-
- got 9 or more you do not need to proceed.
- got less than 9 you have to study this modular unit well.

2- Post test :-
1. d       6-b
2. d       7-a
3. c       8-a
4. a       9-c
5. c       10-d

If you :-
- got 9 or more, so congratulation your performance, go on studying modular unit three.
- got less than 9, go back and study the second unit; or any part of it; again, and then do the post test again.
Quiz 1

1- emesis (drug irritation of the gastrointestinal mucosa)

2- digestive enzymes/gastric acidity destroys the drug

Quiz 2

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

Like propranolol & lidocaine

Quiz 3

Capsules are small cylindrical gelatin containers. They 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.

Quiz 4

tablets also contain one or more of the following ingredients
1- Binders: Adhesive substance that allow the tablet to stick to together.
2- Disintegrator substance that encourages dissolution in body fluid.
3- lubricant required for manufacturing.
4- Filters ingredients to make the tablet size convenient. Tablet sometimes second or grooved. Used to divide the dosage.

Quiz 5

Official syrups. Ax. Sucrose. Glucose 600
Procedure: weight sucrose and put it in a beaker. Add to it purified water until find weight becomes 1000 ml. Filter through a piece of a gauze or filter paper.

Quiz 6

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 with drawing the medication
Sources :-

1- Basic & Clinical Pharmacology (Basic and Clinical Pharmacology)  

2- Katzung and Trevor's Pharmacology Anthony J. Trevor (Author), Bertram G. Katzung (Author), Susan B. Masters (Author) : McGraw-Hill Medical; Latest edition 640 pages

3- Lippincott's Illustrated Reviews: Pharmacology (Lippincott's Illustrated Reviews Series) Richard D Howland (Author), Mary J Mycek (Author), Richard A Harvey (Author), Pamela C Champe (Author)  
Paperback: 559 pages Publisher: Lippincott Williams & Wilkins; Latest edition

4- Goodman & Gilman's The Pharmacological Basis of Therapeutics Laurence Brunton (Author), John Lazo (Author), Keith Parker (Author)  
Publisher: McGraw-Hill Professional; Latest edition  
Laurence Brunton (Author), John Lazo (Author), Keith Parker (Author)  
Publisher: McGraw-Hill Professional; Latest edition  
Language: English ISBN-10: 0071422803

1/ Over view

Autonomic nervous system anatomy and physiology, neurotransmitter ganglia, parasympathetic nervous system

1/ A – Target population:

This lecture is designed for second year Technical Institute students Department of nursing. It will be assumed that students have an adequate background in the effect of autonomic drugs

1/ B – Rationale:

- At the end of the lecture, the student should be refresh their mind about first year of nursing department on anatomy and physiology of autonomic nervous system. Lastly able to apply practically what he different analgesic drugs on pain relieve will be given.
1 / C – Central Idea:

1 - Definition

2 – Major Topics of the lecture:
   - 1-knowoldg of all parts of nervous system
   - 2- enumerate neurotransmitter
3-general aspect of sympathetic and parasympathetic nervous system

1/ D – Instructions:

5. Study over view thoroughly.
6. Identify the goal of this modular unit.
7. Do the pre test
8. After studying the text of this modular unit, do the post test

2/ Performance Objectives

A. The student shall know the definition and characteristics of neuromuscular blockers.
B. The student shall able to describe anatomy and physiology of autonomic nervous system
C. The student shall able to describe the mechanism of action, effects on organ systems, pharmacokinetics, contraindications, cautions and drug interactions, uses, and methods for drug

3/ Pre test
Circle the correct answer :-

4. **autonomic nervous system involve:-**
   a-central nervous system .       b- peripheral nervous system
   c- a&b                                 c- somatic nervous system

2- sympathetic nervous system is one part of
   a-central nervous system .       b- peripheral nervous system
   c- somatic nervous system       d- no one of them

3- part that control in voluntary movement is
   a-central nervous system .       b- autonomic nervous system
   c- somatic nervous system       c- all of them

4- autonomic nervous system mostly controlling:
   a- cardiovascular system       b- respiratory system
   c- digestive system           d- all of them

5- Diverts blood flow away from the gastro-intestinal (GI) tract and skin via.
   a- vasodilation               b- vasoconstriction
   c- a&b                        d- no one of them

**Note**
- Check your answers in key answer page 51.
- ( 2 ) degree for each.
Autonomic N.S: control involuntary movement like heart smooth muscle

- The nervous impulses are transmitted via chemical substance called chemical transmitted & according to last nerves fiber classify to:-
**Quiz / 2**

Define autonomic nervous system

**Note**

- Check your answers in key answer page 52
**Quiz / 1**

Define neurotransmitter

**Note**

- Check your answers in key answer page 52

The autonomic nervous system (ANS) (or visceral nervous system) is the part of the peripheral nervous system that controls homeostasis, that is the constancy of the tissues in gasses, ions and nutrients. It does so mostly by controlling cardiovascular, digestive and respiratory
functions, but also salivation, perspiration, diameter of the pupils, micturition - (the discharge of urine), and erection. Many of the activities of the ANS are involuntary. However, breathing, for example, can be in part consciously controlled. Indeed, although breathing is a purely homeostatic function in aquatic vertebrates, in land vertebrates it accomplishes much more than oxygenating the blood: it is essential to sniff a prey or a flower, to blow a candle, to talk or sing. This example, among others, illustrates that the so-called “autonomic nervous system” is not truly autonomous. It is anatomically and functionally linked to the rest of the nervous system and a strict delineation is impossible.

The ANS is nevertheless a classical term, still widely used throughout the scientific and medical community. Its most useful definition could be: the sensory and motor neurons that innervate the viscera. These neurons form reflex arcs that pass through the lower brainstem or medulla oblongata. This explains that when the central nervous system (CNS) is damaged experimentally or by accident above that level, a vegetative life is still possible, whereby cardiovascular, digestive and respiratory functions are adequately regulated.

---

**Sympathetic nervous system** Diverts blood flow away from the gastro-intestinal (GI) tract and skin via vasoconstriction. Blood flow to skeletal muscles, the lung is not only maintained, but enhanced (by as much as 1200%, in the case of skeletal muscles). Dilates bronchioles of the lung, which allows for greater alveolar oxygen exchange. Increases heart rate and the contractility of cardiac cells (myocytes), thereby providing a mechanism for the enhanced blood flow to skeletal muscles. Dilates pupils and relaxes the lens, allowing more light to enter the eye.

**Parasympathetic nervous system** Dilates blood vessels leading to the GI tract, increasing blood flow. This is important following the consumption of food, due to the greater bolic demands placed on the body by the gut. The parasympathetic nervous system can also constrict the bronchiolar diameter when the need for oxygen has diminished. During accommodation, the parasympathetic nervous system causes constriction of the pupil and lens.

**Quiz / 3**

Differentiated between sympathetic n. s. and parasympathetic according on effect on heart rat, Eye pupil & Blood vessels.

**Note**

- Check your answers in key answer page 52

The parasympathetic nervous system stimulates salivary gland secretion, and accelerates
peristalsis, so, in keeping with the rest and digest functions, appropriate PNS activity mediates
digestion of food and indirectly, the absorption of nutrients.
Is also involved in erection of genitals, via the pelvic splanchnic nerves

**Quiz / 4**

Fill in the blank
1-The ANS Its most useful definition could be: the sensory and motor neurons that innervate the **********
2- These neurons form reflex arcs that pass through the ********** brainstem or medulla oblongata
3-parasympathetic Is also involved in erection of genitals, via the 

**********

4- The parasympathetic nervous system ********** salivary gland secretion

**Note**

- Check your answers in key answer page 52

5/ Post test

Circle the correct answer :-

1- Blood flow to skeletal muscles, the lung is not only maintained, but enhanced (by, in the case of skeletal muscles):-

a- as much as 1200%  
b- as little as 1200%

c- as much as 1100%  
c- as much as 1300%

2- The parasympathetic nervous system can also the bronchiolar diameter when the need for oxygen has diminished.

a- dilated  
b- constrict

c- no effect  
d- a&b

3the parasympathetic nervous system of the pupil and lens causes

a- has no effect  
b- pessure

c- constriction  
d- dilation

4-Sympathetic nervous system effect on heart rate:
a- decrease                                          b- increase

c- no effect                                          d- stopped

5- These neurons form reflex arcs that pass through the lower
a- or medulla oblongata  b- brainstem

c- a&b                                            d- no one of them

Note

- Check your answers in key answer page 51.
- (2) degree for each.

6/ key answer :-

1- Pre test :-
   1. b
   2. c
   3. b
   4. d
   5. b

   If you :-
   • got 4 or more you do not need to proceed.
   • got less than 4 you have to study this modular unit well.

2- Post test :-
   1. a
   2. b
   3. c
   4. b
   5. c

   If you :-
   • got 4 or more, so congratulation your performance, go on studying modular unit three.
   • got less than 4, go back and study the second unit; or any part of it; again, and then do the post test again.
**Quiz 1**

(ANS) (or visceral nervous system) is the part of the peripheral nervous system that controls homeostasis, that is the constancy of the of tissues in gasses, ions and nutrients.

**Quiz 2**

The nervous impulses are transmitted via chemical substance called chemical transmitted & according to last nerves fiber

**Quiz 3**

<table>
<thead>
<tr>
<th>Organ</th>
<th>sympathetic</th>
<th>parasympathetic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-heart rat</td>
<td>increase</td>
<td>decrease</td>
</tr>
<tr>
<td>2-Eye pupil</td>
<td>dilated</td>
<td>constrict</td>
</tr>
<tr>
<td>3-Blood vessels</td>
<td>vasoconstriction</td>
<td>vasodilatation</td>
</tr>
</tbody>
</table>

**Quiz 4**

1-The ANS Its most useful definition could be: the sensory and motor neurons that innervate the viscera

2- These neurons form reflex arcs that pass through the lower brainstem or medulla oblongata

3-parasympathetic Is also involved in erection of genitals, via the pelvic splanchnic nerves

4- The parasympathetic nervous system stimulates salivary gland secretion
Sources :

1- Basic & Clinical Pharmacology (Basic and Clinical Pharmacology)

2- Katzung and Trevor's Pharmacology Anthony J. Trevor (Author), Bertram G. Katzung (Author), Susan B. Masters (Author) : McGraw-Hill Medical; Latest edition640 pages

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4- Goodman & Gilman's The Pharmacological Basis of Therapeutics Laurence Brunton (Author), John Lazo (Author), Keith Parker (Author)
   Publisher: McGraw-Hill Professional; Latest edition
acetylcholine ;cholinergic drugs, Cholinergic agonists, cholinmmetic drug

1 / A – Target population:-

This lecture is designed for second year Technical Institute students Department of nursing. It will be assumed that students have an adequate background in cholinergic drugs, Anticholinergics, Anticholinesterases & Neuromuscular Blocking Agents

1 / B – Rationale :-

1. The student shall understand the structure, mechanism of action, systemic effects, side effects and contraindications of acetylcholine, methacholine, carbachol, bethanechol, and pilocarpine.

2. The student shall be able to describe the mechanism of action, pharmacokinetics, systemic effects, contraindications and toxicity, and therapeutic uses of atropine and drugs with similar actions.

3. Ganglionic Stimulants and Blockers

4. The student shall be able to describe the current concepts of ganglionic blocking agents including major effects, side effects and other problems, and uses of these drugs.

5. The student shall know the definition and characteristics of neuromuscular blockers.

1 / C – Central Idea :-

1. The student shall be able to describe the general effects, pharmacokinetics, and therapeutic uses of various cholinesterase inhibitors.
2. The student shall be able to describe the current concepts of ganglion stimulating drugs including the major effects and toxicity of nicotine.
3. The student shall be able to describe the mechanism of action, effects on organ systems, pharmacokinetics, contraindications, cautions and drug interactions, uses, and methods for drug reversal for d-tubocurarine, gallamine,

1 / D –Instructions:

1. Study over view thoroughly.
2. Identify the goal of this modular unit.
3. Do the pre test.
4. After studying the text of this modular unit, do the post test.

2/ Performance Objectives

1- Know mechanism of action, systemic effects, side effects and contraindications of acetylcholine and cholinmimetic drug.
2- Determine mechanism of action, effects on organ systems, pharmacokinetics, contraindications, cautions and drug interactions, uses, and methods for drug reversal for depolarizing neuromuscular blocking agents.
3- Know the cholinergic drugs, Anticholinergics, Anticholinesterases & Neuromuscular Blocking Agents.

3/ Pre test

Circle the correct answer:

5. The nerve ending which release ach called:
   a- cholinergic fiber  b- adrenergic fiber
   c- cholinmimetic fiber  d- nor adrenergic fiber

2. Indirect irreversible cholinergic drug like
a- neostigmine b- physostigmine

c - edrophoniam d- isoflurophate

3- indirect reversible cholinergic drug like
    a- isoflurophate b- phsyostigmine
    c - edrophoniam d- b&c

4- Ach causes
    a- vasodilatation & decrease blood pressure
    b- vasodilatation & increase blood pressure
    c- vasoconstriction & decrease blood pressure
    d- vasoconstriction & increase blood pressure

5- carbachol has
    a- cholinic activity b- mascarinic activity
    c-a& b d- no one of them

6- action of carbachol
    a- use in glaucoma b- Stimulate gut in illus
    c- Help urination d- all of them

7- trade name of pilocarpine:
    a- Isoptocarbachol b- Isoptocarpine
    c- prostgmine d- llbraxam

8- The positive charge of acetylcholine interacts with:
    a- tryptophan-84 (Trp-84)
    b- glutamatic acid-199 (Glu-199)
    c- .-. phenylalanine-330 (Phe-330)
    d- a&c

9- Alkaloid from calabar been used as eye drop
    a- neostigmine b- atropine
    c- scopolamine d- Physostigmine

10- neostigmine dose is
    a- Orally 15-30 mg b- Orally 150-130 mg
c- Orally 35-90 mg
d- Orally 6-8 mg

Note

- Check your answers in key answer page 66.
- (1) degree for each.

4/ the module contents

1: cholinergic fiber -- release Ach
2: adrenergic fiber—adrenaline & noradrenalin

Cholinergic agonists
A: cholinergic (direct action)
1: Ach 2: carbachol 3: pilocarpin

B: (indirect)

C: Indirect reversible
1: Neostigmine 2: physostigmine 3: edrophonium

D: indirect irreversible
1: echothiophate 2: isofluorophate

Cholinergic receptor (choloceptors)
a: choline receptor
b- Muscarinic receptor
(1) Location: ganglia of peripheral (N.S) such heart, smooth muscle, brain & exocrine gland.
(2) Muscarinic agonist & antagonists: many drugs act as direct antagonist for muscarinic receptor like pirenzepine a tricyclic anti cholinergic drugs

**Quiz / 1**

Mention receptor of Ach in body

**Note**

- Check your answers in key answer page 65

Acetylcholine: it is neurotransmitter parasympathetic & cholinergic nerves it is action include

1 - Decrease H R & cardiac output
2 - Decrease blood pressure (injection of Ach causes vasodilatation & decrease blood pressure

* No innervations of vasculature by parasympathetic

3 - Increase salivary secretion & stimulates intestinal secretion & motility.
4 - Increase bronchial secretion.
5 - Eye → constriction of pupil

(3) :- chlinomimetics drug

carbachol (mascarinic activity)

Action:-
1- Stimulate gut in illus
2- Help urination (urine retention)
3- decrease secretion
4- use in glaucoma (miotic action to cause contraction of the pupil and decrease in intraocular pressure

Dose: 0.3- 0.4mg orally intradermal

® Isoptocarbachol

2-bethanechol chloride: - stimulate urinary &G.I.T, so empty bladder in patients after surgery or parturition or spinal cord injury.

3- Pilocarpine effect as ach
   Action:-
   1_ increase secretion of exocrine gland
   2- decrease intraocular pressure
   3- Glaucoma

Dose: - drop (1/2-4) % or orally 5-20 mg
® Isoptocarpine.

**Quiz / 2**

Mention actionr of Ach

**Note**

- Check your answers in key answer page 65

**Neurotransmitter of A.N.S**
1-ACH
2-norepineohrine
3 -serotonin
4- dopamine
5- histamine

**Anticholinesterases (Reversible)**
The biological action acetylcholine is terminated by hydrolysis, catalyzed by the enzyme acetylcholinesterase: The overall reaction is shown below --

Acetylcholinesterase

Acetylcholinesterase itself is a large, complex protein which has its primary catalytic function the extremely rapid hydrolysis of the neurotransmitter acetylcholine.

Acetylcholinesterase

The image below illustrates the relationship between the very small molecule, acetylcholine, and its specific interaction within the very large molecule, acetylcholinesterase.
This image illustrates how the neurotransmitter acetylcholine represented above the in ball-and-stick form is recognized by specific amino acids within acetylcholinesterase's active site.

- The positive charge of acetylcholine (due to the permanently positive quaternary nitrogen) interacts with tryptophan-84 (Trp-84) and phenylalanine-330 (Phe-330), through cationic (+ charged)-π-electron interactions.
- This part of the acetylcholinesterase molecule is referred to as the "aromatic gorge".
- The negatively charged amino acid, glutamic acid-199 (Glu-199) is thought to interact with acetylcholine through ionic-type interactions.

**Quiz / 4**

Enumerate Neurotransmitter of A.N.S

**Note**

- Check your answers in key answer page 65

Acetylcholinesrerase is an enzyme that changes acetylcholine to acetate and choline. There is some drugs inhibit this enzyme indirectly action prolong like time of ach.

(A) Physostigmine:-
Alkaloid from calabar been used as eye drop-- glaucoma, well absorbed.

(B) Neostigmine (prostgmine) ® used in paralytic illus &myasthenia gravis & atropine
poisoning stimulate motility of G.I.T & urinary tract.
Dose:-
Orally _15-30 mg. Injection 1-5mg I.M

Anti cholinesterase (irreversible)
a number of synthetic organophosphate compound have the capacity to bind covalently to acetyl-cholinesterase

The result is long lasting increase in acetyl choline at all sites

A- Ispflurophate
Action-: include generalized cholinergic stimulate paralysis of motor function (causing breathing difficulties) and convulsion

Therapeutic uses:
_AN OPHTHALMIC ointment to treat glaucoma

B-Ectothiophate (like isoflurophate)
*pralidoxim (PAM) is compound can reactivate inhibit Ach esterase.
Cholinergic antagonists:
  _Anti muscarinic agents
  (1) Atropine
  (2) Ipratropium
  (3) Scopolamine
  _Ganglion blockers
  (1)- Nicotine
  (2) Trimethaphan
  _Neuromuscular blockers
  (1) Mivacurium
  (2) Pancuronium
  (3) Sucanyl choline
  (4) Tubocurarine

Anti muscarinig agent. these agent block muscarinic receptors causing inhibition of all muscarinic function. Have little or no action at skeletal-neuromuscular or autonomic ganglia
Atropine: It is a belladonna alkaloid that binds competitively, preventing Ach from binding to its receptor site. Atropine is both a central and peripheral muscarinic blocker.

1. Decrease salivary and bronchial secretion
2. In C.N.S. in Parkinson disease (minimizes tremor and rigidity)
3. Locally in eye—dilation of the eye pupil so used in examination of retina
4. Analgesic
   - Dose locally 0.5 -2mg, orally 0.25-2mg
5. Antidote
6. Before anesthesia to decrease bronchial secretion

Quiz /5

Define Anti muscarinic agent

Note

- Check your answers in key answer page 65

Side effects:

Mouth dryness & increase pulse & constipation *Not used in glaucoma & heart failure
2. Hematropine used in eye disease
   - Dose (2-5%) drop 2-5 mg orally
3. Scopolamine: Similar action long duration & greater action on C.N.S. Used in motion sickness before anesthesia (Buscopan) ®

4. Clidinium anti-cholinergic
   - Uses: stomach infection, ulcer
   - DOSE 2-5MG ORALLY before meal
   - Librax® Libraxam®

5. Propantheline as atropine
   - Mode of action—decrease gut contraction, ulcer
   - Chronic infection of pancreas & urinary system
Probathine ®

6- Benzhexol: uses in Parkinson disease
Dose 2mg orally before meal
Peraglt ® Artane®

Quiz /5

Define Propantheline

Note

- Check your answers in key answer page 65

5/ Post test

Circle the correct answer :-

1- it belladonna alkaloid it binds competitive preventing ach from bind to that site:
   a- neostigmine               b- atropine
   c- scopalmine                d- Physostigmine

2- dose of carbachol
   a- 3- 4mg orally            b- 13- 14mg orally
   c- 0.3- 0.4mg orally        d- 30- 40mg orally

3- Neurotransmitter of A.N.S
   a- norepineohrine           b- ACH
   c- serotonin                d- all of them

4- Peraglt is trade name of:
   a- benzhexol                b- propantheline
c-atropine  

d-no one of them

5- probathine is trade name of:

a- benzhexol  
b- propantheline  
c-atropine  
d-no one of them

6- the antimuscarinic agents

a- atropine  
b- nicotine  
c-mivacurium  
d- pancuronium

7- agent block muscarinic receptors causing inhibition of all muscarinic function called:

a- Ganglion blockers  
b- Neuromuscular blockers  
c- Anti muscarinic agents  
d- no one of them

8- organophosphate compound:

a- Neuromuscular blockers  
b- ant cholinergic reversible  
c- Ganglion blockers.  
d- ant cholinergic irreversible

9- the negative charged amino acid interact with ach

a- tryptophan-84 (Trp-84)  
b- glutamatic acid-199 (Glu-199)  
c- phenylalanine-330 (Phe-330)  
d- a&c

10- used in paralytic illness & myasthenia gravis

a- neostigmine  
b- atropine  
c- scopalmine  
d- Physostigmine

Note

- Check your answers in key answer page 66.
- (1) degree for each.
6/ key answer :-

1- Pre test :-
1. a 6- d
2. d 7- b
3. d 8- d
4. a 9- d
5. a 10- a

If you :-
• got 9 or more you do not need to proceed .
• got less than 9 you have to study this modular unit well .

2- Post test :-
1. b 6- a
2. c 7- c
3. d 8- d
4. a 9- b
5. b 10- a

If you :-
• got 9 or more , so congratulation your performance , go on studying modular unit three .
• got less than 9 , go back and study the second unit ; or any part of it ; again, and then do the post test again .
**Quiz 1**

a- choline receptor  
b- Muscarinic receptor  

**Quiz 2**

1 - Decrease H R & cardiac output  
2 - Decrease blood pressure (injection of Ach causes vasodilatation & decrease blood pressure  
3- Increase salivary secretion & stimulates intestinal secretion & motility.  
4 - Increase bronchial secretion.  
5 - Eye → constriction of pupil

**Quiz 3**

1- Stimulate gut in illus  
2- Help urination (urine retention)  
3- Increase secretion  
4 - use in glaucoma (miotic action to cause contraction of the pupil and

**Quiz 4**

1-ACH  
2-norepineohrine  
3 -serotonin  
4- dopamine  
5- histamine

**Quiz 5**

Anti muscarinig agent._ these agent block muscarinic receptors causing inhibition of all muscarinic function. Have little or no action at skeletal-neuromuscular or autonomic ganglia

**Quiz 6**

Propantheline as atropine  
Mode of action decrease guts contraction, ulcer, Chronic infection of pancreas & urinary system trade name Probathine ®
Sources :-

1- Basic & Clinical Pharmacology (Basic and Clinical Pharmacology)

2- Katzung and Trevor's Pharmacology Anthony J. Trevor (Author), Bertram G. Katzung (Author), Susan B. Masters (Author) : McGraw-Hill Medical; Latest edition640 pages

3- Lippincott's Illustrated Reviews: Pharmacology (Lippincott's Illustrated Reviews Series) Richard D Howland (Author), Mary J Mycek (Author), Richard A Harvey (Author), Pamela C Champe (Author)
Paperback: 559 pages Publisher: Lippincott Williams & Wilkins; Latest edition

4- Goodman & Gilman's The Pharmacological Basis of Therapeutics Laurence Brunton (Author), John Lazo (Author), Keith Parker (Author)
Publisher: McGraw-Hill Professional; Latest edition
1/ Over view

Sympathetic nervous system : adrenaline ; adrenergic drugs.

1/ A –Target population:-

This lecture is designed for second year Technical Institute students Department of nursing. It will be assumed that students have an adequate Knowledge in Adrenergic Agonists.

1/ B –Rationale :-

A. The student shall be able to describe specificity of adrenaline  
B. The student shall be able to know type of Adrenergic Agonists.  
C. The student shall understand who uses of adrenergic drug

1/ C –Central Idea :-

1 – know effect of adrenergic drug and uses of these drug in disease 
2- Determine all about pharmacokinetic &uses & therapeutic drug associated with adrenaline  
3- know pharmacokinetic ,uses, dose, coordination & therapeutic drug of Adrenergic Agonists

1/ D –Instructions:-
9. Study over view thoroughly.
10. Identify the goal of this modular unit.
11. Do the pre test
12. After studying the text of this modular unit, do the post test

2/ Performance Objectives

Adrenergic Agonists I
A. The student shall understand the pathway of catecholamine synthesis and the subtypes of adrenergic receptors, what tissue they are present in, and their effects on the tissue.
B. The student shall be able to list the major factors affecting the end result of administering sympathomimetic amines, and the factors that affect the rate of metabolism.
C. The student shall be able to describe the systemic and organ effects, mechanism of action, therapeutic uses and side effects of epinephrine, nor epinephrine, and dopamine.

Adrenergic Agonists II
A. The student shall recognize the mechanisms of action of adrenergic receptors.
B. The student shall be able to describe the cardiovascular effects, therapeutic uses, pharmacokinetics side effects and precautions of alpha-2 adrenergic agonists.
C. The student shall be able to describe the cardiovascular effects, therapeutic uses, pharmacokinetics side effects and precautions of beta adrenergic agonists.
D. The student shall be able to describe the cardiovascular effects, therapeutic uses, pharmacokinetics side effects and precautions of mixed adrenergic agonists.

3/ Pre test

Circle the correct answer:

6. Direct adrenergic agonist:
   a) Dopamine  b) Amphetamine
c ephedrine       c- no one of them

2- mixing adrenergic agonist:-
    a Dopamine       b- Amphetamine
    c ephedrine       c- Epinephrine

3- Epinephrine interact with
    a-beta receptors     b- alpha and beta receptors
    c- alpha receptors   d- no one of them

4- Therapeutic uses of epinephrine :-
    a- Bronchodilator     b- Glaucoma
    c- Anaphylactic shock d- all of them

5- Terbutalin is
    a- B1 agonist use as bronchodilator b- B2 agonist use as bronchodilator
    c- B2 agonist use as vasodilator       d- B2 agonist use as vasoconstriction

6- adverse effect of epinephrine
    a- Central nervous system disturbance     b- Hemorrhage
    c-a&b                                      d- no one of them

   7- the best drug used in shock stimulate beta-receptor in heart:
    a- dopamine       b- salbutamol
    c- terbutaline    c-amphetamine

   8- Are C.N.S stimulates used in treat of depression appetite control:
    a- dopamine       b- salbutamol
    c- terbutaline    c-amphetamine

   9- increase systolic & diastolic blood pressure
   *
a- dopamine  b- ephedrine  
c- terbutaline  c-a&c  

10-ephedrine effect on C.N.S 
a- mild stimulation  b- moderate stimulation  
c- highly stimulation  d- mild to moderate stimulation

Note

- Check your answers in key answer page 77.
- (1) degree for each.

4/ the module contents

<table>
<thead>
<tr>
<th></th>
<th>Direct</th>
<th>indirect</th>
<th>mixing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dopamine</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Epinephrine</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pherylephrin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terbutalin</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A- Epinephrine interact with alpha and beta receptors
   - At low doses beta effect vasodilators
- at high doses alpha effect vasoconstriction
- increase contractility of myocardium so increase cardiac output
- Causes bronchodilator

*Hyperglycemia:-
-increase glucose in blood by increase glycogenlysis in liver (B2 effect)

*Lipolysis:- initiates lipolysis it is agonist activity on B-receptor of adipose tissue

Therapeutic uses:-
- Bronchodilator
- Glaucoma
- Anaphylactic shock
- In anesthesia

**Quiz / 1**
Mention Therapeutic uses of Epinephrine

**Note**
- Check your answers in key answer page 78

Adverse effect:-
- Central nervous system disturbance
- Hemorrhage
- Cardiac arrhythmias
  - Pulmonary edema

**Dopamine**: used in shock stimulate beta-receptor in heart
Dobuttamine:- used in C.H.F so increase cardiac output
Terbutalin and salbutamol
B2 agonist use as bronchodilator

**Quiz / 2**
define Dopamine
**Note**
- Check your answers in key answer page 78

Indirect-acting adrenergic agonists:
Cause norepinephrine release from presynaptic terminals

**Amphetamine:**
Are C.N.S stimulates used in treat of depression appetite control

Side effect addiction hypertension

**Quiz / 3**

define Amphetamine

**Note**
- Check your answers in key answer page 78

Mixed –action adrenergic agonists

**Ephedrine**
1-release stored nor epinephrine from nerves ending

2- Directly stimulate both alpha & beta receptors

Action:-
1-increase systolic & diastolic blood pressure

2-prduce bronchodilator
3-mild stimulation of C.N.S

4-treat of asthma& nasal decongestant
Enumerate mode of action of ephedrine

**Note**
- Check your answers in key answer page 78

---

**5/ Post test**

Circle the correct answer :-

1- indirect adrenergic agonist: -
a) Dopamine.  
b) Amphetamine  
c) tyramine  
d) b & c

7. Epinephrine effect vasodilators at :-
   a) low dose.  
b) high dose  
c) middle dose  
d) low dose & middle dose

3- salbutamol is
   a) B1 agonist use as bronchodilator  
b) B2 agonist use as bronchodilator  
c) B2 agonist use as vasodilator  
d) B2 agonist use as vasoconstriction

4- pulmonary edema is one adverse effect of :-
   a) dopamine  
b) epinephrine  
c) terbutaline  
d) amphetamine

5- addiction is side effect of
a- dopamine  
b- amphetamine  
c- a&b  
c- no one of them  

6- Indirect-acting adrenergic agonists:-

a- Cause epinephrine release from presynaptic terminals  
b- Cause norepinephrine release from postsynaptic terminals  
c- Cause norepinephrine release from presynaptic terminals  
d- a&b  

7- Hyperglycemia are:-

a- Increase glucose in blood by increase glycogenlysis in liver  
b- Increase glucose in blood by increase glycogenlysis in kidney  
c- Increase glucose in urine by increase glycogenlysis in liver  
d- Increase glucose in blood by decrease glycogenlysis in liver  

8- Produce bronchodilator:

a- Ephedrine  
b- Epinephrine  
c- a&b  
d- no one of them  

9- Ephedrine used as:

a- Treat asthma  
b- Treat nasal decongestant  
c- Treat hemorrhage  
d- a&b  

10- Dobutamine is one of:

a- Adrenergic agonist  
b- Cholinergic drug  
c- Ant cholinergic  
d- Antimascuring agent  

Note
- Check your answers in key answer page 77.
- (1) degree for each.

6/ key answer:

1- Pre test:
1. a 6-c
2. c 7-a
3. b 8-c
4. d 9-b
5. b 10-a

If you:
• got 9 or more you do not need to proceed.
• got less than 9 you have to study this modular unit well.

2- Post test:
1. d 6-c
2. a 7-a
3. b 8-c
4. b 9-d
5. b 10-a

If you:
• got 9 or more, so congratulation your performance, go on studying modular unit three.
• got less than 9, go back and study the second unit; or any part of it; again, and then do the post test again.
Quiz 1
Therapeutic uses:
- Bronchodilator
- Glaucoma
- Anaphylactic shock
- In anesthesia

Quiz 2
Dopamine: - used in shock stimulate beta-receptor in heart
Dobuttamine:-used in C.H.F so increase cardiac output

Quiz 3
Amphetamine:-
Are C.N.S stimulates used in treat of depression appetite control
Side effect addiction hypertension

Quiz 4
Action:-
1-increase systolic &diastolic blood pressure

2-produce bronchodilator
3-mild stimulation of C.N.S

4-treat of asthma& nasal decongestant
Sources:-

1- Basic & Clinical Pharmacology (Basic and Clinical Pharmacology)

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4- Goodman & Gilman's The Pharmacological Basis of Therapeutics
Laurence Brunton (Author), John Lazo (Author), Keith Parker (Author)
Publisher: McGraw-Hill Professional; Latest edition
1/ Over view

Adrenergic drug & their effect on medicine

1/ A – Target population:

This lecture is designed for second year Technical Institute students Department of nursing. It will be assumed that students have an adequate Knowledge in adrenergic drug & their effect on medicine.

1/ B – Rationale:

A. The student shall be able to describe specificity of adrenaline
B. The student shall be able to know type of Adrenergic drug.
C. The student shall understand who uses of adrenergic drug

1/ C – Central Idea:

1 – know effect of adrenergic drug and uses of these drug in disease
2- Determine all about pharmacokinetic & uses & therapeutic drug associated with adrenaline
3- know pharmacokinetic , uses, dose, coordination & therapeutic uses of Adrenergic drug
1/ D – Instructions:–

13. Study over view thoroughly.
14. Identify the goal of this modular unit.
15. Do the pre test
16. After studying the text of this modular unit, do the post test

2/ Performance Objectives

A. The student shall recognize the mechanisms of action of adrenergic drug.
B. The student shall be able to describe the cardiovascular effects, therapeutic uses, pharmacokinetics side effects and precautions of alpha-2 adrenergic drug.
C. The student shall be able to describe the cardiovascular effects, therapeutic uses, pharmacokinetics side effects and precautions of beta adrenergic drug.
D. The student shall be able to describe the cardiovascular effects, therapeutic uses, pharmacokinetics side effects and precautions of mixed adrenergic drug.

3/ Pre test

Circle the correct answer:

1. The sympathetic nervous system is stimulate:
   a- heartbeat.       b- sweating
   c- breathing rate   d- all of them

2. The sympathetic nervous system regulates
   a- involuntary reactions       b- voluntary reactions
   c- a & b                      d- no one of them
3- phenylephrine receptor site

a- beta   b- alpha

c- alpha or beta   d- gamma

4- mode of action phenylpropanolamine:

a- direct interaction with specific receptors   b- indirect action by stimulating release of neurotransmitters

c- mixed action   d- no one of them

5- Adrenergic drugs are used

a- increase the output of the heart   b- decrease blood pressure

c- decrease urine flow   d- decrease the output of the heart

---

**Note**

- Check your answers in key answer page 88.
- ( 1 ) degree for each .

---

**4/ the module contents**

**Adrenergic Drugs**

**Definition**

Adrenergic amines are drugs that stimulate the sympathetic nervous system (also called the adrenergic nervous system). These compounds are also called sympathomimetic drugs. The sympathetic nervous system is the part of the autonomic nervous system that originates in the
thoracic (chest) and lumbar (lower back) regions of the spinal cord and regulates involuntary reactions to stress. It stimulates the heartbeat, sweating, breathing rate, and other stress-related body processes.

<table>
<thead>
<tr>
<th>Adrenergic Stimulants</th>
<th>Structure</th>
<th>Use, Receptor Site</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Norepinephrine or Noradrenaline</strong></td>
<td></td>
<td>Alpha</td>
</tr>
<tr>
<td><strong>Epinephrine or Adrenaline</strong></td>
<td>Vassopressor, bronchodilator, nasal decongestant alpha or beta</td>
<td></td>
</tr>
<tr>
<td><strong>Phenylinephrine</strong></td>
<td>Neo-Synephrine vasopressor nasal decongestant Alpha</td>
<td></td>
</tr>
<tr>
<td><strong>Phenypropanolamine</strong></td>
<td>Propadrine, nasal decongestant alpha or beta</td>
<td></td>
</tr>
</tbody>
</table>
Adrenergic Stimulants:

Adrenergic drugs stimulate the adrenergic nerves directly by mimicking the action of norepinephrine. Therapeutically, these drugs are used in nasal decongestants as the main example given here.

The structures of the stimulants closely mimic the structure of the neurotransmitters and are thus able to interact with the receptor site. Adrenergic stimulants may have three modes of action: direct interaction with specific receptors (examples are epinephrine and phenylephrine); indirect action by stimulating release of neurotransmitters; or a mixed action involving both of the above (examples are phenylpropanolamine and ephedrine).
Purpose

Adrenergic drugs have many uses. They are used to increase the output of the heart, to raise blood pressure, and to increase urine flow as part of the treatment of shock. Adrenergics are also used as heart stimulants. They may be given to a patient to reverse the drop in blood pressure that is sometimes caused by general anesthesia. They may be used to stop bleeding by causing the blood vessels to constrict, and to keep local anesthetics in a small area of the body by closing off the nearby blood vessels that would otherwise spread the anesthetic to other parts of the body. This ability to make blood vessels constrict makes adrenergics useful in reducing nasal stuffiness associated with colds and allergies. They may also be given to open the bronchi (the tubes leading to the lungs) for treatment of asthma and chronic obstructive pulmonary disease (COPD).

Quiz / 2

Explain purpose of adrenergic drug

Note

- Check your answers in key answer page 89

Description

There are several types of adrenergic receptors in the human body. Although all types of adrenergic receptors (nerve endings) respond to the same drugs, the effects depend on which specific receptors are stimulated. The alpha receptors make the heart beat faster, the pupils of the eyes dilate, and the muscles contract. The beta receptors have similar effects and also cause the bronchi in the lungs to open up. Both alpha and beta receptors are divided into subgroups—alpha-1, alpha-2, beta-1, and beta-2—each with its own specific effects. A hormone called norepinephrine that is secreted in the body affects all types of adrenergic receptors; the drugs used in medicine and surgery, however, have been developed to affect only specific types of receptors.

Quiz / 3

Mention effect of adrenergic fiber on alph and beta receptor  

Note

- Check your answers in key answer page 89
There are several adrenergic amines in common use:

- **Albuterol** (Alupent, Ventolin, others): given by mouth or as a **nasal** spray to improve breathing.
- **Dobutamine** (Dobutrex and generic forms): used to stimulate the heart during surgery or after a heart attack or **cardiac arrest**.
- **Dopamine** (Intropin): used to increase cardiac output, blood pressure, and urine flow in treating patients with shock.
- **Epinephrine** (Adrenalin): used locally to control bleeding from arterioles and capillaries during surgery. It is used to treat shock, as a heart stimulant, and as a decongestant. Epinephrine may be added to local anesthetics to keep the anesthetic in the area where it is applied. Epinephrine may also be applied to the eye to reduce the symptoms of **conjunctivitis** (red eye).
- **Isoproteranol**: most widely used to ease breathing problems in asthma and COPD, but also used to control several types of irregular heartbeat until a pacemaker can be implanted.
- **Phenylephrine** (Neo-Synephrine): used to treat shock and low blood pressure; also used in the form of nose drops or spray to relieve nasal congestion from colds and allergies.
- **Metaraminol** (Aramine): used to raise the blood pressure and stimulate the heart in treating patients with shock.
- **Norepinephrine** (Levophed): used to increase the output of the heart and raise blood pressure as part of the treatment of shock.

**Quiz / 4**

Enumerate adrenergic amines

**Note**

- Check your answers in key answer page 89

**5/ Post test**

Circle the correct answer :-

1. **COPD** mean :-

   a- asthma.  
   b- chronic obstructive pulmonary disease.  
   c- general anesthesia  
   d- blood pressure
2- Levophed is brand name of
   a- Norepinephrine          b- Phenylephrine
   c- Albuterol               d- Dopamine

3- Alupent given as
   a- vial                    b- nasal spray
   c- cream                   d- capsule

4- used to stimulate the heart during surgery or after a heart attack or cardiac arrest:
   a- Norepinephrine          b- Phenylephrine
   c- Albuterol               d- Dopamine

5- used locally to control bleeding from arterioles and capillaries during surgery
   a- Phenylephrine           b- Metaraminol
   c- Adrenalin               d- Dobutrex

Note
- Check your answers in key answer page 88.
- (1) degree for each.
6/ key answer :-

1- Pre test :-
   1. d
   2. a
   3. b
   4. c
   5. a

   If you :-
   • got 9 or more you do not need to proceed .
   • got less than 9 you have to study this modular unit well .

2- Post test :-
   1. b
   2. a
   3. b
   4. b
   5. d

   If you :-
   • got 9 or more , so congratulation your performance , go on studying modular unit three .
   • got less than 9 , go back and study the second unit ; or any part of it ; again, and then do the post test again .
**Quiz 1**

Adrenergic amines are drugs that stimulate the sympathetic nervous system (also called the adrenergic nervous system). These compounds are also called sympathomimetic drugs.

**Quiz 2**

**Purpose**

Adrenergic drugs have many uses. They are used to increase the output of the heart, to raise blood pressure, and to increase urine flow as part of the treatment of shock. Adrenergics are also used as heart stimulants. They may be given to a patient to reverse the drop in blood pressure that is sometimes caused by general anesthesia. They may be used to stop bleeding by causing the blood vessels to constrict, and to keep local anesthetics in a small area of the body by closing off the nearby blood vessels that would otherwise spread the anesthetic to other parts of the body. This ability to make blood vessels constrict makes adrenergics useful in reducing nasal stuffiness associated with colds and allergies. They may also be given to open the bronchi (the tubes leading to the lungs) for treatment of asthma and chronic obstructive pulmonary disease (COPD).

**Quiz 3**

The alpha receptors make the heart beat faster, the pupils of the eyes dilate, and the muscles contract. The beta receptors have similar effects and also cause the bronchi in the lungs to open up.

**Quiz 4**

There are several adrenergic amines in common use:

1. Albuterol (Alupent, Ventolin,
2. Dobutamine (Dobutrex).
3. Dopamine (Intropin):
4. Epinephrine (Adrenalin):
5. Phenylephrine (Neo-Synephrine):
6. Metaraminol (Aramine):
7. Norepinephrine (Levophed):
Sources :-

1- Basic & Clinical Pharmacology (Basic and Clinical Pharmacology)

2- Katzung and Trevor's Pharmacology Anthony J. Trevor (Author), Bertram G. Katzung (Author), Susan B. Masters (Author) : McGraw-Hill Medical; Latest edition640 pages

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4- Goodman & Gilman's The Pharmacological Basis of Therapeutics Laurence Brunton (Author), John Lazo (Author), Keith Parker (Author)
   Publisher: McGraw-Hill Professional; Latest edition
Drug acting on digestive system: anti-acids drug uses for diarrhea; drug uses for constipation; laxatives and other drugs used for peptic ulcer, vomiting

1/Overview

The lecture is designed for second year Technical Institute students Department of nursing. It will be assumed that students have an adequate knowledge in Drug acting on digestive system.

1/A – Target population:

This lecture is designed for second year Technical Institute students Department of nursing. It will be assumed that students have an adequate knowledge in Drug acting on digestive system.

1/B – Rationale:

A. The student shall be able to describe specificity of the principle of Drugs Affecting GI Motility
B. The student shall be able to know pharmacokinetic, therapeutic uses & side effect of these drug.
C. The student shall understand triple therapy ulcer
1/ C – Central Idea:

1. Determine the best treatment of ulcer.
2. Describe all classes of GI drugs: laxatives, ant diarrheal agents, emetics, antiemetic, and ant nausea medications.

1/ D – Instructions:

5. Study overview thoroughly.
6. Identify the goal of this modular unit.
7. Do the pre test.
8. After studying the text of this modular unit, do the post test.

2/ Performance Objectives

1. The student shall be able to recognize drugs and their mechanism of action for the following classes of GI drugs: laxatives, ant diarrheal agents, emetics, antiemetic, and ant nausea medications.

Gastrointestinal Drugs II

B. Drugs used in Peptic Ulcer Disease

1. The student shall describe the drugs and their mechanism of action of gastric antacids.
2. The student shall describe the drugs and their mechanism of action of histamine and its antagonists, and note the unique characteristics of cimetidine, ranitidine, famotidine, and nizatidine.
3. The student shall describe the drugs and their mechanism of action of mucosal protective agents, prostaglandins, proton-pump inhibitors, antispasmodic agents.
4. The student should be able to describe the unique role of Helicobacter pylori in ulcers.
3/ Pre test

Circle the correct answer:

2. associated disorders with GIT:
   a- GERD.                     b- cholestasis
   c- cirrhosis                   d- all of them

2- Dilution of gastric acid by
   a- food only                   b- food and secretions
   c- secretions only             d- blood

3- pepsin is only active at
   a- very high pH                b- at moderate pH
   c- very low pH                 d- high pH

4-: neutralizing acidity by:
   a- Na- bicarbonate             b- Mg - trisilicate
   c- Al - hydroxide              d- no one of them

5- Mechanism of Action of Bismuth compounds
   a- compounds bind to the ulcer base
   b- cytoprotective effects
   c- a&b                         d- no one above

6- Most successful protocol for gastric ulcer
   a -bismuth compounds & amoxicillin
   b- & tetracycline
   c - bismuth compounds & amoxicillin & metronidazole
   d- a&b

7- Drugs that dissolve gallstones -:
   a -Bethanechol                  b- Chenodiol
c- Monoctanoin  

8- pancreatic extract Uses in:

a- metabolic disorder  
b-. insufficiency of pancreatic function  

c- reduce pepsin in body.  
d- a&b  

- 9- Carminative or Adsorbent Used to
in stomach and intestine due to metabolic process.

a- as antiemetic  
b -decrease or remove high amount of gases  
c- digestive enzyme  
d- no one of them  

10- treatment of chemotherapy induced emesis

a- domperidone  
b- bismuth sulfate  
c- abomorphine  
d- atropine  

Note

- Check your answers in key answer page 113.
- (1) degree for each.

4/ the module contents

- Review physiology of the digestive system

Organs and some associated disorders:

- Oral cavity - inflammation-stomatitis  
  Esophagus-GERD  
- Stomach—peptic ulcers, gastritis  
- Small intestine—malabsorption, Inflammatory bowel  
- Large intestine—diarrhea, constipation
- Pancreas—pancreatitis, Diabetes, ARDS
- Gallbladder—cholelithiasis, cholecystitis
- Liver—hepatitis, cirrhosis

Cell protective mechanisms in stomach

- Secretion of mucus and bicarbonate
- Dilution of gastric acid by food and secretions
- Prevention of diffusion of HCL from the stomach lumen back into the gastric mucosal lining
- Presence of prostaglandin E
- Alkalization of gastric secretions by pancreatic juices and bile
- Stimulation (acetylcholine, gastrin, histamine)
- Inhibition (PGE2, PGI2)

Drug act on digestive system

1: antacids
2: digestants and gastric enzyme
3: anti cholinergic
4: laxative
5: anti diarrhea

Quiz / 1
Enumerate Drug act on digestive system

Note
- Check your answers in key answer page 114

1: antacids

Antacids :- chemically neutralize gastric acid that appear with HCL and pepsin secretion
- pepsin is only active at very low pH, thus neutralization of pH secondarily inactivates pepsin
"Benign chronic gastric ulcer: note sharp margins, flat relatively clean ulcer base and folds that radiate from the ulcer margin, location on the lesser curvature in the antrum at the fund pyloric junction mucosa

**Action:**
1: neutralizing acidity by reaction and PH $\uparrow$ to 4-5. (Na-bicarbonate)
2: by bifurcation (Mg-trisilicate)
3: by reaction and buffer (Al-hydroxide)

*It can also classify in to:*
1. systemic A
2. local A

**Drug forms**
1: Simple anti acids: give orally, suspension, tablet, powder
   e.g. Aludin (Aldrox)
2: Compound antacids (more than one antacids)
   e.g. gastrobel powder
   Actenorum powder

**Side effect of anti acids**
1: long or high dose of Na-bicarbonate & Aluminum hydroxide
   constipation
and the first one cause milk-alkali syndrome with elevation of serum calcium & creatinine.

high dose of Mg – trisilicate → diarrhea
high dose of Ca – carbonate → hyper Ca

2: not give for patient complaining with renal disease (due to toxicity and hypermagnesemia and may result in renal calcinosis)

"Regulation of Gastric secretion of HCL"
Drug Treatment

- Patients with documented duodenal ulcers (upper GI contrast radiography or endoscopy) -- treat for H. pylori
  - Many drugs, usually in combination, are used in management and eradication of H. pylori infection. Drugs include:
    - bismuth compounds
    - amoxicillin
    - tetracycline (Achromycin)
    - clarithromycin (Biaxin)
    - metronidazole (Flagyl)
    - omeprazole (Prilosec), lansoprazole (Prevacid)
    - H₂ antagonists

- **Bismuth compounds**
- **Mechanism of Action:**
- **cytoprotective effects**

- compounds bind to the ulcer base, stimulating mucus and prostaglandin production
- antibacterial effect: inhibition of proteolytic, lipolytic, and unease
- Most successful protocol: triple therapy
  - bismuth compounds
  - metronidazole (Flagyl)
  - amoxicillin or tetracycline (Achromycin)
- Triple therapy (two weeks) plus H₂ blocker therapy (six weeks) is also a recommended protocol
- Further increase eradication by the addition of omeprazole
- dose of triple therapy:
  - patient compliance (two-week treatment: 200 tablets)
  - Antacids
- Most widely used: mixture of aluminum hydroxide and magnesium hydroxide (neutralizes HCl)
- H2 Receptor Antagonists
- Effective inhibitor of stimulated and non-stimulated gastric acid secretion
- Healing rates
  1. Cimetidine (Tagamet) -- reduces acid secretion responses to: histamine, caffeine, hypoglycemia, gastrin
  2. Ranitidine (Zantac) -- six times as potent as cimetidine in inhibiting gastric acid secretion
  3. Famotidine (Pepcid) and nizatidine (Axid): potent H2 receptor blockers
- Anticholinergic drugs:
- atropine: not as effective as H2 receptor blockers
  - Side effects:
    1. dryness of mouth
    2. blurred vision
    3. urinary retention
    4. cardiac arrhythmias
- Coating Agents:
  - Sucralfate (Carafate)-complex polyaluminum hydroxide salt of sucrose sulfate
    - highly polar antacid pH: binds to ulcer bed (granulation tissue, not to gastric or duodenal mucosa)
    - decreases proton diffusion to the ulcer base
  - Colloidal bismuth: -- bismuth-protein coagulant
    - may protect also from pepsin and acid digestion
    - may inhibit pepsin activity
- Prostaglandins:
- reduction in basal and stimulated gastric acid secretion
- Omeprazole (Prilosec) and lansoprazole (Prevacid) inhibit the proton pump, effectively irreversibly -- requiring synthesis of new enzyme protein
- Omeprazole and lansoprazole approved for treatment of:
  - duodenal ulcer
    - may be used in conjunction with triple therapy
  - erosive esophagitis
  - gastric acid hypersecretory states, including Zollinger-Ellison syndrome

**Quiz / 2**

Mention dose of triple therapy

**Note**

- Check your answers in key answer page 114
"Parietal Cell-HCl secretion"

- Important Drugs for Gastrointestinal Disorders
  - H₂Histamine receptor blockers
    - cimetidine (Tagamet)
    - ranitidine (Zantac)
    - famotidine (Pepcid)
    - nizatidine (Axid)
  - Antimuscarinic drugs
    - Atropine
    - Propantheline
    - Pirenzepine
Proton pump inhibitor
- omeprazole (Prilosec)
- lansoprazole (Prevacid)

Mucosal protective agents
- sucralfate (Carafate)
- misoprostol (Cytotec)

Antidiarrheal drugs
- Diphenoxylate
- Kapectate
- Bismuth Subsalicylate
- Loperamide
- Paragoric

Laxative Drugs
- Bisacodyl
- Magnesium Hydroxide
- Mineral Oil
- Docusate
- Lactulose
- Methyl Cellulose
- Psyllium

Antacids
- Magnesium hydroxide
- Aluminum hydroxide
- Calcium carbonate

Drugs that dissolve gallstones
- Chenodiol
- Monocatanoin

Drugs acting on G.I. motility
- Bethanechol
- Metoclopramide

Quiz / 3

Enumerate antidiarrheal drug

Note
- Check your answers in key answer page 114

Relevant Drugs
- 5 categories
1) H2 RECEPTOR ANTAGONISTS
- H2 receptor antagonists decrease histamine-mediated gastric acid secretion
- H2 receptor antagonists also inhibit the secondary messenger systems of gastrin- and acetylcholine-mediated gastric acid secretion
- Thus, H2 receptor antagonists may decrease basal- and pranial gastric acid secretion by over 90%
- They also promote healing of duodenal ulcers by a separate mechanism
2) MUSCARINIC RECEPTOR ANTAGONISTS
- Muscarinic receptor antagonists decrease acetylcholine-mediated gastric acid secretion, thus decreasing both basal- and pranial gastric acid secretion
3) HYDROGEN ION/POTASSIUM ANTIPOINTER INHIBITORS
- Hydrogen ion/potassium antiporter inhibitors irreversibly inhibit the hydrogen ion/potassium antiporter responsible for secretion of hydrogen ions into the parietal cell canaliculi, thus decreasing both basal- and pranial gastric acid secretion
DRUG NAME | DESCRIPTION
--- | ---
OMEPRAZOLE | General information
- Administered orally
- Is degraded rapidly by the gastric acid, thus must be administered in enteric-coated granules for absorption into the systemic circulation in the small intestine
- Weak base, thus, once reaching the parietal cells through the systemic circulation, it will be trapped in the acidic environment of the parietal cell canaliculi
Medical uses
- Treatment of peptic ulcer
- Treatment of reflux esophagitis
- Treatment of hypergastrinemia
Side effects
- Severe diarrhea
- Severe headache
- Mild gynecomastia
- Mild impotence
- Mild joint/muscle pain
LANSOPRAZOLE | General information
- Same as omeprazole
PANTOPRAZOLE | General information
- Same as omeprazole
5) MUCOPROTECTIVE DRUGS
- 3 types
DRUG NAME | DESCRIPTION
SUCRALFATE | General information
- binds to positively charged proteins (including glycoproteins of the gastric mucous)
- forms a complex gel with the gastric mucous
- administered orally

**Medical uses**
- treatment of gastric ulcer

**Side effects**
- constipation
- dry mouth
- nausea

**MISOPROSTOL General information**
- synthetic PGE1 analogue
- inhibits both basal- and pranial gastric acid secretion
- increases secretion of bicarbonate and mucous
- increases mucosal blood flow
- also causes simultaneous contraction of the uterus and relaxation of the cervix
- administered orally or intravaginally (if used for 1st trimester abortion)

**Medical uses**
- treatment of peptic ulcer
- 1st trimester abortion (then administered coherently with mifepristone)

**Side effects**
- diarrhea
- abdominal cramps

**CARBENOXOLON General information**
- found in liquorice root
- increases production of mucous

**Medical uses**
- treatment of gastric ulcer

---

2/ **Laxative** (purgatives or aperients) :- are foods, compounds, or drugs taken to induce bowel movements or to loosen the stool, most often taken to treat constipation. Certain stimulant, lubricant, and saline laxatives are used to evacuate the colon for rectal and bowel examinations, and may be supplemented by enemas. Laxatives may be suppository
or in oral form & increase peristalsis without interfering with the normal neurohormonal regulation.

**Indications for Use**

- Reduce cholesterol
  Obtain stool sample
- Accelerate excretion of parasites after anthelminthics started anthelminthics
- Accelerate elimination of potentially toxic substances (Kayexalate)
  • Prevent straining at stool w/CAD, hemorrhoids
  • Relieve constipation in pregnancy, in the elderly; in children with mega colon, and in those w/decreased motility

**Safety in Use**

Saline cathartics must be used cautiously in the renally impaired.

- Lactulose may be indicated in those with hepatic encephalopathy.
- Lactulose
  • Seen frequently in form of enemas in hyperkalemia in hospital.

**Quiz / 4**

Define laxative

**Note**

- Check your answers in key answer page 114

**Foods**

Some vegetables and foods can be eaten to cure constipation and act as laxatives, although the effectiveness may vary. These include:

- almonds
- apple juice
- dried apricots
- basil
- beets

**Types :--- :**

1: stimulating (irritant): it is act by irritation of intestinal wall and increase of intestinal move

- increase GI secretion into the intestinal lumen, thus increasing the water content and following amount of feces in the intestines also increase peristalsis

  e.g. caster oil, bisacodyl (dulcolax) administered rectally *Side effects* diarrhea

2: saline laxatives: it is hypertonic compound act by water absorbed in to intestine from surrounding tissue

  e.g. Mg – sulfate & sodium phosphate

  - 3: lubricant or emollient laxative: it is lubricate the intestinal wall and soft the stool. e.g. An example is mineral oil (liquid paraffin) Onset of Action: 0.5–6 hours

**Stool softeners / surfactants**

- Site of Action: Small and large intestine
- Onset of Action: 12–72 hours
- Examples: docusate (Colace, Diocto)

These enable additional water and fats to be incorporated in the stool, making it easier to move along. Their strength is between that of the bulk producers and the stimulants, and they can be used for patients with occasional constipation or those with anorectal conditions for whom passage of a firm stool is painful.

4: Bulk-producing agents

- bulk laxatives are polysaccharide polymers that are not broken down in the GI tract they bind water physically in the intestinal lumen, thus increasing the amount of feces left in the intestines this causes increased stretch of the wall of the GI tract, increased activation of the cholinergic axons of the myenteric plexus, and following increased peristalsis

  Bulk-producing agents have the gentlest of effects among laxatives and can be taken just for maintaining regular bowel movements

  - act by water retention with stool and bulk volume and peristalsis intestinal.

  e.g. Metamucil, Isogel granules, apple, Citrucel
- Site of Action: Small and large intestine
- Onset of Action: 12–72 hours

**Quiz / 5**

Define bulk laxative

**Note**

- Check your answers in key answer page 114

3/ anti-diarrhea drugs used in diarrhea or in case of high dose of laxative

**Drug Types**

1: Di-phenoxylate with atropine it motility of intestine and stoop the diarrhea

Tablet 2 – 5 ml/grams

2: hydroxyl quinoline derivative (Entero stoop) R

3: in children used pecto kaolin as syrup, suspension 2 – 3 T.D.

Zelnorm (market name for Tegaserod) Serotonin agonist is a motility stimulant in the gastrointestinal tract.

.(Tegaserod) Zelnorm

**Uses**

- Bowel preparation
- Chronic constipation
- Chronic immobility

**Anti – spasmodic drug**

An antispasmodic (synonym: spasmolytic) is a drug or an herb that suppresses muscle spasms. Smooth muscle spasm & Skeletal muscle spasm

**Uses :-**

2: ulcer, active colitis

3: acute pancreatitis
4: cholengitis
e.g.
1. atropine sulphate
   a: tab
   b: amp
2: buscopan
   Tap, amp, syrup, suppositories

Emetic drug: it produce vomiting through stimulation of vomiting center in brain in case of poisoning
   - local emetic drug: irritant mucous membrane of stomach so stimulate vomiting center
e.g. copper sulfa
   - central emetic drug (Abomorphin)

**Quiz / 6**

Define antispasmodic drug

**Note**

- Check your answers in key answer page 114

**ANTI-EMETICS**

Anti-emet drug: these drug treat nausea and vomiting

**Nausea**: a sensation of abdominal discomfort with Pain and desire to vomiting

Vomiting: it is a forceful expulsion of gastric content

Drug form:
- metoclopramide (plasil) give orally 10mg / 1 t. d. or i/m or i/v amp: 5mg
- syrup: 5ml / 3 t. d

**Relevant Drugs**

- 5 categories
  1) H1 RECEPTOR ANTAGONISTS
     - H1 receptor antagonists inhibit H1 receptors of the vestibular nuclei in the CNS, thus inhibiting histamine-mediated emesis due to motion (motion sickness)
     - they also inhibit H1 receptors of the nucleus of the solitary tract (relay nucleus for noxious stimuli of the GI tract), thus inhibiting emesis due to ingestion of toxic substances
  2) MUSCARINIC RECEPTOR ANTAGONISTS
     - same as H1 receptor antagonists, though it acts on muscarinic receptors
  3) 5-HT 3 RECEPTOR ANTAGONISTS
     - 5-HT 3 receptor antagonists inhibits 5-HT 3 receptors in the chemoreceptive trigger zone, thus inhibiting emesis due to all type of noxious stimuli (including chemotherapy-induced emesis)
4) D2 RECEPTOR ANTAGONISTS
- D2 (dopaminergic) receptor antagonists are really antipsychotic drugs
- D2 receptor antagonists also inhibit D2 receptors on the chemoreceptive trigger zone, thus inhibiting emesis due to all types of noxious stimuli
- 3 groups
  A) PHENOTHIAZINES
  B) BUTYROPHENONES
  C) OTHERS

DRUG NAME DESCRIPTION
DOMPERIDONE *General information*
- also increases tone of GI smooth muscle

*Medical uses*
- treatment of chemotherapy induced emesis
- treatment of reflux esophagitis (increased tone of lower esophageal sphincter)
- treatment of disorders of gastric emptying (increased tone of the stomach smooth muscle)

METOCLOPRAMIDE
- also increases tone if the GI smooth muscle
- also stimulates prolactin release
- may not cross the blood-brain barrier, central side effects are absent

*Medical uses*
- same as domperidone

*Side effects*
- hyperprolactinemia (increased prolactin secretion)

5) CANABINOID RECEPTOR AGONISTS
- inhibit emesis due to substances directly stimulating the chemoreceptive trigger zone (including chemotherapy-induced emesis)
- also decrease acetylcholine secretion of the myenteric plexus, thus decreasing peristalsis
- 2 types

DRUG NAME DESCRIPTION
NABILONE *General information*
- synthetic THC derivative
- administered orally

*Medical uses*
- conjunctive to 5-HT 3- and/or D2 receptor antagonists in treatment of chemotherapy-induced emesis
- treatment of diarrhea (decreased peristalsis)

- Carminative or Adsorbent
Used to decrease or remove high amount of gases in stomach and intestine due to metabolic process.

**Divided according to action**
1: expulsion of gases by eructation like carminative
e.g. ginger
  chamomile
  2: by adsorbent the gases
e.g. activated medicinal charcoal

**Digestive enzyme**
Chemical substance increase metabolic rate at standard environment (temp, ph, salts)

**Types:**
1: pepsin extract (from m. m of stomach of sheep, calve)
Give orally incase reduce pepsin in body
2: pancreatic extract Uses in
  1. metabolic disorder (festal) R
  2. insufficiency of pancreatic function

An anti-diarrhoeal drug (or anti-diarrheal drug) is any medication which provides symptomatic relief for diarrhoea.

**Types**
- Electrolyte solutions are used to replace lost fluids and salts in acute cases.
- Bulking agents like methylcellulose, guar gum or plant fibre (bran, sterculia, etc.) are used for diarrhoea in functional bowel disease and to control ileostomy output.
- Absorbents absorb toxic substances that cause infective diarrhoea, methylcellulose is an absorbent.
- Anti-inflammatory solutions like Bismuth subsalicylate.
- Opioids' classical use besides pain relief is as an anti-diarrhoeal drug. Opioids have agonist actions on the intestinal opioid receptors, which when activated cause constipation. Drugs such as morphine or codeine can be used to relieve diarrhoea this way.
Antidiarrheals

Opiate related drugs

- Paregoric
- Defenoxin with atropine—Motofen
- Diphenoxylate with atropine--Lomotil

Bile acid sequestrant

The bile acid sequestrates are a group of medications used to bind certain components of bile in the gastrointestinal tract. They disrupt the enterohepatic circulation of bile acids by sequestering them and preventing their reabsorption from the gut. They are generally classified as hypolipidemic agents, although they may be used for purposes other than lowering cholesterol.

. DRUGS USED IN CHOLELITHIASIS
1) BILE ACIDS
   - form micelles around free cholesterol in the bile, thus preventing further aggregation
   - 2 types

   DRUG NAME DESCRIPTION
   CDCA(CHENODEOXYCHOLIC ACID)

   Medical uses
   - treatment of cholesterol cholelithiasis
   (URSODEOXYCHOLIC ACID) - same as CDCA

2) MUSCARINIC RECEPTOR ANTAGONISTS
   - decrease release of acetylcholine, thus decreasing cholic spasms
   - see 15

3) OPIOIDS
   - decrease pain associated with cholic spasms

Examples of bile acid sequestrants

- Cholestyramine (Questran)
- Colestipol (Colestid)
Circle the correct answer :-

1- Peptic ulcer disease: select the correct mechanism and associated drug relationship
   a- Acid neutralization: calcium carbonate  b- Cytoprotection: bismuth.
   c- Antibacterial: bismuth  d- A, B, & C

2- Parietal cells (secretary elements of the gastric mucosa) release acid and intrinsic factors when activated by
   a- norepinephrine  b- atropine
   c- histamine.  d- none of the above

3- Used in management of acid-peptic ulcer disease: Least likely to produce side effects
   a- atropine  b- scopolamine
   c- pirenzepine  d- all produce about equal side effects

4-: Mechanism by which cimetidine decrease gastric acid secretion
   a- interferes with the gastric acid pump
   b- blocks cAMP action by preventing protein phosphorylation
   c- competes with histamine for H-2 receptor sites -
   d- competes with gastrin for H-2 receptor sites -

5-: Reflux esophagitis responds best to
   a- famotidine  b- cimetidine
   c- omeprazole  d- sucralfate

6- Especially effective anti-emetic for patients receiving cisplatin, an antineoplastic drug
   a- metoclopramide  b- ondansetron
   c- both  d- neither

7- Centrally-acting anti-emetic
   a- viscous lidocaine  b- chlorpromazine
   c- bismuth subsalicylate  d- cholestyramine

8- Anti-gastric ulcer drug that binds to mucosal protein substrate and then forms a gel that coats the ulcer:
a- bismuth compounds b- misoprostol (Cytotec)
c- sucralfate (Carafate) d- viscous lidocaine

9- Antiulcer medication that has an antiadrogenic effect--may cause gynecomastia (breast enlargement) in some patients:
a- ranitidine (Zantac) b- the cimetidine (Tagamet)
c- atropine d- omeprazole (Prilosec)

10- H-2 receptor antagonist:
a- famotidine (Pepcid) b- ranitidine (Zantac)
c- nizatidine (Axid) d- all of the above

Note
- Check your answers in key answer page 113.
- (1) degree for each.
6/ key answer :-

1- Pre test :-
1. d 6- c  
2. b 7- d  
3. c 8- d  
4. a 9- b  
5. c 10- a  

If you :-
• got 9 or more you do not need to proceed .  
• got less than 9 you have to study this modular unit well .

2- Post test :-
1. d 6-b  
2. d 7-b  
3. c 8-c  
4. c 9- d  
5. d 10-b  

If you :-
• got 9 or more , so congratulation your performance , go on studying modular unit three .  
• got less than 9 , go back and study the second unit ; or any part of it ; again, and then do the post test again .
**Quiz 1**  
Drug act on digestive system

1: antacids  
2: digestants and gastric enzyme  
3: anti cholinergic  
4: laxative  
5: anti diarrhea

**Quiz 2**
Triple therapy (two weeks) plus H₂ blocker therapy (six weeks) is also a recommended protocol

**Quiz 3**

- Antidiarrheal drugs  
  - Diphenoxylate  
  - Kaopectate  
  - Bismuth Subsalicylate  
  - Loperamide

**Quiz 4**

Laxative (purgatives or aperients) :- are foods, compounds, or drugs taken to induce bowel movements or to loosen the stool, most often taken to treat constipation. Certain stimulant, lubricant, and saline laxatives are used to evacuate the colon for rectal and bowel examinations, and may be supplemented by enemas. Laxatives may be suppository or in oral form & increase peristalsis without interfering with the normal neurohormonal regulation

**Quiz 5**
- bulk laxatives are polysaccaride polymers that are not broken down in the GI tract they bind water physically in the intestinal lumen, thus increasing the amount of feces left in the intestines this causes increased stretch of the wall of the GI tract, increased activation of the cholinergic axons of the myenteric plexus

**Quiz 6**

Uses :-
2: ulcer, active colitis  
3: acute pancreatitis  
4: cholengitis
Sources:

1- Basic & Clinical Pharmacology (Basic and Clinical Pharmacology) 

2- Katzung and Trevor's Pharmacology 
   Anthony J. Trevor (Author), Bertram G. Katzung (Author), Susan B. Masters (Author) 
   McGraw-Hill Medical; Latest edition 640 pages

3- Lippincott's Illustrated Reviews: Pharmacology (Lippincott's Illustrated Reviews Series) 
   Richard D Howland (Author), Mary J Mycek (Author), Richard A Harvey (Author), Pamela C Champe (Author) 
   Paperback: 559 pages Publisher: Lippincott Williams & Wilkins; Latest edition

4- Goodman & Gilman's The Pharmacological Basis of 
   Therapeutics 
   Laurence Brunton (Author), John Lazo (Author), Keith Parker (Author) 
   Publisher: McGraw-Hill Professional; Latest edition
1/ Over view

Anti-cholinergic drugs; atropine uses; side effects; drug used for spasm

1/ A – Target population:

This lecture is designed for second year Technical Institute students Department of nursing. It will be assumed that students have an adequate Knowledge in Anti-cholinergic drugs; atropine uses; side effects; drug used for spasm.

1/ B – Rationale:

A. The student shall be able to describe specificity of cholinergic drugs
B. The student shall be able to know atropine uses; side effects.
C. The student shall understand who uses of drug used for spasm
1 / C – Central Idea:

1. know effect of cholinergic drugs and uses of these drugs in disease
2. Determine all about pharmacokinetic & uses & therapeutic drug associated with atropine uses; side effects
3. know pharmacokinetic, uses, dose, coordination & therapeutic uses of drug used for spasm

1 / D – Instructions:

9. Study overview thoroughly.
10. Identify the goal of this modular unit.
11. Do the pre test
12. After studying the text of this modular unit, do the post test

2/ Performance Objectives

A. The student shall recognize the mechanisms of action of Anti-cholinergic drugs.
B. The student shall be able to describe the cardiovascular effects, therapeutic uses, pharmacokinetics side effects and precautions of Anti-cholinergic drugs.
C. The student shall be able to describe the cardiovascular effects, therapeutic uses, pharmacokinetics side effects and precautions of atropine.
D. The student shall be able to describe the cardiovascular effects, therapeutic uses, pharmacokinetics side effects and precautions of drug used for spasm.

3/ Pre test
Circle the correct answer :-

1. atropine act as :-
a- blocks acetylcholine receptor sites   b- decreases bronchial secretions
c- a&b                                             d- no one of them

2- atropine from
   a- *Atropa belladonna*   b- *Mandragora officinarum*
c- *Solanaceae*                                  d- all of them

3- Atropine degrades slowly, typically wearing off in
   a- 1 to 4 days                                b- 7 to 14 days
   c- 17 to 24 days                              d- 27 to 34 days

4- For symptomatic bradycardia, the usual dosage of atropine is:
   a- 0.5 to 1 mg IV push                      b- 0.5 to 1 mg orally
   c- 1 to 5 mg IV push                        d- 10 to 15 mg IV push

5- The most common atropine compound used in medicine is
   a- atropine sulfate                         b- atropine carbonate
   c- atropine nitrate                         d- atropine phosphate

**Note**

- Check your answers in key answer page 126.
- (1) degree for each.
Atropine

Atropine

Systematic (IUPAC) name

(8-methyl-8-azabicyclo[3.2.1]oct-3-yl) 3-hydroxy-2-phenylpropanoate

Atropine is a tropine alkaloid extracted from deadly nightshade (Atropa belladonna), jimsonweed (Datura stramonium), mandrake (Mandragora officinarum) and other plants of the family Solanaceae. It is a secondary metabolite of these plants and serves as a drug with a wide variety of effects. It is a competitive antagonist for the muscarinic acetylcholine receptor. It is classified as an anticholinergic drug (parasympatholytic). The name comes from the original use in deadly nightshade (Atropa belladonna) as a way of dilating women's pupils to make them beautiful. As such both Atropine and deadly nightshade derive names from Atropos, one of the three Fates who, according to Greek mythology, chose how a person was to die. Atropine is a core medicine in the World Health Organization's "Essential Drugs List", which is a list of minimum medical needs for a basic health care system.

Quiz / 1

Explain name origin of atropine

Note

- Check your answers in key answer page 127
**Physiological effects and uses**

Atropine increases firing of the sinoatrial node (SA) and conduction through the atrioventricular node (AV) of the heart, opposes the actions of the vagus nerve, blocks acetylcholine receptor sites, and decreases bronchial secretions.

In general, atropine lowers the parasympathetic activity of all muscles and glands regulated by the parasympathetic nervous system. This occurs because atropine is a competitive antagonist of the muscarinic acetylcholine receptors (acetylcholine being the main neurotransmitter used by the parasympathetic nervous system). Therefore, it may cause swallowing difficulties and reduced secretions.

**Ophthalmic use**

**Topical** atropine is used as a cycloplegic, to temporarily paralyze the accommodation reflex, and as a mydriatic, to dilate the pupils. Atropine degrades slowly, typically wearing off in 7 to 14 days, so it is generally used as a therapeutic mydriatic, whereas tropicamide (a shorter-acting cholinergic antagonist) or phenylephrine (an α-adrenergic agonist) is preferred as an aid to ophthalmic examination. Atropine induces mydriasis by blocking contraction of the circular pupillary sphincter muscle, which is normally stimulated by acetylcholine release, thereby allowing the radial pupillary dilator muscle to contract and dilate the pupil. Atropine induces cycloplegia by paralyzing the ciliary muscles, whose action inhibits accommodation to allow accurate refraction in children, helps to relieve pain associated with iridocyclitis, and treats ciliary block (malignant) glaucoma. Atropine is contraindicated in patients pre-disposed to narrow angle glaucoma.

Atropine can be given to patients who have direct globe trauma.

**Quiz / 2**

Mention Physiological effects and uses

**Note**

- Check your answers in key answer page 127
Resuscitation

Injections of atropine are used in the treatment of bradycardia (an extremely low heart rate). Atropine blocks the action of the vagus nerve, a part of the parasympathetic system of the heart whose main action is to decrease heart rate. Therefore, its primary function in this circumstance is to increase the heart rate. Atropine was previously included in international resuscitation guidelines for use in cardiac arrest associated with asystole and PEA, but was removed from these guidelines in 2010 due to a lack of evidence. For symptomatic bradycardia, the usual dosage is 0.5 to 1 mg IV push, may repeat every 3 to 5 minutes up to a maximum dose of 3 mg.

Atropine is also useful in treating second-degree heart block Mobitz Type 1 (Wenckebach block), and also third-degree heart block with a high Purkinje or AV-nodal escape rhythm. It is usually not effective in second-degree heart block Mobitz type 2, and in third-degree heart block with a low Purkinje or ventricular escape rhythm. Atropine is contraindicated in ischemia-induced conduction block, because the drug increases oxygen demand of the AV nodal tissue, thereby aggravating ischemia and the resulting heart block.

One of the main actions of the parasympathetic nervous system is to stimulate the $M_2$ muscarinic receptor in the heart, but atropine inhibits this action.

Secretions and bronchoconstriction

Atropine's actions on the parasympathetic nervous system inhibits salivary, sweat, and mucus glands. This can be useful in treating hyperhidrosis, and can prevent the death rattle of dying patients. Even though atropine has not been officially indicated for either of these purposes by the FDA, it has been used by physicians for these purposes.[4]

Treatment for organophosphate poisoning

Atropine is not an actual antidote for organophosphate poisoning. However, by blocking the action of acetylcholine at muscarinic receptors, atropine also serves as a treatment for poisoning by organophosphate insecticides and nerve gases, such as tabun (GA), sarin (GB), soman (GD) and VX. Troops that are likely to be attacked with chemical weapons often carry autoinjectors with atropine and obidoxime, which can be quickly injected into the thigh. Atropine is often used in conjunction with pralidoxime chloride.

Atropine is given as a treatment for SLUDGE (salivation, lacrimation, urination, diaphoresis, gastrointestinal motility, emesis) symptoms caused by organophosphate poisoning. Another mnemonic is DUMBBELSS, which stands for diarrhea, urination, miosis, bradycardia, bronchoconstriction, excitation (as of muscle in the form of fasciculations and CNS), lacrimation, salivation, and sweating (only sympathetic innervation using Musc receptors).

Some of the nerve agents attack and destroy acetylcholinesterase by phosphorylation, so the action of acetylcholine becomes prolonged, pralidoxime (2-PAM) is the cure for organophosphate poisoning because it can cleave this phosphorylation. Atropine can be
used to reduce the effect of the poisoning by blocking muscarinic acetylcholine receptors, which would otherwise be overstimulated by excessive acetylcholine accumulation.

**Optical penalisatin**

In refractive and accommodative *amblyopia*, when occlusion is not appropriate sometimes atropine is given to induce blur in the good eye.

**Side-effects and overdose**

Adverse reactions to atropine include ventricular *fibrillation*, supraventricular or ventricular *tachycardia*, *dizziness*, *nausea*, blurred vision, loss of balance, dilated pupils, *photophobia*, dry mouth and potentially extreme *confusion*, dissociative *hallucinations* and *excitation* especially amongst the elderly. These latter effects are because atropine is able to cross the *blood-brain barrier*. Because of the *hallucinogenic* properties, some have used the drug *recreationally*, though this is potentially dangerous and often unpleasant.

In overdoses, atropine is *poisonous*. Atropine is sometimes added to potentially addictive drugs, particularly anti-diarrhea opioid drugs such as *diphenoxylate* or *difenoxin*, wherein the secretion-reducing effects of the atropine can also aid the anti-diarrhea effects.

Although atropine treats *bradycardia* (slow heart rate) in emergency settings, it can cause paradoxical heart rate slowing when given at very low doses, presumably as a result of central action in the CNS.\(^6\)

Atropine is incapacitating at doses of 10 to 20 mg per person. Its LD\(_{50}\) is estimated to be 453 mg per person (per oral) with a probit slope of 1.8. The antidote to atropine is *physostigmine* or *pilocarpine*.

A common mnemonic used to describe the physiologic manifestations of atropine overdose is: as per Jon Blinkey "hot as a hare, blind as a bat, dry as a bone, red as a beet, and mad as a hatter", These associations reflect the specific changes of warm, dry skin from decreased sweating, blurry vision, decreased sweating/lacrimation, vasodilation, and central nervous system effects on *muscarinic* receptors, type 4 and 5. This set of symptoms is known as *anticholinergic toxidrome*, and may also be caused by other drugs with anticholinergic effects, such as *diphenhydramine*, *phenothiazine antipsychotics* and *benztropine*.

**Chemistry and pharmacology**

Atropine is a racemic mixture of D-*hyoscyamine* and L-*hyoscyamine*, with most of its physiological effects due to L-hyoscyamine. Its pharmacological effects are due to binding to muscarinic *acetylcholine receptors*. It is an antimuscarinic agent. Significant levels are achieved in the CNS within 30 minutes to 1 hour and disappears rapidly from the blood with a half-life of 2 hours. About 60% is excreted unchanged in the urine, most of the rest appears in urine as hydrolysis and conjugation products. Effects on the iris and ciliary muscle may persist for longer than 72 hours.
The most common atropine compound used in medicine is atropine sulfate (\(\text{C}_{17}\text{H}_{23}\text{NO}_3\text{S}\cdot\text{H}_2\text{SO}_4\cdot\text{H}_2\text{O}\)), the full chemical name is 1\(\alpha\) H, 5\(\alpha\) H-Tropan-3-\(\alpha\) ol (\(\pm\))-tropate(ester), sulfate monohydrate.

**History**

*Mandragora* (mandrake) was described by *Theophrastus* in the fourth century B.C. for treatment of wounds, gout, and sleeplessness, and as a love potion. By the first century A.D. *Dioscorides* recognized wine of mandrake as an anaesthetic for treatment of pain or sleeplessness, to be given prior to surgery or cautery. The use of *Solanaceae* containing tropane alkaloids for anesthesia, often in combination with opium, persisted throughout the Roman and Islamic Empires and continued in Europe until superseded by the use of ether, chloroform, and other modern anesthetics.

Atropine extracts from the Egyptian henbane were used by *Cleopatra* in the last century B.C. to dilate her pupils, in the hope that she would appear more alluring. In the Renaissance, women used the juice of the berries of *Atropa belladonna* to enlarge the pupils of their eyes, for cosmetic reasons; "bella donna" is Italian for "beautiful lady". This practice resumed briefly in the late nineteenth- and early twentieth-century in Paris.

The mydriatic effects of atropine were studied among others by the German chemist Friedlieb Ferdinand Runge (1795–1867). In 1831, the pharmacist Mein succeeded the pure crystalline isolation of atropine. The substance was first synthesized by German chemist Richard Willstätter in 1901.

Atropinic shock therapy, also known as atropinic coma therapy, is an old and rarely-used method. It consists of induction of atropinic coma by rapid intravenous infusion of atropine. Atropinic shock treatment is considered safe with careful monitoring and preparation, but it entails prolonged coma (between four and five hours), and it has many unpleasant side-effects, such as blurred vision. [citation needed]

**Natural sources**

Atropine is found in many members of the *Solanaceae* family. The most commonly-found sources are *Atropa belladonna, Datura inoxia, D. metel*, and *D. stramonium*. Other sources include members of the *Brugmansia* and *Hyoscyamus* genera. The *Nicotiana* genus (including the tobacco plant, *N. tabacum*) is also found in the Solanaceae family, but these plants do not contain atropine or other tropane alkaloids.
Synthesis

Atropine can be synthesized by the reaction of tropine with tropic acid in the presence of hydrochloric acid.

Anti – spasmodic drug

An antispasmodic (synonym: spasmolytic) is a drug or an herb that suppresses muscle spasms. Smooth muscle spasm & Skeletal muscle spasm

Uses :-
2: ulcer, active colitis
3: acute pancreatitis
4: cholangitis
e.g.
1. atropine sulphate
   a: - tab
   b: - amp
2: buscopan
   Tap, amp, syrup, suppositories

Quiz / 4

Define antispasmodic drug

Note
- Check your answers in key answer page 127
Circle the correct answer :-

1. the full chemical name of atropine is:-
   a- 1α H, 3α H-Tropan-3-α ol (±)-tropate(ester), sulfate monohydrate
   b- 1α H, 5α H-Tropan-3-α ol (±)-tropate(ester), sulfate monohydrate
   c- 1α H, 5α H-Tropan-2-α ol (±)-tropate(ester), sulfate monohydrate
   d- 1α H, 5α H-Tropan-1-α ol (±)-tropate(ester), sulfate monohydrate

2- Uses of An antispasmodic
   a-ulcer , active colitis
   b- acute pancreatitis
   c-cholengitis
   d- all of them

3- The use of Solanaceae with opium as
   a- anesthesia
   b- analgesic
   c- tranquilizer
   d- b&c

4- Atropine is incapacitating at doses of:
   a- 0.1 to 0.2 mg per person
   b- 1 to 2 mg per person
   c- 10 to 20 mg per person
   d- 20 to 40 mg per person

5- drug form buscopan
   a- tablet
   b- syrup
   c- ampule
   d- all of them

Note
- Check your answers in key answer page 126.
- (1) degree for each.
6/ key answer :-

1- Pre test :-
   1. c
   2. d
   3. b
   4. a
   5. a

   If you :-
   • got 6 or more you do not need to proceed .
   • got less than 6 you have to study this modular unit well .

2- Post test :-
   1. b
   2. d
   3. a
   4. c
   5. d

   If you :-
   • got 6 or more , so congratulation your performance , go on studying modular unit three .
   • got less than 6 , go back and study the second unit ; or any part of it ; again, and then do the post test again .
Quiz 1

The name comes from the original use in deadly nightshade (Atropa belladonna) as a way of dilating women's pupils to make them beautiful. As such both Atropine and deadly nightshade derive names from Atropos, one of the three Fates who, according to Greek mythology, chose how a person was to die.

Quiz 2

Atropine increases firing of the sinoatrial node (SA) and conduction through the atrioventricular node (AV) of the heart, opposes the actions of the vagus nerve, blocks acetylcholine receptor sites, and decreases bronchial secretions.

In general, atropine lowers the parasympathetic activity of all muscles and glands regulated by the parasympathetic nervous system. This occurs because atropine is a competitive antagonist of the muscarinic acetylcholine receptors (acetylcholine being the main neurotransmitter used by the parasympathetic nervous system). Therefore, it may cause swallowing difficulties and reduced secretions.

Quiz 3

Atropine is found in many members of the Solanaceae family. The most commonly-found sources are Atropa belladonna, Datura inoxia, D. metel, and D. stramonium. Other sources include members of the Brugmansia and Hyoscyamus genera. The Nicotiana genus (including the tobacco plant, N. tabacum) is also found in the Solanaceae family, but these plants do not contain atropine or other tropane alkaloids.

Quiz 4

An antispasmodic (synonym: spasmolytic) is a drug or an herb that suppresses muscle spasms. Smooth muscle spasm & Skeletal muscle spasms.

/Sources :-

1- Basic & Clinical Pharmacology (Basic and Clinical Pharmacology)  
2- Katzung and Trevor's Pharmacology Anthony J. Trevor (Author), Bertram G. Katzung (Author), Susan B. Masters (Author) : McGraw-Hill Medical; Latest edition640 pages

3- Lippincott's Illustrated Reviews: Pharmacology (Lippincott's Illustrated Reviews Series) Richard D Howland (Author), Mary J Mycek (Author), Richard A Harvey (Author), Pamela C Champe (Author)
   Paperback: 559 pages Publisher: Lippincott Williams & Wilkins; Latest edition
4- Goodman & Gilman's The Pharmacological Basis of Therapeutics Laurence Brunton (Author), John Lazo (Author), Keith Parker (Author)


Drug uses for respiratory system; expectorants; mucolytics; sedatives; bronchodilators; Drug uses for asthma; antitussive.

1/A – Target population:

This lecture is designed for second year Technical Institute students Department of nursing. It will be assumed that students have an adequate knowledge in Drug uses for respiratory system.

1/B – Rationale:

1. Know the mechanism of action, sites of action, therapeutic uses, routes of administration and adverse effects of expectorant drug
2. Know the mechanism of action, sites of action, therapeutic uses, routes of administration and adverse effects of antitussive drug
3. Differentiate between two types of bronchodilator

1/C – Central Idea:

1- Determine drug effect on respiratory tract infection
2- Discuss best treatment for cough and asthma
3- Explain mechanism action of bronchodilator, site of action, route of administration
4- Pathogenesis of bronchial asthma and to study the pharmacology of antiasthma drugs, and cough
1. The student shall be able to state the mechanism of action, sites of action, therapeutic uses, routes of administration and adverse effects of ephedrine, epinephrine, isoproterenol, beta-2 agonists, and inhalation medications.

2. The student shall be able to state the mechanism of action, sites of action, therapeutic uses, routes of administration and adverse effects of theophylline, glucocorticoids, disodium cromoglycate and nedocromil, ipatropium, zafirlukast, and zileuton.

3. The student shall be able to discuss the potential roles of prostaglandin E2, calcium channel blockers, and drugs used for cough.

4. The student shall be able to state the mechanism of action, sites of action, therapeutic uses, routes of administration and adverse effects of xanthenes.

Circle the correct answer:

- Expectorants
- Anti tissues
c - bronchodilator  d- no one of them

2- Expectorants act as
a- decrease liquidity of it they sedative the cough & reducing it fits
b- increase liquidity of it they sedative the cough & reducing it fits
c- increase liquidity of it they sedative the cough & increase it fits
d- decrease liquidity of it they sedative the cough & increase it fits

3- dose of ammonium chloride as tab
a- 3-5 mg  b- 30-50mg
c- 300-500 mg  d- 3000-5000 mg

4- for treat not productive cough used:
a- sedative Expectorants  b- stimulant Expectorants
c- a&b  d- Anti tissues

5- dextromethopharm synthesis form morphine it
a local analgesic  b- general analgesic
c-a&b  d- no one of them

Note
- Check your answers in key answer page 137.
- (2) degree for each.
Drug of the respiratory system

1- Exoictorantents

2- Anti tissues

3- bronchodilator

1- Expictorantents

These medicine act as analyzing the mucoid secretion where they exceed the secretion of the sputum & increase liquidity of it they sedative the cough & reducing it fits

A- Expectoratents sedative
Used for treat productive cough it increase liquidity of sputum and expelled& increase severity of cough

example
1- ammonium chloride

as tab : 300-500 mg if high doses it make as diuretic .

2_ Ipeac (as tincture or extract)
B_ stimulant expectoratents

Used for chronic bronchitis

Quiz / 1

Define expectoratents and mention their types

Note

- Check your answers in key answer page 138

2- Antitussive
Used in not productive cough it inhibits cough center in medulla oblongata it analgesic cough fits & severity
Example
1-codeine as syrup 2-8ml / 10-40mg

2- dextromethopharm
---------------------------------
  synthesis form morphine it  local analgesic not general

DOSE
------- :
15-30Mg romilar® or sedilar®

3- noscapine
--------------:
[longatin , toscapin]®

uses
-----:
1-in not productive cough with convulsions
2-asthma
3-bronchitis

**Quiz / 2**

Mention therapeutic uses of dextromethopharm

**Note**

- Check your answers in key answer page 138

3-Bronchodilators

Uses in cough with convulsion as in bronchial asthma or chronic bronchitis it dilated bronchus by relaxant the bronchus & decrease convulsion which occur with cough

Example:
  Aminophylline :-
  Uses
  -------:
  -As relaxant of smooth muscle & bronchodilator in asthma & angina
  -As diuretic in edema of renal or pulmonary
  *give orally 100-300mg can give i/m or i/v

Sympathomimetic bronchodilator
Example:

1-ephedrine :- extract from ephedra plant like adrenalin

action:-
  long duration & lesser severity
*give orally 15-60mg or spray

**Uses**

1: Bronchial asthma
2: Hay fever
3: Acute coryza
4: Sinusitis

**Side effect**

1: Hyper tension
2: In somnea

**Quiz / 3**

Mention therapeutic uses of ephedrine

**Note**

- Check your answers in key answer page 138

2: **Isoprenalin**

Like nor adrenaline effect on B1 receptor (cardiac receptor)&B2 bronchial receptor

*short duration lesser effect
* used as relaxant for bronchus

**Action**

As sublingual tab or as spray

**Uses**

1: Bronchial asthma
2: Spasmodic bronchitis

( neo-epine, aleudrin, medihaler) ®

3: **Terbutaline** :

Long action effect on B2 more than B1 (brieanyl)®

*like isoprenaline in action
4- salbutamol
like terbutaline Long action we give orally tab 2-4mg or i/m
Midolin®    ventolin®

Drug affecting the respiratory

1:- drug used to treat asthma

A: B2 adrenergic agonists
   -salbutamol
   -terbutaline
   -epinephrine

B: corticosteroids
   -beclomethason( inhalation)
   -triamainolone ( inhalation)
   -methyl prednisolone (iv)
   -prednisone (oral)

C: anti cholinergic
   ipratorpium

D:theophylline

2:-Drug used to treat rhinitis
A- Alfa adrenergic agonist oxymetazolin
B- antihistamines like (H1) histamine( diphenhydramine, chlorphenamine lortadine , terfenadine)

C-corticosteroids (Beclomethazone, Triamcindone)
D-cromolyn

3:- drug used to treat chronic obstructive pulmonary

A:-b-adrenergic agonist
B:-corticosteroids
C:-tpratropium

4:-drug used to treat cough
A-dextromethorphan
B-opiates (codine) (hydrocodone)
**Quiz / 3**

Mention Drug used to treat rhinitis

**Note**

- Check your answers in key answer page 138

5/ Post test

-Circle the correct answer :-

3. ventolin® is trade name of:-
   a- dextromethorphan.          b- cromolyn
   c- salbutamol                d- oxymetazolin

2- Isoprenalin Like nor adrenaline effect on
   a- B1 receptor ( cardiac receptor )& B1 receptor ( cardiac receptor )
   b- B1 receptor ( cardiac receptor )
   c- B1 receptor ( cardiac receptor )          d- no one of them

3- corticosteroids
   a- beclomethazon             b- triamainolone
   c- prednisolone            d- all of them

   4- anti cholinergic:
   a- beclomethazon             b- ipratorpium
   c- prednisolone                d- salbutamol

5- romilar is trade name of
   a- dextromethorphan.       b- cromolyn
   c- salbutamol              d- oxymetazolin
- Check your answers in key answer page 137.
- (2) degree for each

6/ key answer :-

1- Pre test :-
1. a
2. b
3. c
4. d
5. a

If you :-
- got 6 or more you do not need to proceed.
- got less than 6 you have to study this modular unit well.

2- Post test :-
1. c
2. a
3. d
4. b
5. a

If you :-
- got 6 or more, so congratulation your performance, go on studying modular unit three.
- got less than 6, go back and study the second unit; or any part of it; again, and then do the post test again.
**Quiz 1**

1-Expictorantents

These medicine act as analyzing the mucoid secretion where they exceed the secretion of the sputum & increase liquidity of it they sedative the cough & reducing it fits

A- Expectoratents sedative
B_ stimulant expectoratents

**Quiz 2**

1-in not productive cough with convulsions
2-asthma
3-bronchitis

**Quiz 3**

1:-Bronchial asthma
2:-hey fever
3:-acute coryza
4:-sinusitis

**Quiz 4**

A- Alfa adrenergic agonist oxymetazolin
B- antihistamines like (H1) histamine( diphenhydramine, chlorphenamine lortadine , terfenadine)
C-corticosteroids (Beclomethazone, Triamcindone)
D-cromolyn

Sources :-
1- Basic & Clinical Pharmacology (Basic and Clinical Pharmacology)  
2- Katzung and Trevor's Pharmacology Anthony J. Trevor (Author), Bertram G. Katzung (Author), Susan B. Masters (Author) : McGraw-Hill Medical; Latest edition 640 pages

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Publisher: McGraw-Hill Professional; Latest edition
1/ Over view

Drug used for cardio-vascular system. Cardio tonics; digitalis uses; side of toxic effect

1/ A –Target population:-

This lecture is designed for second year Technical Institute students Department of nursing. It will be assumed that students have an adequate Knowledge in Drug used for cardio-vascular system. Cardio tonics; digitalis uses; side of toxic effect

1/ B –Rationale :-

A. The student shall know the mechanism of action, pharmacokinetics, therapeutic uses, toxicity and side effects of Drug used for cardio-vascular system.
B. The student shall know the mechanism of action, electrographic changes, pharmacokinetics, therapeutic uses, toxicity and side effects of cardio tonics
C. The student shall know about drug used for digitalis uses; side of toxic effect.
1 / C – Central Idea :-

1- Know heart disease & mention best treatment
2- Know types of Drug used for cardio-vascular system and there uses
3- Know bronchodilator drug and there therapeutic uses, dose mechanism of action of cardio tonics; digitalis uses; side of toxic effect

1 / D – Instructions:-

13. Study over view thoroughly.
14. Identify the goal of this modular unit.
15. Do the pre test
4- After studying the text of this modular unit, do the post test

2/ Performance Objectives

1. Identify the electrical conduction system of the heart.
2. Name the three layers of the heart and the four heart valves.
3. Define three types of angina pectoris.
4. Name the mainstays of angina therapy.
5. Describe the action of vasodilation.
6. Define calcium channel blockers.
7. Explain myocardial infarction.
8. Identify the classifications of antidysrhythmic drugs and explain their actions.
9. Describe the adverse reactions of quinidine.
10. Identify the mechanism of action of lidocaine.
11. List the adverse effects of phenytoin.

3/ Pre test
Circle the correct answer :-

8. CVD includes dysfunctional conditions of the: -
   a- heart  b- arteries
   c- veins  d- all of them

2- termed arteriosclerosis and atherosclerosis
   a- Excess buildup of fat or plaque  b- enlargement of artery
   c- supply oxygenated blood to the heart  d- inadequate oxygen flow to the brain

3- disease The Silent Killer is
   a- angina attack  b- High blood pressure
   c- heart attack  d- stroke

4- The cardiac stress test is done with the patient connected to:
   a- ECG  b- EEG
   c- sphygmomanometer  d- no one of them

5- Treadmill test: sensitivity is
   a- 70%  b- 67%
   c- 55%  d- 40%

Note - Check your answers in key answer page 151.
- (1) degree for each.
Cardiovascular Disease (CVD) includes dysfunctional conditions of the heart, arteries, and veins that supply oxygen to vital life-sustaining areas of the body like the brain, the heart itself, and other vital organs. If oxygen doesn't arrive the tissue or organ will die.

Ischemic Heart Disease is the technical term for obstruction of blood flow to the heart. In general this results because excess fat or plaque deposits are narrowing the veins that supply oxygenated blood to the heart. Excess buildup of fat or plaque are respectively termed arteriosclerosis and atherosclerosis. Equally significant would be inadequate oxygen flow to the brain, which causes a stroke.

High Blood Pressure (hypertension) often results from this excess fat or plaque buildup because of the extra effort it takes to circulate blood. Even though the heart works harder, blockages still shortchange the needed blood supply to all areas of the body. The body's amazing survival systems will mask the subtle damage that is occurring from this extra wear and tear, but not forever. High blood pressure is called "The Silent Killer" because the first warning sign is an angina attack or a deadly heart attack or a stroke.

Quiz / 1
Define Pharmacology cardiovascular disease

Note
- Check your answers in key answer page 152
Kidney disorders (which leave extra fluids, sodium, and toxins in the body), obesity, diabetes, birth control pills, pregnancy, smoking, excess alcohol, stress, and thyroid and adrenal gland problems can also cause and exacerbate a high blood pressure condition.

Damage to the heart tissues from CVD or from heart surgery will disrupt the natural electrical impulses of the heart and result in cardiac arrhythmia (an abnormally high or abnormally low heart rate). Individuals often don’t realize the aftermath and side effects that invasive surgical procedures leave. Sudden fluctuations in heart rate can cause noticeable palpitations, with an associated faintness, or dizziness, and if severely abnormal could interfere with blood flow and even initiate a heart attack.

Proper ranges of cholesterol are also important in the prevention of heart attack or stroke. Total blood cholesterol above 200 mg/dl, LDL cholesterol above 130 mg/dl, HDL cholesterol below 35 mg/dl; and lipoprotein(a) level greater than 30 mg/dl are indicators of problematic cholesterol. Cholesterol is not actually a damage mechanism but is more an indicator of compromised liver function, and increased risk of heart attack.

Infection of the heart, carditis and endocarditis, is an additional complication that can occur as a result of a weak immune system, liver problems, heart surgery, or from an autoimmune disorder like rheumatic fever. Endocarditis is quite common in persons with compromised immune systems from HIV or AIDS. If not appropriately handled, permanent heart muscle damage can occur from the infection.

**Quiz / 2**

Enumerate problems that can also cause and exacerbate a high blood pressure condition.

**Note**

- Check your answers in key answer page 152
Cardiac stress test

Cardiac stress test (or Cardiac diagnostic test) is a test used in medicine and cardiology to measure the heart's ability to respond to external stress in a controlled clinical environment.

The stress response is induced by exercise or drug stimulation. Cardiac stress tests compare the coronary circulation while the patient is at rest with the same patient's circulation observed during maximum physical exertion, showing any abnormal blood flow to the heart's muscle tissue (the myocardium). The results can be interpreted as a reflection on the general physical condition of the test patient. This test can be used to diagnose ischemic heart disease, and for patient prognosis after a heart attack (myocardial infarction).

Cardiac Stress Test

The cardiac stress test is done with heart stimulation, either by exercise on a treadmill or with intravenous pharmacological stimulation, with the patient connected to an electrocardiogram (or ECG).

The level of mechanical stress is progressively increased by adjusting the difficulty (steepness of the slope) and speed. The test administrator or attending physician examines the symptoms and blood pressure response. With use of ECG, the test is most commonly called a cardiac stress test, but is known by other names, such as exercise testing, stress testing treadmills, exercise tolerance test, stress test or stress test ECG.

Nuclear Stress Test

Typically, a radiotracer (Tc-99 sestamibi or Tl-201) may be injected during the test. After a suitable waiting period to ensure proper distribution of the radiotracer, photos are taken with a gamma camera to capture images of the blood flow. Photos taken before and after exercise are examined to assess the state of the coronary arteries of the patient.
Showing the relative amounts of radioisotope within the heart muscle, the nuclear stress tests more accurately identify regional areas of reduced blood flow.

Stress and potential cardiac damage from exercise during the test is a problem in patients with ECG abnormalities at rest or in patients with severe motor disability. Pharmacological stimulation from vasodilators such as dipyridamole or adenosine, or positive chronotropic agents such as dobutamine can be used. Testing personnel can include a cardiac radiologist, a nuclear medicine physician, a cardiologist, and/or a nurse.

**Function**

Stress-ECG of a patient with coronary heart disease: ST-segment depression (arrow) at 100 Watt. A in rest, B at 75 Watt, C at 100 Watt, D at 125 Watt.

The American Heart Association recommends ECG treadmill testing as the first choice for patients with medium risk of coronary heart disease according to risk factors of smoking, family history of coronary artery stenosis, hypertension, diabetes and high cholesterol.

- Perfusion stress test (or sestamibi) is appropriate for select patients, especially those with an abnormal resting electrocardiogram.
- Intracoronary ultrasound or angiogram can provide more information at the risk of complications associated with cardiac catheterization.

**Diagnostic Value**

The common approach for stress testing by American College of Cardiology and American Heart Association indicates the following:

- Treadmill test: sensitivity 67%, specificity 70%
- Nuclear test: sensitivity 81%, specificity 85-95%

*(Sensitivity is the percentage of sick people who are correctly identified as having the condition. Specificity indicates the percentage of healthy people who are correctly identified as not having the condition.)*

The value of stress tests has always been recognized as limited in assessing heart disease such as atherosclerosis, a condition which mainly produces wall thickening and enlargement of the arteries. This is because the stress test compares the patient's coronary flow status before and after exercise and is suitable to detecting specific areas of ischemia and lumen narrowing, not a generalized arterial thickening.
According to American Heart Association data, about 65% of men and 47% of women have their first symptom of cardiovascular disease manifesting in a heart attack or sudden death. Stress tests, carried out shortly before these events, are not relevant to the prediction of infarction in the majority of individuals tested. Over the past two decades, better methods have been developed to identify atherosclerotic disease before it becomes symptomatic.

These detection methods have included either anatomical or physiological.

Examples of anatomical methods include

- **CT coronary calcium score**
- **Intima-media thickness (IMT)**
- **Intravascular ultrasound (IVUS)**

Examples of physiological methods include

- **Lipoprotein** analysis
- **HbA1c**
- **Hs-CRP**
- **Homocysteine**

The anatomic methods directly measure some aspects of the actual process of atherosclerosis itself and therefore offer the possibility of early diagnosis, but are often more expensive and may be invasive (in the case of IVUS, for example). The physiological methods are often less expensive and more secure, but are not able to quantify the current status of the disease or directly track progression.

**Absolute Contraindications**

Absolute contraindications to cardiac stress test include:

- Acute myocardial infarction within 48 hours
- Unstable angina not yet stabilized with medical therapy
- Uncontrolled cardiac arrhythmia, which may have significant hemodynamic responses (e.g. ventricular tachycardia)
- Severe symptomatic aortic stenosis, aortic dissection, pulmonary embolism, and pericarditis
- Multivessel coronary artery diseases that have a high risk of producing an acute myocardial infarction

**Quiz / 3**

Enumerate methods have been developed to identify atherosclerotic disease before it becomes symptomatic
Adverse Effects

Side effects from cardiac stress testing may include

- Palpitations, chest pain, MI, shortness of breath, headache, nausea or fatigue.
- Adenosine and dipyridamole can cause mild hypotension.
- As the tracers used for this test are carcinogenic, frequent use of these tests carries a small risk of cancer.

Pharmacological Agents

The choice of pharmacologic stress agents used in the test depends on factors such as potential drug interactions with other treatments and concomitant diseases. Commonly used agents include:

- Dobutamine
- Adenosine
- Dipyridamole

Dobutamine is often used in patients with severe reactive airway disease (asthma or COPD) as adenosine and dipyridamole can cause acute exacerbation of these conditions.

Adenosine or dipyridamole is generally used when a patient cannot achieve adequate work level with treadmill exercise, or has poorly controlled hypertension or left bundle branch block. The effects of beta-agonists such as dobutamine can be reversed by administering beta-blockers such as propranolol.

Quiz / 4

Enumerate pharmacologic stress agents

Note

- Check your answers in key answer page 152
notes

Once the stress test is completed, the patient generally is advised to not suddenly stop activity, but to slowly decrease the intensity of the exercise over the course of several minutes.

- Increased spatial resolution allows a more sensitive detection of ischemia.

- Stress testing, even if made in time, is not able to guarantee the prevention of symptoms, fainting, or death. Stress testing, although more effective than a resting ECG at detecting heart function, is only able to detect certain cardiac properties.

- The detection of high-grade coronary artery stenosis by a cardiac stress test was the key to recognizing people who have heart attacks since 1980. From 1960 to 1990, despite the success of stress testing to identify many who were at high risk of heart attack, the inability of this test correctly identify many others is discussed in medical circles but unexplained.

- High degrees of coronary artery stenosis, which are detected by stress testing methods are often, though not always, responsible for recurrent symptoms of angina.

- Unstable atheroma produces "vulnerable plaques" hidden within the walls of coronary arteries which go undetected by this test.

- Limitation in blood flow to the left ventricle can lead to recurrent angina pectoris.
Circle the correct answer:

1- problems can also cause and exacerbate a high blood pressure condition.
   a- obesity  b- birth control pills  c- pregnancy  d- all of them

2- Examples of anatomical methods include
   a- CT coronary calcium score  b- Lipoprotein analysis
   c- HbA1c  d- Hs-CRP

3- Sensitivity of cardiac stress test is
   a- the percentage of sick people who are correctly identified as having the condition
   b- indicates the percentage of healthy people who are correctly identified as not having the condition
   c- a&b  d- no one of them

4- Absolute contraindications to cardiac stress test include:
   a- Acute myocardial infarction within 48 hours  b- Uncontrolled cardiac arrhythmia
   c- Unstable angina not yet stabilized with medical therapy  d- all of them
   a- Adenosine  b- dipyridamole
   c- Dobutamine  d- all of them

Note
- Check your answers in key answer page 151.
- (1) degree for each.
6/ key answer :-

1- Pre test :-
1 -d
2 -a
3 -b
4 -a
5 -b

If you :-
• got 6 or more you do not need to proceed .
• got less than 6 you have to study this modular unit well .

2- Post test :-
1. d
2. a
3. a
4. d
5. c

If you :-
• got 6 or more , so congratulation your performance , go on studying modular unit three .
• got less than 6 , go back and study the second unit ; or any part of it ; again, and then do the post test again .

19.
**Quiz 1**
Cardiovascular Disease (CVD) includes dysfunctional conditions of the heart, arteries, and veins that supply oxygen to vital life-sustaining areas of the body like the brain, the heart itself, and other vital organs. If oxygen doesn't arrive the tissue or organ will die.

**Quiz 2**
Kidney disorders (which leave extra fluids, sodium, and toxins in the body), obesity, diabetes, birth control pills, pregnancy, smoking, excess alcohol, stress, and thyroid and adrenal gland problems can also cause and exacerbate a high blood pressure condition.

**Quiz 3**
better methods have been developed to identify atherosclerotic disease before it becomes symptomatic. These detection methods have included either anatomical or physiological.

Examples of anatomical methods include:
- CT coronary calcium score
- Intima-media thickness (IMT)
- Intravascular ultrasound (IVUS)

Examples of physiological methods include:
- Lipoprotein analysis
- HbA1c
- Hs-CRP
- Homocysteine

**Quiz 4**

**Pharmacological Agents**
The choice of pharmacologic stress agents used in the test depends on factors such as potential drug interactions with other treatments and concomitant diseases. Commonly used agents include:
- Dobutamine
- Adenosine
- Dipyridamole
1- Basic & Clinical Pharmacology (Basic and Clinical Pharmacology)

2- Katzung and Trevor's Pharmacology  Anthony J. Trevor (Author), Bertram G. Katzung (Author), Susan B. Masters (Author) : McGraw-Hill Medical; Latest edition640 pages

3- Lippincott's Illustrated Reviews: Pharmacology (Lippincott's Illustrated Reviews Series) Richard D Howland (Author), Mary J Mycek (Author), Richard A Harvey (Author), Pamela C Champe (Author)
Paperback: 559 pages Publisher: Lippincott Williams & Wilkins; Latest edition

4- Goodman & Gilman's The Pharmacological Basis of Therapeutics  Laurence Brunton (Author), John Lazo (Author), Keith Parker (Author)
Publisher: McGraw-Hill Professional; Latest edition


6-
Oral Contraceptives and Cardiovascular Disease: An Analysis of the Recent Discussions by J. Cohen (Hardcover - Apr 15 1997) on the Safety of the Pill

7.-

by Giorgio Minotti (Hardcover - May 13 Cardiotoxicity of Non-Cardiovascular Drugs 2010)

8.-

The Biochemical Effects of Drugs in Pregnancy: Drugs Active on the Nervous, Cardiovascular and Haemopoietic Systems (Ellis Horwood Series in biochemi Grella, Peter J. Lewis and A. Onnis (Hardcover - Nov 1984)

9.-


10.-
Sex Steroids and the Cardiovascular System: The Proceedings of the 1st Interdisciplinary Workshop, Tuebingen, Germany 1997

11.-

by Terry Kenakin (Paperback A Pharmacology Primer: Theory, Application and Methods - Dec 19 2003)

12.-

by Bernard I. Levy and Alain Tedgui (Hardcover - Feb 28 Biology of the Arterial Wall 1999)

13.-

by Peter Collins and Hormone Therapy and Cardiovascular Dynamics: Pocketbook Carolyn Webb (Paperback - Nov 18 1997)

14.-

by Michel Pairet and Joanne van Ryn (Hardcover - May 14 2004) COX-2 Inhibitors from CDN$ 163.98 2 used from CDN$ 150.47 8 new

Excerpt - Page 139
1/ Over view

Anti-arrhythmic drugs; vasodilatations heparin, cycle Capron; drug used for cholesterol

1/A – Target population:-
This lecture is designed for second year Technical Institute students Department of nursing. It will be assumed that students have an adequate Knowledge in Anti-arrhythmic drugs; vasodilatations, heparin.

1/B – Rationale :-

A. The student shall know the mechanism of action, pharmacokinetics, therapeutic uses, toxicity and side effects of antiarrhythmics.
B. The student shall know the mechanism of action, electrographic changes, pharmacokinetics, therapeutic uses, toxicity and side effects of vasodilatations
C. The student shall know about drug used for cholesterol
1 / C –Central Idea :-

4- Know antiarthymtic heart disease & mention best treatment
5- Know types of antiarrythmatic drug and there uses
6- Know bronchodilator drug and there therapeutic uses ,dose mechanism of action

1 / D –Instructions:-

16. Study over view thoroughly.
17. Identify the goal of this modular unit.
18. Do the pre test
4- After studying the text of this modular unit ,do the post test

2/ Performance Objectives

Antiarrhythmic Drugs II
A. The student shall know the mechanism of action, electrographic changes, pharmacokinetics, therapeutic uses, toxicity and side effects of group IA (quinidine, procainamide, disopyramide), group IB (lidocaine, phenytoin, tocainide, mexillitine) and group IC (flecainide, propafenone, ) antiarrhythmics.
B. The student shall know the mechanism of action, electrographic changes, pharmacokinetics, therapeutic uses, toxicity and side effects of group II (propranolol, esmolol, acebutolol, etc) and group III (bretylium, amiodarone, sotalol,) antiarrhythmics.
C. The student shall know the mechanism of action, electrographic changes, pharmacokinetics, therapeutic uses, toxicity and side effects of group 4

3/ Pre test
Circle the correct answer:-

1-Cholesterol Drug Information-

a- Lipitor Oral. b- Pravachol Oral
c- Tricor Oral d- all of them

2- Atorvastatin is an enzyme blocker

a- Lipitor Oral. b- Pravachol Oral
c- Tricor Oral d- all of them

3- the myocyte reaching a membrane potential of -60 mV

a- Plateau b- Repolarization
c- Partial repolarization d- no one of them

4- heart rate above 150 BPM:

a- ACTIVE ECTOPIC BEATS b- PAROXYSMAL TACHYCARDIA
c- FLUTTER d- FIBRILLATION

5- It belongs to a group of drugs known as "statins

a- Lipitor Oral. b- Pravachol Oral
c- Tricor Oral d- no one of them

6- antiepileptic drug used as antiarrhythmic drug

a- quindine b- PHENYTOIN
c- lidocaine d- no one of them

7-: Side effects AMIODARONE

a- hyperthyroidism b- photosensitivity
c- visual disturbances d- all of them

8- PHENYTOIN used as:
a- antiarrhythmic drug       b- antiepileptic drug

c- a&b                   d- bronchodilator

9- hyperlipoproteinemia mean
a- triglycerides and cholesterol are transported in lipoproteins in the intestine
b- triglycerides are transported in lipoproteins in the circulation
c- cholesterol are transported in lipoproteins in the circulation

10- papaverine act as
a- as peripheral vasodilator
b- as central vasodilator
c- as peripheral vasoconstriction

- Check your answers in key answer page 171.
- ( 1 ) degree for each .

4/ the module contents

Cholesterol Drug Information

- Lipitor Oral

Atorvastatin is an enzyme blocker (HMG-CoA reductase inhibitor), also known as a "statin". It is used along with a proper diet to help lower cholesterol and fats (triglycerides) in the blood. In general, this drug is prescribed after non-drug treatment options have not been fully successful at lowering cholesterol (e.g., diet
change, increase in exercise, weight loss if overweight). Reducing cholesterol and triglycerides help prevent strokes and heart attacks.

- **Pravachol Oral**

  It belongs to a group of drugs known as "statins the risk of heart disease and helps prevent strokes and heart attacks.

- **Tricor Oral**

  . It belongs to a group of drugs known as "fibrates. decreases the risk of heart disease and helps prevent strokes and heart attacks. may also decrease the risk of pancreas disease (pancreatitis)

**Quiz / 1**

Define **Pravachol Oral**

**Note**

- Check your answers in key answer page 172

**Antiarrhythmic Drugs**

- action potential in myocytes has 4 phases
  PHASE 0 Rapid depolarization
  - due the myocyte reaching a membrane potential of -60 mV - this leads to rapid influx of sodium and following depolarization
  PHASE 1 Partial repolarization
  - due to the myocyte reaching +40 mV and- partial repolarization is done by out flux of potassium through the normal potassium-sodium leak channels
  PHASE 2 Plateau
  - due to the myocyte reaching 0 mV - this leads to release of large quantities of calcium into the sarcoplasm, and following initiation of muscle contraction
  PHASE 3 Repolarization
  - due to the myocyte reaching –10 mV and- repolarization is done by the same mechanism as with partial repolarization
PHASE 4 Pacemaker potential
- due to the myocyte reaching -90 mV (resting membrane potential) and following
  activation of a special sodium-potassium leak channel (only found in SA-node, AV-node,
  and purkinje fibers)
- there are 4 types of cardiac arrhythmias

ACTIVE ECTOPIC BEATS
Causes
- excess sympathetic tone
- ischemia
- small calcified plaques
- myocardial toxins (alcohol, caffeine, nicotine, drugs etc.)

PAROXYSMAL TACHYCARDIA
- heart rate above 150 BPM

FLUTTER (ATRIAL-)
General information
Causes
- presence of extranodal conducting pathways(wolff-parkinson-white syndrome etc.)
- increased distance of conductance(atrial/ventricular dilation)
- decreased velocity of conduction (ischemia, excess parasympathetic activity etc.)
- decreased refractory period (excess sympathetic activity etc.)

FIBRILLATION (ATRIAL-, VENTRICULAR-)
- heart rate above 350 BPM

Relevant Drugs
- antiarrhythmic drugs may be divided in 4 classes (vaughan williams’ system)

Quiz / 2
Mention 4 phases action potential in myocytes

Note
- Check your answers in key answer page 172

1) CLASS I ANTIARRHYTHMIC DRUGS
decrease excitability of the myocardium
quindine administered orally

Medical uses
- treatment of ventricular arrhythmias

Side effects
- tachycardia
- thrombocytopenia

Disopyramide&procainamide

DRUG NAME DESCRIPTION
LIDOCAINE
- local anesthetic
- administered IV
- extensive first-pass metabolism

*Medical uses*
- treatment of arrhythmias associated with irreversible myocardial ischemia

**PHENYTOIN**
- antiepileptic drug
- administered orally
- same as lidocaine

*Medical uses*
- treatment of arrhythmias associated with irreversible myocardial ischemia to selective refractory blockage)
- treatment of epilepsy

**FLECAINIDE Medical uses**
- treatment of arrhythmias associated with reentrant circuits (strong general suppression)

2) **CLASS 2 ANTIARRHYTHMIC DRUGS**
- beta-adrenergic receptor antagonists
- block voltage-gated sodium- (phase 0) and calcium channels (phase 2

3) **CLASS 3 ANTIARRHYTHMIC DRUGS**
- block the potassium-sodium leak channels (phase 1 and phase 3)

**AMIODARONE**

*Medical uses*
- treatment of arrhythmias associated with reentrant circuits (prolonged refractory period)

*Side effects*
- tachycardia
- hypo- or hyperthyroidism (iodine, tissue accumulation)
- photosensitivity
- visual disturbances
- skin discoloration
- neurological disturbances

**SOTALOL**

4) **CLASS 4 ANTIARRHYTHMIC DRUGS**
- calcium channel blockers

. drug used to treat hyperlipoproteinemia
- triglycerides and cholesterol are transported in lipoproteins in the circulation

**MEDULLA**
- consists of triglycerides and cholesterol esters

**CORTEX**
- consists of phospholipids, cholesterol and apolipoproteins

**Quiz / 3**

*Mention side effect of AMIODARONE*

**Note**
- Check your answers in key answer page 172

- there are 5 types of lipoproteins
  Chylomicron - transports triglycerides and cholesterol from the intestines to muscle- and adipose tissue

- here, the triglycerides are split to free fatty acids by lipoprotein lipase and the free fatty acids taken up by these tissues

Chylomicron remnant - transports the cholesterol and remaining triglycerides
  - here, the cholesterol is converted to bile salts and secreted through the bile into the intestines for absorption of new lipids and cholesterol(enterohepatic bile circulation)

VLDL Very low density lipoprotein
- transports newly synthesised triglycerides and cholesterol from the liver back to muscle- and adipose tissue

LDL Low density lipoprotein
- transports the remaining cholesterol either back to the liver for conversion to bile acids, or to extrahepatic tissues for metabolism

HDL High density lipoprotein- a scavenger lipoprotein that adsorbs cholesterol

Relevant Drugs
1) STATINS
- statins are HMG-CoA (3-hydroxy-3- methylglutaryl-coenzyme A) reductase inhibitors
- HMG-CoA catalyzes the rate limiting step of cholesterol synthesis in the liver, thus blocking it will lead to a relative deficiency of cholesterol for synthesis of bile acids

- this leads to upregulation of LDL receptors, and following removal of LDL from the circulation
- statins also reduce VLDL production
  a- mevastatin
  Side effects
  - mild GI disturbances
  - mild sleep disturbances
  - mild skin rashes
  b-LOVASTATIN & SIMVASTATIN & PRAVASTATIN

2) FIBRATES
- fibrates are PPAR-alpha (peroxysome proliferator-activated receptor alpha) agonists- PPAR-alpha is an intracellular receptor regulating gene transcription of proteins responsible for lipid metabolism- consequences of PPAR-alpha upregulation include

DRUG NAME DESCRIPTION
fenofibrate Side effects
- myositis (inflammation of muscle)
- acute renal failure (due to myositis and following hemoglobinuria)
- mild GI disturbances

**CIPROFIBRATE & BENZAFIBRATE**

3) **RESINS**
- resins complex with bile salts in the intestines, thus inhibiting reabsorption through the enterohepatic circulation this results in deficiency of bile acids, upregulation of LDL receptors, and following removal of LDL from the circulation.

Ex Colestyramine& COLESTIPIL

*Side effects*
- nausea& vomiting
- bloating
- constipation or diarrhea
- fat-soluble vitamin deficiency

---

a-cardiac depressant
action
----------:
which depress excitation of cardiac & lesser activity to correct it is work so used in tachycardia & heart fibrillation

E.g. Quinidine

Dose
----------:
orally 200mg/3times daily
Contra indications;:- not used in C.H.F

b-anti- adrenergic B-receptor:-

E.g. propranolol (inderal) ® or (indicardin)®

Dose
----------:
10-40mg/ 3 times daily

Uses
----------:
1-hyper tension
2-angina pectoris

3:-vasodilater drug
Drugs that cause widening of blood vessels (mainly small arteries) and therefore an increase in blood flow. Because blood pressure depends partly on the diameter of blood vessels, vasodilators are used to lower blood pressure in hypertension. Coronary vasodilators increase the blood flow through the heart and are used to relieve or prevent angina. Peripheral vasodilators effect the blood flow to the limbs and are used to treat conditions of poor circulation, such as acrocyanosis (purple-blush discoloration of hands and feet due to slow circulation of blood in the skin), chilblains, and Raynaud's syndrome (poor circulation in hands and feet). Poor peripheral blood flow can also cause claudication (a cramp-like pain felt in the legs on walking or exercise). The main classes of vasodilator drugs are alpha blockers, nicotinic acid derivatives, nitrates, class II calcium antagonists, potassium channel activators, and ACE inhibitors. Potent vasodilators used in the treatment of severe hypertension include diazoxide, sodium nitroprusside, minoxidil, and hydralazine. The blood vessels are widened either by affecting the action of the muscles of the vessel walls (nitrates and calcium antagonists) or by interfering with nerve signals that govern the tone of the blood vessels (alpha blockers).

A/peripheral vasodilator action
------------
arterioles dilator of four limbs increase blood circulation & decrease itching & decrease redness

E.g. papaverine
it is alkaloid of isoquinoline derivatives which obtained from opium act as smooth muscle relaxant of B.V.S
Dose
-------: orally 30-60mg/daily or I/v given slowly

Contraindication
-------------------:- not used in glaucoma.

Uses
------:-
1-B.V.S spasm
2-heart tension
3-hyper tension
4-asthma

Quiz / 3
Define vasodilator drug
**Note**

- Check your answers in key answer page 172

B/ coronary vasodilators
it coronary vasodilators with out affecting on cardiac function & blood pressure.

Uses

--------:-

1-to prevent & treat angina pectoris
2-to treat G.H.F

E.g. sorbide nitrate (isordil)®

Dose

--------:-

Sublingual ( action appear after 5 min and continuous for 2 hours)
orally( action appear after 1/2 hour and continuous for 5 hours)

4:- hypotension drug

**Antihypertensive Drugs**

Hypertension refers to the prolonged and persistent elevation of blood pressure above the normal range, hypertension can cause severe complications such as stroke, coronary heart disease and kidney failure

**Classification of the Drugs**

Antihypertensive drugs that are commonly used can be classified into three categories:

1. Diuretics: They lower blood pressure by increasing urination. Common examples are hydrochlorothiazide and indapamide.
2. Vasodilators: They dilate blood vessels to lower blood pressure. One common example is nifedipine.
3. Other drugs: They achieve an effective control of the level of blood pressure by regulating bodily functions that governs blood pressure. Common examples are metoprolol, propranolol, methyldopa and captopril.

All antihypertensive drugs can only be sold on doctors’ prescription in registered dispensaries, and should be taken regularly according to medical instructions

**Side Effects of the Drugs**

Side effects of antihypertensive drugs vary with individual drugs. Common side effects include the following temporary reactions:

1. Headache, weakness or fatigue.
2. Dizziness upon rising quickly from a sitting or lying position.
3. Numbness or sharp pain in fingers or toes.
4. Cold hands and feet.
5. Dry eyes, mouth and throat.
6. Nightmares or sleeping difficulties.

Do not worry if you have any of these reactions. In most cases, such reactions would gradually subside after the drugs have been taken for some time. Consult a doctor right away if the adverse reactions persist or aggravate.

Advice on Medication
The following should be borne in mind when taking antihypertensive drugs:
1. Learn the name and dosage of the drugs you are taking.
2. Take the drugs regularly as instructed by your doctor in order to have effective control of hypertension. Keep on taking the drugs even if your conditions improve.
3. Do not stop medication without your doctor’s instruction. Take your medicines at the same fixed time every day as far as possible. If you miss a dose, take it as soon as possible unless it is almost time for the next scheduled dose. In that case, skip the missed dose and take the next dose as directed. Do not take double doses.
4. The drugs should not be taken with alcoholic drinks to avoid dizziness or fainting.
5. If you have to take other drugs as well such as cough syrup, drugs for common cold and anti-cough medicines, you should consult your doctor first to avoid affecting the efficacy of the antihypertensive drugs. You may bring along your medical history or labelled drug bags for your doctor’s reference during follow-up consultation.
6. Do not put different drugs in the same bottle. Each drug should be put into its original labelled container.
7. The stock of drugs should be sufficient for several days’ use. Do not wait till the last minute to fill the prescription.

Life Adaptations
People with hypertension should take note of the following in their daily lives:
1. Quit smoking.
2. Reduce salt intake. Eat less preserving and processed food such as sausages, pickles and potato chips.
3. Drink less caffeinated beverages like strong tea, coffee and coke.
4. Do moderate exercise regularly.
6. Learn self-relaxation because anxiety, loss of temper and overstrain all give rise to increased blood pressure.

Storage of the Drugs
The drugs should be stored in a cool and dry place. Generally, they do not need to be refrigerated unless otherwise stated in the drug labels. Also, they should be stored properly to avoid accidents of mistaken consumption by children.
(A)- Rauwolfia & it is alkaloid:-
   it cause C.N.S & peripheral depression
   E.g. reserpin rauwolfia plant (serpasi)®

Action
-------
1- vasodilater (hypotension)
2- bradycardiac
3- sedative to treat psychosis

Dose
-----
Orally 0.1-0.5mg as vasodilator
   1-5mg as sedative

(B)- antiadrenergic drug
   It cause depression of sympathetic chemical transmitter (post-ganglionic)
   E.g.: bethanidine esbatol®

Dose: orally 10 mg/ 3time daily dose can increase as needed

(C) - ganglionic depressant drug
   it depressant drug so depress nerve impulses
   E.g.; trimetaphan artonad ®
   Not used to treat arteriosclerosis but used to treat hypertension

(D) - enzyme depressant drug
   E.g. methydopa (aldomet)® used to treat hypertension
dose
----------:
   orally 250mg /3time daily can be increased as needed

5:- anti coagulants
   E.g  Heparin ----- pularin®

Action
-------:
Prevent conversion of prothrombine in to thrombin
Uses;
   1- pulmonary embolism
   2- thrombophlebitis

Not given orally it cause destroyed so given iv by dose 5000-15000 unit add to dextrose solution or Nacl solution
6:- homeostatic:
It stop bleeding by making coagulation process

E.g. Tranexamic acid (cyelokapron)®
Dose
-------:
orally tab 1gm/evry 8hrs
Or I/ v

* cholesterinosis depressant
Blood lipid included the falling:
1.Cholostrol triglyceride
2.phospholipids
3.fatty acid

E.g. clofibrate (atromids)®

Uses
--------:- to treat atherosclerosis

Dose
-------- : Orally 20-30 mg/kg B.W

5/ Post test

Circle the correct answer :-

9. It belongs to a group of drugs known as "fibrates:-

a-Lipitor Oral. b- Pravachol Oral
c- Tricor Oral d- all of them

2- Plaaterecording as
a- phase 1 b- phase2
c- phase 3 d- phase4

3- heart rate above 350 BPM:
a- ACTIVE ECTOPIC BEATS b- PAROXYSMAL TACHYCARDIA
c- FLUTTER d- FIBRILLATION

4- the myocyte reaching a membrane potential of +40 mV
a- Plateau b- Repolarization
c- Partial repolarization d- no one of them

5- local anesthesia drug used as antiarrhythmic drug
a- quindine b- PHENYTOIN
c- lidocaine d- no one of them

6- (inderal) ® is trade name of
a- Quinidine b- propranolol
c- Tranexamic acid d- methydopa

7-: Side effects mevastatin
a- mild GI disturbances b- mild sleep disturbances
c- mild skin rashes c- all of them

8- Dose Quinidine
a- orally 20mg/3times daily b- orally 100mg/3times daily.
c- orally 200mg/3times daily d- i/m 200mg/3times daily

9- PPAR-alpha
a- FIBRATES b- RESINS
c- Colestyramine d- COLESTIPIL

10- transports newly synthesised triglycerides and cholesterol from the liver back to muscle- and adipose tissue

a- LDL b- VLDL
c- HDL d-b&c

Note
- Check your answers in key answer page 171.
- ( 1 ) degree for each.
6/ key answer :-

1- Pre test :-
1  d                6- b
2  a                 7- d
3  c                  8- c
4  b                 9- d
5  b            10- a
If you :-
• got 9 or more you do not need to proceed .
• got less than 9 you have to study this modular unit well .

2- Post test :-
1.  c             6- b
2.  b             7- d
3.  d             8- a
4.  c              9- a
5.  c           10- b
If you :-
• got 9 or more , so congratulation your performance , go on studying modular unit three .
• got less than 9 , go back and study the second unit ; or any part of it ; again, and then do the post test again .
**Quiz 1**

**Pravachol Oral**

It belongs to a group of drugs known as "statins the risk of heart disease and helps prevent strokes and heart attacks.

**Quiz 2**

**Antiarrhythmic Drugs**

PHASE 0 *Rapid depolarization*

PHASE 1 *Partial repolarization*

PHASE 2 *Plateau*

PHASE 3 *Repolarization*

PHASE 4 *Pacemaker potential*

**Quiz 3**

**AMIODARONE**

*Side effects*
- tachycardia
- hypo- or hyperthyroidism (iodine, tissue accumulation)
1- photosensitivity  2 - visual disturbances
3- skin discoloration  4- neurological disturbances

**Quiz 4**

**vasodilator drug**

Drugs that cause widening of blood vessels (mainly small arteries) and therefore an increase in blood flow. Because blood pressure depends partly on the diameter of blood
vessels, vasodilators are used to lower blood pressure in hypertension. Coronary vasodilators increase the blood flow through the heart and are used to relieve or prevent angina.

Sources :-

1- Basic & Clinical Pharmacology (Basic and Clinical Pharmacology)

2- Katzung and Trevor's Pharmacology Anthony J. Trevor (Author), Bertram G. Katzung (Author), Susan B. Masters (Author) : McGraw-Hill Medical; Latest edition640 pages

3- Lippincott's Illustrated Reviews: Pharmacology (Lippincott's Illustrated Reviews Series) Richard D Howland (Author), Mary J Mycek (Author), Richard A Harvey (Author), Pamela C Champe (Author)
Paperback: 559 pages Publisher: Lippincott Williams & Wilkins; Latest edition

4- Goodman & Gilman's The Pharmacological Basis of Therapeutics Laurence Brunton (Author), John Lazo (Author), Keith Parker (Author)
Publisher: McGraw-Hill Professional; Latest edition
This lecture is designed for second year Technical Institute students Department of nursing. It will be assumed that students have an adequate Knowledge in Antihypertensive drugs; diuretics adrenergic blockers.

A. The student shall be able to describe specificity of Antihypertensive drugs.
B. The student shall be able to know type of diuretics.
C. The student shall understand mechanism action of diuretics.
Diuretics are one type of drugs effect on cardiovascular system and used to treat several disorder effects on cardiovascular system involve hypertension and we showed know about pharmacokinetic and pharmacognosy effect also therapeutic uses and side effect of these drug.

1 / D – Instructions:–

1. Study over view thoroughly.
2. Identify the goal of this modular unit.
3. Do the pre test
4. After studying the text of this modular unit, do the post test

2/ Performance Objectives

After studying the second modular unit, the student will be able to:

1. Define of hypertension drugs and diuretics.
2. Know the mode of action of diuretics.
3. Determine the types of abnormal value of blood pressure

3/ Pre test

Circle the correct answer:–
1. diuretic drugs are drugs that:
   a- increase fatty acid level.   b- increase the urinary output
   c- bronchodilator    d- prevent bleeding

2- “ceiling diuretics” the name of

   a- LOOP DIURETICS b- THIAZIDE DIURETICS
   c- CA (CARBONIC ANHYDRASE) INHIBITORS    d- OSMOTIC DIURETICS

3- LOOP DIURETICS may increase urinary output to

   a- 4 liters/day    b- 5 liters/day
   c- 45 liters/day    d- 45 mg/day

4- ACETAZOLAMIDE
   a- not used as a diuretic    b- not used as a diuretic
   c- treatment of epilepsy    d- all of them

5- THIAZIDE DIURETICS may increase urinary output to

   a- 0.1 liters/day    b- 1 liters/day
   c- 10 liters/day    d- 10 ml/day

6- THIAZIDE DIURETICS used as prophylaxis of urolithiasis
   a- increased tubular flow rate    b- no inhibition of calcium reabsorption
   c- a & b    d- no one of them

7- FUROSEMI DE used to treatment of systemic edema due to:
   a- due to left-sided congestive heart failure    b- right-sided congestive heart failure
   c- due to liver cirrhosis    c- increased water excretion

8- BENDROFLUMETHAZIDE used to treatment of diabetes insipidus:
a- paradoxal decrease in urinary output  
b- increased tubular flow rate and no inhibition of calcium reabsorption)  
c- due to decreased water reabsorption and vasodilation.  
d- no one of them

9- CA (CARBONIC ANHYDRASE) INHIBITORS may increase urinary output to  
a- 1 liters/day  
b- 10 liters/day  
c- 20 liters/day  
d- 30 liters/day

10- CA  
a- inhibit intracellular carbonic anhydrase  
b- decreased intracellular hydrogen ion concentration  
c- disruption of the hydrogen ion/sodium antiporter  
d- all of them

- Check your answers in key answer page 185.  
- ( 1 ) degree for each .

4/ the module contents

Diuretics these drug effect on kidney it increase urine secretion amount

Used to  
1-treat edema ascites in C.H.F  
2-renal disease
3-in treat hypertension
4-in toxicity of some drug
5-glaucoma

Types:
1:Mercurials

Action
----------:
increase reabsorption of Na & Cl while reabsorption of k in renal tubules it give injection only

2:thiazides (diuril)®

It inhibit reabsorption of Na & increase excretion of Na & water in urine & k

Uses
----------:
1-hyper tension
2-odema
Long use
----------:
1-hypokalemia
2-increase bolic acid in blood (gout)

1. ~ furosemide and ethacrynic acid
It strong diuretic act on descending part of henel loob it

↑Excretion of NaCl , water ,K , give orally or injection
Furosemide (Lasix)R
Ethacrynic acid (Edecrine)

2. carbonic anhydrase inhibit
it inhibit work of carbonic anhydrase w excretion H. ione in urine so lead to excretion of Na , water
used in glaucoma
e.g. Acetazolamide (Diamox)R

3. Aldosterone antagonist (Aldactone)R
This hormone cause reteus ion of Na , water and execrtion of K

4. Diuretic prevent loss of K
It not stronge pharma cology effect used with thiazide derivatine

5. Osmotic diuretics

⇒ osmotic pressure of blood
⇒ % Act :
↑Urine execrtion.
Uses: prevention and treatment of cerebral edema
Like glucose, mannitol, urea (in intracranial hypertension)

DIURETIC DRUGS

Overview
- Diuretic drugs are drugs that increase the urinary output. All diuretics (except osmotic diuretics) are drugs that inhibit sodium reabsorption from the renal tubules, resulting in an increased tubular oncotic pressure, decreased water reabsorption, and following increased urinary output.

Quiz / 1

Define diuretic

Note
- Check your answers in key answer page 186

Relevant Drugs
- 5 categories (listed from most- to least potent)
1) LOOP DIURETICS “ceiling diuretics”
- May increase urinary output to 45 liters/day (25% of glomerular filtrate)
- Inhibits the 1 sodium/2 chloride/1 potassium cotransported reabsorption of the thick ascending limb of the loop of Henle
- 3 types

<table>
<thead>
<tr>
<th>DRUG NAME</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>Furosemide General information</td>
<td></td>
</tr>
</tbody>
</table>
- Administered orally or IV
- Extensively bound to plasma proteins
- Eliminated by the organic acid transporter of the proximal tubule of the kidneys

Medical uses
- Treatment of severe hypertension
- Treatment of systemic edema (due to right-sided congestive heart failure)
- Treatment of pulmonary edema (due to left-sided congestive heart failure)
- Treatment of ascites (due to liver cirrhosis)
- Treatment of acute- and chronic renal failure (increased water excretion)
- Treatment of hypercalcemia (inhibition of calcium reabsorption)

Side effects
- Hypotension (hypovolemia)
- hypokalemia (inhibition of potassium reabsorption and increased tubular flow rate)

- metabolic alkalosis (due to hypokalemia)

- hypomagnesemia (increased tubular flow rate)

- hypocalcemia (increased tubular flow rate)

  - azotemia (competition between urea and loop diuretics at the organic acid transporter)

**Quiz / 2**

Mention therapeutic uses of diuretic

**Note**

- Check your answers in key answer page 186

**ETACRYNIC ACID** General information
- same as furosemide

2) THIAZIDE DIURETICS
- may increase urinary output to 10 liters/day (5% of glomerular filtrate)
- inhibits the sodium/chloride cotransported reabsorption of the distal tubule
- 3 types

**DRUG NAME DESCRIPTION**

**BENDROFLUMETHAZIDE** General information
- administered orally
- eliminated by the organic acid transporter of the proximal tubule of the kidneys

**Medical uses**
- treatment of hypertension (due to decreased water reabsorption and vasodilation)
- treatment of chronic resistant edema (together with loop diuretics)
- prophylaxis of urolithiasis (increased tubular flow rate and no inhibition of calcium reabsorption)
- treatment of diabetes insipidus (paradoxal decrease in urinary output)

**Side effects**
- hypotension (vasodilation)
- hyperglycemia (inhibition of insulin secretion)

- hypokalemia (increased tubular flow rate)

- metabolic alkalosis (due to hypokalemia)
- azotemia (competition between urea and thiazide diuretics at the organic acid transporter)

- hyperlipoproteinemia
- male impotence

HYDROCHLORTHIAZIDE *General information*
- same as bendrofluazide

CYCLOPENTHIAZIDE *General information*
- same as bendrofluazide

**Quiz / 3**

Mention side effect of bendrofluazide

**Note**

- Check your answers in key answer page 186

**3) CA (CARBONIC ANHYDRASE) INHIBITORS**
- may increase urinary output to 10 liters/day (5% of glomerular filtrate)
- carbonic anhydrase is the main enzyme responsible for metabolic pH buffering

**CARBONIC ACID**

**HYDROGEN ION + BICARBONATE ION**
- CA inhibitors inhibit intracellular carbonic anhydrase in the tubular epithelium of the distal tubule
- this leads to decreased intracellular hydrogen ion concentration and following disruption of the hydrogen ion/sodium antiporter
- 1 drug

**DRUG NAME DESCRIPTION**

**ACETAZOLAMIDE *General information***
- not used as a diuretic

**Medical uses**
- treatment of glaucoma (carbonic anhydrase is also involved in production of the aqueous humor of the eye)
- treatment of epilepsy

**Side effects**
- hypokalemia (increased tubular flow rate)
- metabolic acidosis (decreased hydrogen secretion and increased loss of bicarbonate due to no hydrogen ion in the tubular fluid to react with to form carbon dioxide and water)

**4) POTASSIUM-SPARING DIURETICS (“ALDOSTERONE RECEPTOR ANTAGONISTS”)**
- may increase urinary output to 5 liters/day (3% of glomerular filtrate)
- potassium-sparing diuretics antagonize the effect of aldosterone in the late distal tubule
- 3 types
DRUG NAME DESCRIPTION

spirnolactone General information
- direct antagonist of aldosterone at the intracellular aldosterone receptors in the late distal tubule, thus inhibiting expression of aldosterone-dependent sodium reabsorption, and potassium and hydrogen ion secretion
- administered orally

Medical uses
- coadministered with non-potassium sparing diuretics to preserve potassium
- treatment of hyperaldosteronism ("conn’s syndrome")

Side effects
- hyperkalemia (decreased potassium secretion)
- metabolic acidosis (decreased hydrogen secretion and hyperkalemia)
- testicular atrophy
- impotence
- gynecomastia
- amenorrhea

TRIAMTERENE General information
- indirect antagonist of aldosterone by blocking the aldosterone-dependent sodium reabsorption and potassium secretion
- administered orally

Medical uses
- coadministered with non-potassium sparing diuretics to preserve potassium

Side effects
- hyperkalemia
- metabolic acidosis (due to hyperkalemia)

AMILORIDE General information
- same as triamterene

Quiz / 3

Mention medical uses of spirnolactone

Note
- Check your answers in key answer page 186
5) OSMOTIC DIURETICS
- osmotic diuretics do not increase urinary output by the way of inhibition of sodium reabsorption
- however, osmotic diuretics also act by increasing the tubular oncotic pressure
- the osmotic diuretics are chemical compounds that are unable to leave the intravascular fluid space except at the large fenestrations of the glomerular capillaries (freely filtered), and are unable to be reabsorbed by the tubular epithelium
- this results in an increased intravascular- and tubular oncotic pressure
- 1 type

DRUG NAME DESCRIPTION
MANNITOL General information
- administered IV
Medical uses
- prophylaxis of acute renal failure (increased tubular flow rate)
- treatment of glaucoma (increased intravascular oncotic pressure)
- treatment of cerebral edema (increased intravascular oncotic pressure)

Side effects
- transient expansion of the intravascular fluid space

---

5/ Post test

Circle the correct answer :-

1- Side effects of MANNITOL:
   a- transient expansion of the intravascular fluid space.  b- adhesion
   c- permanent expansion of the intravascular fluid space  d- bleeding

2- Side effects of FUROSEMIDE
   a- hypomagnesemia  b- hypocalcemia
   c- hypotension       d- hypokalemia

3- mannitol dose as
   a- IV  b- IM
   c- orally   d- spray
4:- drug used to treatment of Conn's syndrome:
   a- LOOP DIURETICS  b- THIAZIDE DIURETIC
c- potassium-sparing diuretics  d- osmotic diuretics

5- azotemia mean
   a- increased tubular flow rate  b- decreased tubular flow rate
c- competition between urea and loop diuretics at the organic acid transporter
d- hypokalemia

6- Side effects of SPIRONOLACTONE
   a- testicular atrophy  b- impotence
c- gynecomastia  d- all of them

7- osmotic diuretics act by
   a- do not increase urinary output by the way of inhibition of sodium reabsorption
   b- act by increasing the tubular oncotic pressure
   c- a&b  d- no one of them

6. Execretion of NaCl, water,K, give orally or injection

8- Diamox is trade name of:
   a- Ethacrynic acid
   b- Acetazolamide.
c- Furosemide.
d- Aldosterone antagonist

9- the trade name of Furosemide is
   a- Aldactone  b- Edecrine
c- Diamox  d- Lasix

10- Diuretics Used to
   a- treat edema ascites in C.H.F  b- in treat hypertension
c- in toxicity of some drug  d- all of them
Note
- Check your answers in key answer page 185.
- (1) degree for each.

6/ key answer :-

1- Pre test :-
1. b 6-c
2. a 7-b
3. c 8-a
4. b 9-b
5. c 10-d

If you :-
- got 9 or more you do not need to proceed.
- got less than 9 you have to study this modular unit well.

2- Post test :-
1. a 6-d
2. d 7-c
3. a 8-b
4. c 9-d
5. c 10-d

If you :-
- got 9 or more, so congratulation your performance, go on studying modular unit three.
- got less than 9, go back and study the second unit; or any part of it; again, and then do the post test again.
**Quiz 1**
diuretic drugs are drugs that increase the urinary output all diuretics (except osmotic diuretics) are drugs that inhibit sodium reabsorption from the renal tubules this results in an increased tubular oncotic pressure, decreased water reabsorption, and following increased urinary output

**Quiz 2**
1-treat edema ascites in C.H.F
2-renal disease
3-in treat hypertension
4-in toxicity of some drug
5-glaucoma

**Quiz 3**
BENDROFLUMETHAZIDE
- treatment of hypertension (due to decreased water reabsorption and vasodilation)
- treatment of chronic resistant edema(together with loop diuretics)
- prophylaxis of urolithiasis (increased tubular flow rate and no inhibition of calcium reabsorption)
- treatment of diabetes insipidus(paradoxal decrease in urinary output)

**Quiz 4**
SPIRONOLACTONE
*Side effects*
- hyperkalemia (decreased potassium secretion)
- metabolic acidosis (decreased hydrogen secretion and hyperkalemia)
- testicular atrophy
- impotence
- gynecomastia
- amenorrhea
Sources :-

1- Basic & Clinical Pharmacology (Basic and Clinical Pharmacology)

2- Katzung and Trevor's Pharmacology Anthony J. Trevor (Author), Bertram G. Katzung (Author), Susan B. Masters (Author) : McGraw-Hill Medical; Latest edition640 pages

3- Lippincott's Illustrated Reviews: Pharmacology (Lippincott's Illustrated Reviews Series) Richard D Howland (Author), Mary J Mycek (Author), Richard A Harvey (Author), Pamela C Champe (Author)
Paperback: 559 pages Publisher: Lippincott Williams & Wilkins; Latest edition

4- Goodman & Gilman's The Pharmacological Basis of Therapeutics Laurence Brunton (Author), John Lazo (Author), Keith Parker (Author)
Publisher: McGraw-Hill Professional; Latest edition
1/ Over view

Antibiotics used for u.t.Infection  Drug used for urinary system . Anti-spasmodic drugs .nephron.

1 / A –Target population:-

This lecture is designed for second year Technical Institute students Department of nursing. It will be assumed that students have an adequate Knowledge in urinary tract infection and their best treatment .

Teaching Methods:
Lectures, Discussions, Data show, Seminars, and Handouts.

1 / B –Rationale :-

A. The student shall be able to describe anatomy of urinary tract
B. The student shall be able to know specificity of urinary tract drug
C. The student shall understand pharmacokinetic,therapeutic uses, side effect of these drug .
1 / C – Central Idea :-

1 - Definition
2- enumerate drug effect on urinary tract infection
3- enumerate Anti-spasmodic drugs

1 / D – Instructions:-

21.. Study over view thoroughly.
22.Identify the goal of this modular unit .
23.Do the pre test
24.After studying the text of this modular unit , do the post test

2/ Performance Objectives

determine pharmacokinetic and pharmacognosy Drug used for urinary system and understand mode of action of the renin angiotensin aldosterone system is primarily consumed with regulation of blood pressure

3/ Pre test

Circle the correct answer :-

1. the renin angiotensin aldosterone system is primarily consumed with:-
   a-. regulation of blood pressure   b- regulation of cholesterol level
c- regulation of fatty acid level       d- all of them

2- renin angiotensin decreased flow rate of preurine in the distal tubules of the nephrons due to

   a- decreased blood pressure in the glomeruli of the nephrons
   b- decreased glomerular filtration rate

   c- a&b                                           d- none of them

3- activation of the renin angiotensin aldosterone system is done by

   a- ANGIOTENSINOGEN to ANGIOTENSIN I only
   b- ANGIOTENSIN I to ANGIOTENSIN II
   c- ANGIOTENSINOGEN to ANGIOTENSIN I to ANGIOTENSIN II
   d- none of them

4: inhibit the enzymatic activity of renin, thus decrease the conversion of angiotensinogen to angiotensin I

   a- ACE inhibitors                                b- renin inhibitors
   c- beta-1 adrenoceptors                           d- none of them

5- ENALAPRIL administered

   a- IV                                              b- IM
   c- inhalation                                     d- orally

Note - Check your answers in key answer page 197.
A urinary tract infection, which often referred to as a UTI, is an infection which occurs in the urinary tract. The urinary tract encompasses the kidneys, ureter, bladder, urethra, and the prostate in males. Urinary tract infections can affect both men and women, adults and children.

The symptoms of a urinary tract vary a little bit and sometimes depend on the severity of the infection. Some patients experience nothing more than a burning sensation during urination. Others also experience fever and chills, pain in the lower back or abdomen, frequent and urgent urination, passing very little urine, feeling as though the bladder doesn’t empty, and unusual urine such as cloudy, dark, bloody, or unusual odor.

Urinary tract infections are caused by bacteria. Most often this bacterium enters the body through the vagina or the penis, and then travels through the urethra into the bladder or kidneys. This bacterium can also come from the digestive tract. It is not uncommon for the bacteria which cause urinary tract infections to enter the body regularly. The body typically rids itself of the bacteria before any type of infection sets in, however some patients are more susceptible while others may be susceptible due to a weakened immune system from poor sleep, poor diet, disease, or even fighting the common cold.
Women and children, especially little girls, are more at risk for urinary tract infections. Women and girls are placed at higher risk due to a higher rate of the bacterium entering the body. The bacteria can enter the bodies of women and girls more readily than boys or men as the distance that the bacterium travels is shorter. Women who use diaphragms, IUDs, un-lubricated condoms, and spermicidal condoms for birth control choices are at a higher risk for UTIs.

Diagnosing a urinary tract infection is not a difficult process. The physician will do a basic interview with the patient to determine fluid intake, birth control devices, if applicable, and request the patient describe the symptoms. X-rays, ultrasounds, or CT scans, if necessary, can reveal any blockage, swelling, or even if kidney stones are the cause of the symptoms described. However, most physicians can determine whether the patient is carrying a urinary tract infection or a kidney stone by the degree of pain the patient presents. Kidney stones typically present with intolerable pain while urinary tract infections are high in discomfort but still manageable. Urine tests can also help determine whether a urinary tract infection is present. A urinalysis can be the fastest determining factor if the physician is set up for testing on the facility site.

While most urinary tract infections are easy to treat and cause few complications, there is always a risk of complications when certain individuals come down with a urinary tract infection. Urinary tract infections in men can be difficult to treat. Pregnant women and older patients may get very ill from a urinary tract infection. Urinary tract infections can lead to dehydratation and hospitalization. Severe urinary tract infections can lead to the need for intravenous antibiotics and hospitalization. In third world countries where medicine is not readily available, people still die from urinary tract infections.

Urinary tract infections are treated with antibiotics, a three day treatment for mild infections and a seven day treatment for more serious infections. Medication may be administered to alleviate pain and make it easier to urinate while the infection clears. Drinking ample fluids, particularly apple juice or cranberry juice can help clear up a urinary tract infection as well as help prevent future infections.

For people who experience urinary tract infections regularly or have been diagnosed with UTIs more than once a year, some physicians allow the patient to keep antibiotics on hand to take at the first sign of illness. Drinking fluids that are rich in vitamin C but low in acid, like cranberry juice, can help ward off future infections. Urinating after sexual intercourse can help flush away bacteria that may be passed from partner to partner, and the choice of birth control and sexual protection can impact the frequency of urinary tract infections. Drinking lots of water and urinating when the urge strikes rather than waiting long periods of time is very helpful in preventing infections. After urination, women should use the toilet paper from front to back, especially after a bowel movement, to help eliminate the spreading of bacteria. Wearing cotton underwear and clothing that allows the area to breathe can help avoid future infections. Tight fitting jeans and thong underwear can contribute to urinary tract infections.
Coping with a urinary tract infection requires urinating when needed, drinking plenty of fluids, and taking the full round of antibiotics as prescribed, even when feeling better. Stopping the antibiotics too early will only encourage the infection to return.

- The renin angiotensin aldosterone system is primarily consumed with regulation of blood pressure. Initiation of the renin angiotensin aldosterone system is done by secretion of renin from the juxtaglomerular apparatus of the kidney nephrons in response to decreased flow rate of preurine in the distal tubules of the nephrons (due to decreased blood pressure in the glomeruli of the nephrons and following decreased glomerular filtration rate).

- Activation of the renin angiotensin aldosterone system is done in 2 (3) steps:
  - ANGIOTENSINOGEN to ANGIOTENSIN I to ANGIOTENSIN II
  - ANGIOTENSIN II - arterial vasoconstriction (primarily in the kidneys, heart and brain)
  - Increased sympathetic tone
  - Hypertrophy/hyperplasia of cardiac- and smooth muscle
  - Aldosterone secretion
  - ALDOSTERONE - sodium/water reabsorption by the kidneys
  - Potassium secretion by the kidneys and potassium uptake by the cells of the body
  - Hydrogen ion secretion by the kidneys (pH regulation)

**Quiz / 1**

Define renin angiotensin

**Note**

- Check your answers in key answer page 198

*Relevant Drugs*

- 5 categories
  1) BETA-1 ADRENERGIC RECEPTOR ANTAGONISTS
     - Beta-1 adrenoceptors are found in macula densa cells of the juxtaglomerular apparatus, and facilitate renin release upon activation

     - Beta-1 adrenoceptor antagonists thus inhibit renin release

**Quiz / 2**

Explain general information about aldosterone

**Note**

- Check your answers in key answer page 198
2) RENIN INHIBITORS
- renin inhibitors inhibit the enzymatic activity of renin, thus decrease the conversion of angiotensinogen to angiotensin I
- 1 type

<table>
<thead>
<tr>
<th>DRUG NAME</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>ENALKIREN</td>
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</table>

3) ACE INHIBITORS
- ACE inhibitors inhibit the enzymatic activity of ACE, thus decrease the conversion of angiotensin I to angiotensin II
- 3 types

<table>
<thead>
<tr>
<th>DRUG NAME</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENALAPRIL</td>
<td>General information</td>
</tr>
</tbody>
</table>
- administered orally
- prodrug
- extensive first-pass metabolism (conversion to active metabolites)

**Medical uses**
- treatment of hypertension (arterial vasodilation and decreased sodium/water retention)
- prophylaxis of angina pectoris and AMI (coronary artery vasodilation)
- treatment of cardiac failure (coronary arterial vasodilation, decreased hypertrophy/hyperplasia of cardiac muscle and decreased preload/afterload)
- treatment of chronic- and acute renal failure (decreased workload of the kidneys)

**Side effects**
- hypotension
- renal failure (renal ischemia, if bilateral renal artery stenosis is present)
- teratogenesis
- hyperkalemia (decreased potassium secretion and cell uptake)
- respiratory mucosal edema (ACE is also responsible for catabolizing bradykinin)
- dry cough (respiratory mucosal edema)

**Quiz / 3**
Mention medical uses of enalapril

**Note**
- Check your answers in key answer page 198
4) TYPE 1 ANGIOTENSIN II RECEPTOR ANTAGONISTS
- type 1 angiotensin II receptors are found in both arteries and renal tubules and are the primary receptors for angiotensin II action
- type 1 angiotensin II receptor antagonists are competitive antagonists of angiotensin II at type 1 angiotensin II receptors, thus decreasing their activation

- 2 types

<table>
<thead>
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<th>DRUG NAME</th>
<th>DESCRIPTION</th>
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<td>LOSARTAN</td>
<td>General information</td>
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<td></td>
<td>administered orally</td>
</tr>
<tr>
<td></td>
<td>Medical uses</td>
</tr>
<tr>
<td></td>
<td>treatment of hypertension (arterial vasodilation and decreased sodium/water retention)</td>
</tr>
<tr>
<td>VALSARTAN</td>
<td>General information</td>
</tr>
<tr>
<td></td>
<td>same as losartan</td>
</tr>
</tbody>
</table>

5) ALDOSTERONE RECEPTOR ANTAGONISTS (“POTASSIUM-SPARING DIURETICS”)

Define type 1 angiotensin II receptors and give the two types drugs

**Note**
- Check your answers in key answer page 198

**5/ Post test**

Circle the correct answer :-

1- ALDOSTERONE act as
a- sodium/water reabsorption by the kidneys.
b- potassium secretion by the kidneys and potassium uptake by the cells of the body

c- hydrogen ion secretion by the kidneys (pH regulation

d- all of them

2- ENALAPRIL used to prophylaxis of angina pectoris and AMI

   a- conversion to active metabolites  
   b- coronary artery vasodilatation

   c- arterial vasodilatation and decreased sodium/water retention

   d- decreased workload of the kidneys

3- type 1 angiotensin II receptors are found in

   a- arteries
   b- renal tubules

   c- both arteries and renal tubules
   d- muscle

4- LOSARTAN administered:

   a- orally
   b- IM

   c- IV
   d- spray

5- losartan used to treatment of hypertension

   a- arterial vasodilatation
   b- decreased sodium/water retention

   c- a & b
   d- no one of them

Note

- Check your answers in key answer page 197.
- (1) degree for each.
6/ key answer :-

1- Pre test :-
   1. a
   2. c
   3. c
   4. b
   5. d

If you :-
   • got 6 or more you do not need to proceed.
   • got less than 6 you have to study this modular unit well.

2- Post test :-
   1. d
   2. b
   3. c
   4. a
   5. c

If you :-
   • got 6 or more, so congratulation your performance, go on studying modular unit three.
   • got less than 6, go back and study the second unit; or any part of it; again, and then do the post test again.
**Quiz 1**

The renin-angiotensin-aldosterone system is primarily consumed with regulation of blood pressure. Initiation of the renin-angiotensin-aldosterone system is done by secretion of renin from the juxtaglomerular apparatus of the kidney nephrons in response to decreased flow rate of preurine in the distal tubules of the nephrons (due to decreased blood pressure in the glomeruli of the nephrons and following decreased glomerular filtration).

**Quiz 2**

**ALDOSTERONE**
- Sodium/water reabsorption by the kidneys
- Potassium secretion by the kidneys and potassium uptake by the cells of the body
- Hydrogen ion secretion by the kidneys (pH regulation)

**Quiz 3**

**ENALAPRIL**

**Medical uses**
- Treatment of hypertension (arterial vasodilation and decreased sodium/water retention)
- Prophylaxis of angina pectoris and AMI (coronary artery vasodilation)
- Treatment of cardiac failure (coronary arterial vasodilation, decreased hypertrophy/hyperplasia of cardiac muscle and decreased preload/afterload)
- Treatment of chronic- and acute renal failure (decreased workload of the kidneys)

**Quiz 4**

Type 1 angiotensin II receptors are found in both arteries and renal tubules and are the primary receptors for angiotensin II action. Type 1 angiotensin II receptor antagonists are competitive antagonists of angiotensin II at type 1 angiotensin II receptors, thus decreasing their activation. Two types of drugs: losartan & valsartan.
Sources :-

1- Basic & Clinical Pharmacology (Basic and Clinical Pharmacology)

2- Katzung and Trevor's Pharmacology Anthony J. Trevor (Author), Bertram G. Katzung (Author), Susan B. Masters (Author) : McGraw-Hill Medical; Latest edition640 pages

3- Lippincott's Illustrated Reviews: Pharmacology (Lippincott's Illustrated Reviews Series) Richard D Howland (Author), Mary J Mycek (Author), Richard A Harvey (Author), Pamela C Champe (Author)
Paperback: 559 pages Publisher: Lippincott Williams & Wilkins; Latest edition


8-
1/ Over view

Antibiotics used for UTI infection.

1/ A – Target population:

This lecture is designed for second year Technical Institute students Department of nursing. It will be assumed that students have an adequate Knowledge in antibiotic for UTI infection.

Teaching Methods:
Lectures, Discussions, Data show, Seminars, and Handouts.

1/ B – Rationale:

A. The student shall be able to describe antibiotic for UTI infection.
B. The student shall be able to know specificity of drug relive UTI pain
C. The student shall understand pharmacokinetic, therapeutic uses, side effect of antibiotic for UTI infection

1/C – Central Idea:
1. Explain all information about antibiotic used to treat UTI
2. Explain mode of action of another drug used to relieve pain before using antibiotic
3. Mention trade name of important antibiotic used for UTI

1/D – Instructions:
25. Study overview thoroughly.
26. Identify the goal of this modular unit.
27. Do the pre-test
28. After studying the text of this modular unit, do the post-test

2/ Performance Objectives
1. Determine pharmacokinetic and pharmacognosy & pharmacognosy of antibiotic used for urinary tract infection
2. Determine therapeutic uses and side effect of antibiotic used for urinary tract infection
3. Determine better course of drug used

3/ Pre-test
Circle the correct answer :-

1- Alternative Names of urinary tract infection
a-. Cystitis  b-. UTI
c-. a& b  d-. no one of them

2- the most common cause of UTIs, are increasing worldwide
a-. tricomonas  b-. Ecoli
c-. salmonella  d-. shighella

3- the antibiotic classes used most commonly to treat UTIs
a-. penicillins  b-. cephalosporin's.
c-. Fluoroquinolones  d-. all of them

4- Amoxicillin or Augmentin may be useful for UTIs caused by
a-. Gram-positive organisms  b-. Gram-negative organisms
c-. a& b  d-. no one of them

5- Ceftin is brand name of
a-. cephalexin  b-. cefixime
c-. cefuroxime  d-. cefadroxil

Note

- Check your answers in key answer page 207.
- ( 1 ) degree for each .
Urinary tract infections are caused by bacteria. Most often this bacterium enters the body through the vagina or the penis, and then travels through the urethra into the bladder or kidneys. This bacterium can also come from the digestive tract. It is not uncommon for the bacteria which cause urinary tract infections to enter the body regularly. The body typically rids itself of the bacteria before any type of infection sets in, however some patients are more susceptible while other may be susceptible due to a weakened immune system from poor sleep, poor diet, disease, or even fighting the common cold.

Alternative Names
Cystitis; UTI

Medications:
Although antibiotics are the first treatment choice for urinary tract infections, antibiotic-resistant strains of *E. coli*, the most common cause of UTIs, are increasing worldwide. As more bacteria have become resistant to the standard UTI treatment trimethoprim-sulfamethoxazole (TMP-SMX), more doctors have prescribed quinolone antibiotics to treat UTIs. In some areas, quinolones have now overtaken TMP-SMX as the most commonly prescribed antibiotic for UTIs. Researchers are concerned that resistance may develop to these drugs as well.

The following are some of the antibiotic classes used most commonly to treat UTIs:

**Beta-Lactams**
The beta-lactam antibiotics share common chemical features and include penicillins, cephalosporins, and some newer similar drugs.

*Penicillins (Amoxicillin).* Until recent years, the standard treatment for a UTI was 10 days of amoxicillin, a penicillin antibiotic, but it is now ineffective against *E. coli* bacteria in up to 25% of cases. A combination of amoxicillin-clavulanate (Augmentin) is sometimes given for drug-resistant infections. Amoxicillin or Augmentin may be useful for UTIs caused by Gram-positive organisms, including *Enterococcus* species and *S. saprophyticus*.

*Cephalosporins.* Antibiotics known as cephalosporins are also alternatives for infections that do not respond to standard treatments or for special populations. They are often classed as first, second, or third generation. Cephalosporins used for treatment of UTIs include cephalaxin (Keflex), cefadroxil (Duricef) cefuroxime (Ceftin), loracarbef (Lorabid), and cefixime (Suprax, among others).

*Other Beta-Lactam Drugs.* Other beta-lactam antibiotics have been developed. For example, pivmecillinam (a form of mecillinam), is commonly used in Europe for UTIs.
Quiz / 1

Define beta-lactam antibiotics

Note

- Check your answers in key answer page 208

Trimethoprim-Sulfamethoxazole (TMP-SMX)
The typical treatment is a 3-day course of the combination drug trimethoprim-sulfamethoxazole, commonly called TMP-SMX (such as Bactrim, Cotrim, or Septra). A 1-day course is somewhat less effective but poses a lower risk for side effects. Longer courses (7 - 10 days) work no better than the 3-day course and have a higher rate of side effects.

TMP-SMX should not be used in patients whose infections occurred after dental work or in patients allergic to sulfa drugs. Allergic reactions can be very serious. Trimethoprim (such as Proloprim or Trimex) is sometimes used alone in those allergic to sulfa drugs. TMP-SMX can interfere with the effectiveness of oral contraceptives. High rates of bacterial resistance to TMP-SMX exist in many parts of the United States.

Fluoroquinolones (Quinolones)
Fluoroquinolones (also simply called quinolones) are now becoming as widely used as TMP-SMX. They are the standard alternatives to TMP-SMX. Examples of quinolones include ofloxacin (Floxacin), ciprofloxacin (Cipro), norfloxacin (Noroxin), and levofloxacin (Levaquin).

Pregnant women should not take fluoroquinolone antibiotics. They also have more adverse effects in children than other antibiotics and should not be the first-line option in most situations.

Tetracyclines
Tetracycline include doxycycline, tetracycline, and minocycline. Treatment with tetracycline or doxycycline may be used for infections that are caused by Mycoplasma or Chlamydia. Tetracyclines have unique side effects among antibiotics, including skin reactions to sunlight, possible burning in the throat, and tooth discoloration. They cannot be taken by children or pregnant women.

Aminoglycosides
Aminoglycosides (gentamicin, tobramycin, amikacin) are given by injection for very serious bacterial infections. They can be given only in combination with other antibiotics. Gentamicin is the most commonly used aminoglycoside for severe UTIs. They can have very serious side effects, including damage to hearing, sense of balance, and kidneys.
Other Antibiotics Used Specifically for UTIs

*Nitrofurantoin.* Nitrofurantoin (Furadantin, Macrodantin) is an antibiotic that is used specifically for urinary tract infections as an alternative to TMP-SMX or a quinolone. Unlike many of the other drugs, however, it is usually taken for 7 - 10 days, even in cases of simple cystitis. It is not useful for treating kidney infections. Nitrofurantoin frequently causes stomach upset and interacts with many drugs. Other chronic or serious medical conditions may also affect its use. It should not be used in pregnant women within 1 - 2 weeks of delivery, in nursing mothers, or in those with kidney disease.

*Fosfomycin.* The antibiotic fosfomycin (Monurol) may be prescribed as a 1-dose treatment for women who are pregnant.

*Doripenem.* Doripenem (Doribax) is a new carbapenem antibiotic, which was approved in 2007 for the treatment of complicated urinary tract infections. It is given by injection.

---

**Quiz / 2**

Define Aminoglycosides

*Note*

- Check your answers in key answer page 208

**Medications for Treating Symptoms**

Although antibiotics can cure for most urinary tract infections, severe symptoms can persist for several days until treatment effectively eliminates the bacteria. A number of options are available for relieving symptoms until the antibiotics take action.

*Phenazopyridine.* Phenazopyridine (such as Pyridium, Uristat, Barodium, Eridium, and AZO Standard) relieves pain and burning caused by the infection. Patients should not take this medicine for more than 2 days.

Side effects include headache and stomach distress. The drug turns urine a red or orange color, which can stain fabric and be difficult to remove. Rarely, it can cause serious side effects, including shortness of breath, a bluish skin, a sudden reduction in urine output, shortness of breath, and confusion. In such cases, patients should immediately call the do

**Quiz / 3**

Explain drug for relieving symptoms until the antibiotics take action and side effect of these drug

*Note*
Antispasm Drugs. Methenamine (such as Atrosept, Prosed, and Urised) or flavoxate (Urispas) reduce bladder spasms, which may occur with some UTIs. These drugs can have severe side effects, however, that the patient should discuss with the doctor.

Quiz / 3
Mention better course day to treat UTI for
- trimethoprim-sulfamethoxazole
- Phenazopyridine
- Quinolone

Note

Circle the correct answer:

1- better course treatment of trimethoprim-sulfamethoxazole is a
   a- 3-day  b- 7 days
   c- 7 days  d- 7 - 10 days

2- Floxacin is brand name of
   a- ciprofloxacin  b- ofloxacin
   c- norfloxacin  d- levofloxacin

3- Nitrofurantoin is an antibiotic that is used for simple cystitis it is usually taken for
   a- 3-day  b- 7 days
   c- 7 days  d- 7 - 10 days

4- Doripenem treatment of complicated urinary tract infections. It is given by:
   a- orally  b- injection
   c- ointment  d- spray
5- Side effects of Phenazopyridine include headache and stomach distress

a- headache  b- stomach distress

Note
- Check your answers in key answer page 20.
- (1) degree for each.

6/ key answer:-

1- Pre test:-
1. c
2. b
3. d
4. a
5. c

If you:
• got 6 or more you do not need to proceed.
• got less than 6 you have to study this modular unit well.

2- Post test:-
1. a
2. b
3. d
4. b
5. c

If you:
• got 6 or more, so congratulation your performance, go on studying modular unit three.
• got less than 6, go back and study the second unit; or any part of it; again, and then do the post test again.

**Quiz 1**
The beta-lactam antibiotics share common chemical features and include penicillins, cephalosporins, and some newer similar drugs.

*Penicillins (Amoxicillin).* Until recent years, the standard treatment for a UTI was 10 days of amoxicillin, a penicillin antibiotic, but it is now ineffective against *E. coli* bacteria in up to 25% of cases. A combination of amoxicillin-clavulanate (Augmentin) is sometimes given for drug-resistant infections. Amoxicillin or Augmentin may be useful for UTIs caused by Gram-positive organisms, including *Enterococcus* species and *S. saprophyticus*

**Quiz 2**
Aminoglycosides (gentamicin, tobramycin, amikacin) are given by injection for very serious bacterial infections. They can be given only in combination with other antibiotics. Gentamicin is the most commonly used aminoglycoside for severe UTIs. They can have very serious side effects, including damage to hearing, sense of balance, and kidneys.

**Quiz 3**
*Phenazopyridine.* Phenazopyridine (such as Pyridium, Uristat, Barodium, Eridium, and AZO Standard) relieves pain and burning caused by the infection. Patients should not take this medicine for more than 2 days.

Side effects include headache and stomach distress. The drug turns urine a red or orange color, which can stain fabric and be difficult to remove. Rarely, it can cause serious side effects, including shortness of breath, a bluish skin, a sudden reduction in urine output, shortness of breath, and confusion. In such cases, patients should immediately call the doctor.

**Quiz 4**

trimethoprim-sulfamethoxazole for a *3-day*
Phenazopyridine for *2 days*
Quinolone for *7 - 10 days*
Sources:


Histamin; histaminic receptors antihistaminic drugs. Anti-H1, anti-H2. Ex: allermine, cyproheptadin, cemetidin; ranitidine; uses in peptic ulcer.

1/ A –Target population:-

This lecture is designed for second year Technical Institute students Department of nursing. It will be assumed that students have an adequate Knowledge in histaminic receptors antihistaminic drugs.

Teaching Methods:
Lectures, Discussions, Data show, Seminars, and Handouts.

1/ B –Rationale :-

1. The student shall describe the location and action of histamine and effects of histamine released in humans.
2. The student shall pharmacokinetic, therapeutic uses, trade name, side effect of these drug.

1 / C – Central Idea:

1 – Definition Histamine and Antihistamines
2- limited type histaminic receptor
3- enumerate drug under antihistaminic drug group

1 / D – Instructions

29. Study overview thoroughly.
30. Identify the goal of this modular unit.
31. Do the pre test
32. After studying the text of this modular unit, do the post test

2/ Performance Objectives

Histamine and Antihistamines
1. The student shall describe the location and action of histamine and effects of histamine released in humans.
2. The student shall recognize the difference between first and second-generation antihistamines, including the therapeutic uses, and side effects.
3. The student shall recognize some of the unique attributes among the drugs in the antihistamine class.
Circle the correct answer :-

1. antihistaminic drugs effect on:-
   a- H1 receptors .
   b- H2 receptors
   c- H1 receptors& H2 receptors
   d- no one of them

2- Antihistamine drug:--
   a diphenhydramine
   b- chorpheniramine
   c cyproheptadin
   d- a&b&c

3-( Polamine ) is the trade name of
   a diphenhydramine
   b- chorpheniramine
   c cyproheptadin
   d- a&b&c

4- histamine is primarily found in locations
   a CNS
   b- SYSTEMIC CIRCULATION
   c GI TRACT
   d- all of them

5- the first histaminergic receptors
   a- smooth muscle- CNS
   b- parietal cells of the gastric glands
   c- presynaptically in CNS neurons
   d- heart

- Check your answers in key answer page 20.
4/ the module contents

Histamin; histaminic receptors antihistaminic drugs. anti –H1 anti-H2 ex allergine, cyproheptadin, cemetidin; ranitidin; uses in peptic ulcer.

Histamine and Antihistamine
Histamine: organic compound compound of histamine as inactive in presence of some factor it release and act on H (receptor) affect on stomach secretion and HR.

Antihistamine drug:
1: diphenhydramine
   It lesser effect it have sedative effect (Allermin)R
2: chorpheniramine
   It have strong effect
e.g. Dextro chorpheniramine (Polarmine)R
3: cyproheptadine
   Strong effect short action (Periactin)R
4: cimetidine (Tagamet)R
   Strong antihistamine
   4 – 6 week can give i/v Give orally as tab. befor meal
5: Promethazine (Phenergan)R

Quiz/1
Define histamine

Note
- Check your answers in key answer page 15

Has sedative effect long duration.
HISTAMINE, H1 AND H2 RECEPTOR ANTAGONISTS
- histamine is a paracrine hormone and an inhibitory neurotransmitter
- histamine is primarily found in 3 locations
  1-CNS - histaminergic neurons
  2-SYSTEMIC CIRCULATION - granules of mast cells - granules of basophils
  3-GI TRACT - neuroendocrine cells in the glands of the GI
- histamine acts on histaminergic receptors
- there are 3 types of histaminergic receptors

RECEPTOR TYPE LOCATION
1-H1 - smooth muscle - CNS
2-H2 - parietal cells of the gastric glands - heart
3-H3 - presynaptically in CNS neurons

Quiz / 2
Enumerate primarily locations of histamine

Note
- Check your answers in key answer page 15

General Effects
ORGAN DESCRIPTION

<table>
<thead>
<tr>
<th>ORGAN</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNS</td>
<td>inhibition of neurotransmitter release</td>
</tr>
<tr>
<td>HEART</td>
<td>positive chronotropic effect (increased heart rate)</td>
</tr>
<tr>
<td>BLOOD VESSELS</td>
<td>vasodilation</td>
</tr>
<tr>
<td>Tissue</td>
<td>Effect</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>RESPIRATORY TRACT</td>
<td>bronchoconstriction</td>
</tr>
<tr>
<td>GI TRACT</td>
<td>increased gastric acid secretion</td>
</tr>
<tr>
<td>GENITO&amp; URINARY TRACT</td>
<td>contraction of uterus</td>
</tr>
</tbody>
</table>

**Quiz / 3**

Enumerate receptor of histamine

*Note*

- Check your answers in key answer page 15

**Relevant Drugs**
- 2 categories
  1) H1 RECEPTOR ANTAGONISTS ("ANTIHISTAMINES")
<table>
<thead>
<tr>
<th>No.</th>
<th>Drug name</th>
<th>description</th>
<th>Medical uses</th>
<th>Side effects</th>
</tr>
</thead>
</table>
| 1   | prometazine | - marked muscarinic receptor antagonist  
- weak local anaesthetic action  
- administered orally | treatment of emesis  
(especially motion sickness)  
- treatment of insomnia  
(sedative) | - diarrhea/constipation  
(GI smooth muscle contraction)  
- same as muscarinic receptor antagonists |
| 2   | diphenhydramine | =  
- may cross the blood brain barrier | = | = |
| 3   | cyclizine | administered orally  
- may cross the blood-brain barrier | treatment of emesis  
(especially motion sickness) | diarrhea/constipation  
- sedation |
| 4   | mequitazinene | = | treatment of anaphylactic reactions  
(allergic rhinitis, urticaria  
(allergic skin rashes), insect bites, drug hypersensitivities etc.) | - diarrhea/constipation |
| 5   | Centrizine & fexofenadine | = | = | = |

2) H2 RECEPTOR ANTAGONISTS
<table>
<thead>
<tr>
<th>No.</th>
<th>Drug name</th>
<th>description</th>
<th>Medical uses</th>
<th>Side effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>cimetidine</td>
<td>minor androgen receptor antagonism - also inhibit cytochrome P450 - administered orally, intramuscularly or IV</td>
<td>- treatment of peptic ulcer (gastric and/or duodenal) - treatment of reflux esophagitis</td>
<td>- - hypergastrinemia - diarrhea - gynecomastia (androgen receptor antagonism)</td>
</tr>
<tr>
<td>2</td>
<td>rantidine</td>
<td>- administered orally, intramuscularly or IV</td>
<td>=</td>
<td>- same as cimetidine (but no gynecomastia)</td>
</tr>
<tr>
<td>3</td>
<td>famotidine</td>
<td>=</td>
<td>=</td>
<td>=</td>
</tr>
<tr>
<td>4</td>
<td>nizatidine</td>
<td>=</td>
<td>=</td>
<td>=</td>
</tr>
</tbody>
</table>

**Quiz / 4**

Enumerate three of **H2 RECEPTOR ANTAGONISTS**

**Note**

- Check your answers in key answer page 15
Circle the correct answer :-

1- histamine acts on histaminergic receptors H3
   a-. presynaptically in CNS neurons       b- smooth muscle- CNS
   c- parietal cells of the gastric glands heart         d- no one of them

2- histamine effect on CNS
   a-stimulation of neurotransmitter release
   b- inhibition of neurotransmitter release
   c- no effect                  d- depression

3- prometazine act as
   a- H1 receptor antagonist       b- H2 receptor antagonist
   c- a&b                              d- H3 receptor antagonist

4- cimetidine act as:
   a- H1 receptor antagonist       b- H2 receptor antagonist
   c- a&b                              d- H3 receptor antagonist

5- Promethazine (phenergan ) R
   a- long duration                 b- Has sedative effect
   c-Has sedative effect long duration   d- Has sedative effect short duration

Note
- Check your answers in key answer page 20 .
- ( 2 ) degree for each .

6/ key answer :-

1- Pre test :-
   6.  c
   7.  d
8. b  
9. d  
10. a  

If you:-  
- got 9 or more you do not need to proceed.  
- got less than 9 you have to study this modular unit well.

2- Post test :-  
6. a  
7. b  
8. b  
9. b  
10. c  

If you:-  
- got 9 or more, so congratulation your performance, go on studying modular unit three.  
- got less than 9, go back and study the second unit; or any part of it; again, and then do the post test again.

Quiz 1  
Histamine: organic compound compound of histamine as inactive in presence of some factor it release and act on H (receptor) which affect on stomach secretion and HR

Quiz 2  
- histamine is primarily found in 3 locations  
1-CNS - histaminergic neurons  
2-SYSTEMIC CIRCULATION - granules of mast cells - granules of basophils  
3-GI TRACT - neuroendocrine cells in the glands of the GI

Quiz 3  
- there are 3 types of histaminergic receptors  
RECEPTOR TYPE LOCATION  
1-H1 - smooth muscle - CNS
2-H2 - parietal cells of the gastric glands - heart

3=H3 - presynaptically in CNS neurons

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<thead>
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<td>2</td>
<td>rantidine</td>
<td>- administered orally, intramuscularly or IV</td>
<td>=</td>
<td>- same as cimetidine (but no gynecomastia)</td>
</tr>
</tbody>
</table>

**Quiz 4**

2) H2 RECEPTOR ANTAGONISTS

**Sources :-**


2- Katzung and Trevor's Pharmacology Anthony J. Trevor (Author), Bertram G. Katzung (Author), Susan B. Masters (Author) : McGraw-Hill Medical; Latest edition640 pages

3- Lippincott's Illustrated Reviews: Pharmacology (Lippincott's
antihistaminic cyproheptadin , cemetidin ; ranitidine.

1 / A – Target population:-

This lecture is designed for second year Technical Institute students Department of nursing. It will be assumed that students have an adequate Knowledge in antihistaminic cyproheptadin , cemetidin ; ranitidine.

Teaching Methods:

Lectures, Discussions, Data show, Seminars, and Handouts.

1 / B – Rationale :-

1. The student shall describe the location and action of antihistaminic cyproheptadin , cemetidin ; ranitidine.

2. The student shall pharmacokinetic , therapeutic uses , trade name, side effect of antihistaminic cyproheptadin , cemetidin ; ranitidine.
1 / C – Central Idea :-

1 – Definition antihistaminic cyproheptadin, cemetidin, ranitidine.

2- limited type antihistaminic cyproheptadin, cemetidin, ranitidine.
3- enumerate drug under antihistaminic drug group

1 / D – Instructions

33. Study over view thoroughly.
34. Identify the goal of this modular unit.
35. Do the pre test
36. After studying the text of this modular unit, do the post test

2/ Performance Objectives

Histamine and Antihistamines
1. The student shall describe the location and action of histamine and effects of histamine released in humans.
2. The student shall recognize the difference between first and second-generation antihistamines, including the therapeutic uses, and side effects.
3. The student shall recognize some of the unique attributes among the drugs in the antihistamine class.
Circle the correct answer :

1-cyproheptadine formula

a-2-(5H-dibenzo [a,d]cyclohepten-5-ylidene)-1-methylpiperidine hydrochloride.
b- 3-(5H-dibenzo [a,d]cyclohepten-5-ylidene)-1-methylpiperidine hydrochloride
c- 4-(5H-dibenzo [a,d]cyclohepten-5-ylidene)-1-methylpiperidine hydrochloride
d-5-(5H-dibenzo [a,d]cyclohepten-5-ylidene)-1-methylpiperidine hydrochloride

2- **cyproheptadine hydrochloride** is:--
a- antihistaminic b- anticholinergic c- antiserotonergic d- all of them

3- **Uses Cyproheptadine is**
   a - to stimulate the appetite b- relieve **SSRI-induced sexual dysfunction** c c- c-
c--treatment of nightmares - d- a&b&c

4- **ranitidine formula**
a - N-(2-[(5-(dimethylaminomethyl)furan-2-yl)methylthio]ethyl)-N-methyl-2-nitroethene-1,1-diamine
b- N-(2-[(4-(dimethylaminomethyl)furan-2-yl)methylthio]ethyl)-N-methyl-2-nitroethene-1,1-diamine
c - N-(2-[(6(dimethylaminomethyl)furan-2-yl)methylthio]ethyl)-N-methyl-2-nitroethene-1,1-diamine
d- N-(2-[(8-(dimethylaminomethyl)furan-2-yl)methylthio]ethyl)-N-methyl-2-nitroethene-1,1-diamine
5- Cyproheptadine interacts with several other medications and can cause adverse reactions such as:

- MAOIs (monoamine oxidase inhibitors)
- Potassium salts
- a&b
- d- no one of them

Note:
- Check your answers in key answer page 20.
- (2) degree for each.

4/ The module contents

Cyproheptadine
Cyproheptadine (trade name Periactin) pronounced usually as cyproheptadine hydrochloride is an antihistaminic/anticholinergic and antiserotonergic agent. It also acts as a 5-HT$_2$ receptor antagonist as well as blocking calcium channels.

**Uses**

Cyproheptadine is used to treat allergic reactions. Cyproheptadine has shown effectiveness in the treatment of nightmares including nightmares related to post traumatic stress disorder.

Cyproheptadine has been used in the management of moderate to severe cases of serotonin syndrome (a complex of symptoms associated with the use of serotonergic drugs, such as selective serotonin reuptake inhibitors and monoamine oxidase inhibitors), and in the disease carcinoid in which serotonin is overproduced by tumor cells.

Cyproheptadine can also be used as a preventive measure against migraine in children and adolescents.

Cyproheptadine can relieve SSRI-induced sexual dysfunction and drug-induced hyperhydrosis (excessive sweating). Cyproheptadine is also used in the treatment of cyclical vomiting syndrome and to stimulate the appetite.

**Adverse effects**

While not specifically used as a sedative, cyproheptadine causes drowsiness, as is common with first-generation antihistamines.

Research has shown a suppression of growth hormone with doses of 8–12 mg per day taken for 5 days.
Other common side effects include: Dizziness

- Blurred vision
- Constipation
- Dry mouth, throat, or nose
- Excitability
- Nausea
- Nervousness
- Restlessness or akathisia

**Research**

Cyproheptadine has been shown to improve quality of sleep in sleep-deprived rats.[23]

Cyproheptadine interacts with several other medications such as MAOIs (monoamine oxidase inhibitors) and potassium salts and can cause adverse reactions. Anti-cholinergic medications such as Cyproheptadine, when used in conjunction with oral potassium salts, can cause slowing of GI transit and increases the local exposure to high potassium concentrations. High potassium concentrations may lead to GI tract ulceration or stenosis.

Periactin (cyproheptadine) 4 mg tablets

![Periactin](image)

**Ranitidine**

![Ranitidine](image)
**Systematic (IUPAC) name**

\[ N-(2-[(5-(dimethylaminomethyl)furan-2-yl)methylthio]ethyl)-N-methyl-2-nitroethene-1,1-diamine \]

**Ranitidine** (trade name **Zantac**) is a histamine H2-receptor antagonist that inhibits stomach acid production. It is commonly used in treatment of peptic ulcer disease (PUD) and gastroesophageal reflux disease (GERD). Ranitidine is also used alongside fexofenadine and other antihistamines for the treatment of skin conditions such as hives. Ranitidine is also known to give false positives for methamphetamine on drug tests.

**Medical use**

Certain preparations of ranitidine are available over the counter (OTC) in various countries. In the United States, 75 mg and 150 mg tablets are available OTC. Zantac OTC is manufactured by **Boehringer Ingelheim**. In Australia, packs containing 7 or 14 doses of the 150 mg tablet are available in supermarkets, small packs of 150 mg and 300 mg tablets are **Schedule 2 Pharmacy Medicines**. Larger doses and pack sizes still require a prescription.

Outside the United States, ranitidine is combined with bismuth (which acts as a mild antibiotic) as a citrate salt (ranitidine bismuth citrate, Tritec), to treat *Helicobacter pylori* infections. This combination is usually given with clarithromycin, an antibiotic.

Ranitidine's main role is in treating gastric and duodenal ulcers and gastroesophageal reflux disease. It is also used to treat pediatric reflux, where it is preferred over a PPI, because it does not induce histologically relevant hyperplastic changes in the parietal cells. Liquid formulations are available for administering to children.

Ranitidine can also be co-administered with NSAIDs to reduce the risk of ulceration.

Ranitidine can be administered preoperatively to reduce the risk of aspiration pneumonia. The drug not only increases gastric pH, but also reduces the total output of gastric juice. Ranitidine may have an antiemetic effect when administered preoperatively.

It can be administered IV in intensive care units to critically ill patients (particularly geriatric ones) to reduce the risk of gastric bleeding.

The usual dose of ranitidine is either 150 mg twice a day or 300 mg once every twenty four hours, usually at night. For ulcer treatment, a 300 mg nighttime dose is especially important - as the increase in gastric/duodenal pH promotes healing overnight when the stomach and duodenum are empty. Conversely, for treating reflux, smaller and more frequent doses are more effective.
Ranitidine used to be administered long term for reflux treatment, sometimes indefinitely. However, PPIs have taken over this role.

In some patients with severe reflux, up to 600 mg of ranitidine can be administered daily, usually in 4 lots of 150 mg. Such a high dose was not unusual in the past, but nowadays a once-a-day PPI is used instead - both for convenience and because they are more effective in raising gastric pH. Patients with Zollinger-Ellison syndrome have been given doses of 6000 mg per day without any harm.

**Adverse effects**

Ranitidine's main side effects are confusion and depression, although these are very rare and are usually only seen in older people.

**History and development**

Ranitidine was developed by Sir James Black, graduate of the University of St Andrews Bute Medical School, who at the time worked for Glaxo Pharmaceuticals. In an effort to match the success of Smith, Kline & French (prior to the merger of the two companies into GlaxoSmithKline), Glaxo developed cimetidine as the first histamine H₂-receptor antagonist. Ranitidine was the result of a rational drug-design process using what was by then a fairly refined model of the histamine H₂-receptor and quantitative structure-activity relationships (QSAR).

Glaxo refined the model further by replacing the imidazole-ring of cimetidine with a furan-ring with a nitrogen-containing substituent, and in doing so developed ranitidine. Ranitidine was found to have a far-improved tolerability profile (i.e. fewer adverse drug reactions), longer-lasting action, and ten times the activity of cimetidine. Ranitidine has 10% the affinity that cimetidine has to CYP450 so it causes fewer side effects, but other H₂ blockers famotidine and nizatidine have no CYP450 significant interactions. [1]

Ranitidine was introduced in 1981 and was the world's biggest-selling prescription drug by 1988. It has since largely been superseded by the even more effective proton pump inhibitors, with omeprazole becoming the biggest-selling drug for many years. When omeprazole and ranitidine were compared in a study of 144 people with severe inflammation and erosions or ulcers of the esophagus, 85% of those treated with omeprazole healed within eight weeks, compared to 50% of those given ranitidine. In addition, the omeprazole group reported earlier relief of heart burn symptoms.
Zantac (ranitidine) 300 mg tablets

5/ Post test

Circle the correct answer :

1- Other common side effects cyproheptadine
   a-. Constipation                b- Dry mouth, throat, or nose
   c- Excitability d- no one of them

2- Ranitidine's main side effects are
   a- confusion                   b- depression
   c- confusion and depression    d- no one of them

3- rantidine is commonly used in treatment
   a- peptic ulcer disease (PUD)   b- gastroesophageal reflux disease (GERD).
   c- treatment of skin conditions d- all of them

4- cimeti


a- H1 receptor antagonist      b- H2 receptor antagonist

5- The usual dose of ranitidine is
   a- 150 mg once a day         b- 150 mg twice a day
   c- 150 mg three a day        d- 15 mg twice a day

Note

- Check your answers in key answer page 20.
- (2) degree for each.

6/ key answer :-

1- Pre test :-
   1.  b
   2.  a
   3.  d
   4.  a
   5.  c

   If you :-
   • got 9 or more you do not need to proceed.
   • got less than 9 you have to study this modular unit well.

2- Post test :-
   1.  d
   2.  c
   3.  d
   4.
   5.  b
If you:

- got 9 or more, so congratulation your performance, go on studying modular unit three.
- got less than 9, go back and study the second unit; or any part of it; again, and then do the post test again.

**Quiz 1**

*Cyproheptadine* (trade name *Periactin*) pronounced usually as *cyproheptadine hydrochloride* is an *antihistaminic/anticholinergic* and *antiserotonergic* agent. It also acts as a *5-HT<sub>2</sub> receptor antagonist* as well as blocking *calcium channels*.

**Quiz 2**

- Other common side effects include: Dizziness
  
  - Blurred vision
  - Constipation
  - Dry mouth, throat, or nose
  - Excitability
  - Nausea
  - Nervousness
  - Restlessness or *akathisia*

**Quiz 3**

*Ranitidine* (trade name *Zantac*) is a *histamine H<sub>2</sub>-receptor antagonist* that inhibits *stomach acid* production. It is commonly used in treatment of *peptic ulcer* disease (PUD) and *gastroesophageal reflux* disease (GERD). Ranitidine is also used alongside *fexofenadine* and other antihistamines for the treatment of skin conditions such as *hives*. Ranitidine is also known to give false positives for *methamphetamine* on drug tests.

**Quiz 4**

*Medical use*

Outside the United States, ranitidine is 1-combined with *bismuth* (which acts as a mild *antibiotic*) as a to treat *Helicobacter pylori* infections.
2- Ranitidine's main role is in treating gastric and duodenal ulcers and gastroesophageal reflux disease.

3- Ranitidine can also be co-administered with NSAIDs to reduce the risk of ulceration.

4- Ranitidine can be administered preoperatively to reduce the risk of aspiration pneumonia.
This lecture is designed for second year Technical Institute students Department of nursing. It will be assumed that students have an adequate Knowledge in Antibiotics bacteriostatics.

**Teaching Methods:**
Lectures, Discussions, Data show, Seminars, and Handouts.

1 / B – Rationale :-
A. The student shall be able to describe specificity of antibiotic
B. The student shall be able to know medical uses, side effect, pharmacokinetic of anti tuberculosis & anti leprosy drug
C. The student shall understand dose and side effect of these drug

1 / C – Central Idea :-
1 – Definition
2 – classification of bacteriostatic
2 – mode of action, side effect, therapeutic uses & dose of bacteriostatic and mention anti tuberculosis and anti leprosy drug

1 / D – Instructions:
37. Study overview thoroughly.
38. Identify the goal of this modular unit.
39. Do the pre test
40. After studying the text of this modular unit, do the post test

2/ Performance Objectives
1. The student shall appreciate the general concepts of mechanism of actions, choice of antibiotics, spectrum of activity and resistance, antibiotic combinations, bacteriostatic prophylaxis, pharmacokinetics and toxicity.

2. The student shall be able to describe the chemistry, mechanism of action, resistance, pharmacokinetics, toxicity and therapeutic uses for sulfonamides, trimethoprim- other beta-lactam antibiotics, va, macrolides and ketolides, clindamycin, spectinomycin, streptogramins, oxazolidinones, fosfomycin, bacitracin, metronidazole, fluoroquinolones, cyclic lipopeptides, polymyxins, and urinary tract antiseptics.

**3/ Pre test**

Circle the correct answer :-

1. POLYMIXINS effect on :-
   a- gram -ve.  
   b- gram +ve  
   c- gram –ve& gram +ve  
   c- no effect

2. side effect of isoniazid
   a- arthritis  
   b- vasculitis  
   c- hepatotoxicity  
   d- all of them

3. optic neuritis is side effect of
   a- ISONIAZID  
   b- ETHAMBUTOL  
   c- PYRAZINAMIDE  
   d- DAPSONE

4. Hansen disease mean :
   a- tuberculosis  
   b- leprosy  
   c- bronchitis  
   d- allergy
5- ISONIAZID
a- inhibits mycolic acid synthesis  b- inhibits cell wall synthesis
c- inhibits DNA ,RNA synthesis  d- inhibits fat synthesis

Note
- Check your answers in key answer page 20.
- (2) degree for each.

4/ the module contents

ANTIBIOTICS
- antibiotics used in the treatment of neoplastic diseases act on cellular events preceding mitosis, thus are relatively specific for the highly mitotic cells of neoplasms- due to the same reason, they have the same effect on physiological tissues and less active

Antibiotics ; classification ; bacteriostatics ;bactericidal penicillin's cephalosporin

Antibiotic:-
Two type according to action
1. bacteriostatic
2. bactericidal

Classify according mechanism work :-
1. cell wall inhibitors ; pencillin , cephalosporim
2. protin biosyn thesis inhibitors ; aminoglycoside , tetracycline , chloramphincol
3. nucleic acid inhibitors ; DNA , inhibitor , RNA

4. cell membarane inhibitors polymyxin
5. competitive antagonist sulfanamides

Quiz / 1
Classification of antibiotic according to mode of action

Note
DETERGENTS
1) POLYMIXINS  bacteriocidal
- polymixins are detergents that dissolve lipoprotein membranes
Medical uses treatment of gastrointestinal overgrowth by gram – bacteria

ANTITUBERCULOTIC DRUGS
- tuberculosis is a chronic persistent systemic inflammation caused by mycobacterium tuberculosis
- mycobacterium tuberculosis is an airborne bacteria entering the airways in droplet nuclei leading to formation of primary caseating granulomatic lesions in the lungs

- form here, mycobacterium tuberculosis may spread by the pulmonary veins to cause secondary caseating granulomatic lesions in virtually any tissue of the body

Quiz / 2
Define polymixins

Note

- Check your answers in key answer page 15

Relevant Drugs

FIRST-CHOICE ANTITUBERCULOTIC DRUGS
1-ISONIAZID (bacteriostatic)
- inhibits mycolic acid synthesis, thus rendering the mycobacteria susceptible to oxidative burst in the phagolysosomes of macrophages
- administered orally- may cross the blood-brain barrier

Side effects
- hypersensitivity reactions leading to fever
and/or skin rashes
- arthritis
- vasculitis
- hepatotoxicity
- central- and/or peripheral neuropathies (if vitamin B6 deficiency)
- hemolytic anemia (if glucose-6-phosphate dehydrogenase deficiency)
2-ETHAMBUTOL

*Side effects*
- optic neuritis leading to red-green color
- Blindness

*Quiz / 3*

Mention side effect of isoniazid

*Note*
- Check your answers in key answer page 15

3-PYRAZINAMIDE
- prodrug
- activated by pyrazinamidase pyrazinamidase is only active at low pH thus pyrazinamide is only active in the phagolysosomes of macrophages pyrazinamidase is an enzyme only present in mycobacteria thus pyrazinamide is only effective against mycobacteria

3-RIFAMPICIN

PHASES DESCRIPTION

2) SECOND-CHOICE ANTITUBERCULOTIC DRUGS
- second-choice antituberculotic drugs are drugs administered against mycobacterium tuberculosis infections if the mycobacteria exhibit resistance to the first-choice antituberculotic drugs

<table>
<thead>
<tr>
<th>DRUG NAME</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-CAPREOMYCIN</td>
<td>2-CYCLOSERINE</td>
</tr>
</tbody>
</table>

ANTI-LEPROSY DRUGS
- leprosy (“hansen disease”) is a systemic infection primarily affecting skin and peripheral nerves caused by mycobacterium leprae

1-DAPSONE

*Mode of action*
inhibiting folate synthesis and following inhibition of bacterial DNA- and RNA synthesis, thus is bacteriostatic administered orally

*Medical uses*
- treatment of paucibacillary leprosy
- treatment of multibacillary leprosy
(then administered in conjunction with rifampiciin and clofazimine)
- treatment of malaria

**Side effects**
- hypersensitivity reactions leading to fever and/or skin rashes
- nausea and vomiting
- hemolysis
- methemoglobinemia
- peripheral neuropathies

2-CLOFAZIMINE
- a complex dye
- mechanism of action is unknown administered orally

**Medical uses**
- treatment of multibacillary leprosy

**Side effects**
- red discoloration of skin and urine
- dark blue discoloration of leprous skin lesions
- headache
- vertigo
- nausea and vomiting

3-RIFAMPICIN
- a first-choice antituberculotic drug

MULTIBACILLARY LEPROSY
2) SECOND-CHOICE ANTI-LEPROSY DRUGS
1-OFLOXACIN 2- AZITHROMYCIN

**Quiz / 4**

Mention antileprosy drug

**Note**
- Check your answers in key answer page 15

5/ Post test
Circle the correct answer :-

1- polymixins are detergents that dissolve:
   a- lipoprotein tissue      b- fat tissue
   c- blood                   d- c&b

2- mode of action of bacteriostatic
   a- killing bacteria       b- pervert growth of bacteria
   c- a&b                    d- increase growth of bacteria

3- sulfonamides is
   a- competitive antagonist b- cell membrane inhibitors
   c- inhibitor, RNA         d- protein biosynthesis inhibitors

4- the drug activated by pyrazinamidase:
   a- ISONIAZID               b- ETHAMBUTOL
   c- PYRAZINAMIDE           d- DAPSONE

5- Side effects DAPSONE
   a- hemolysis              b- nausea
   c- vomiting               d- all of them

Note
- Check your answers in key answer page 20.
- (2) degree for each.
6/ key answer :-

1- Pre test :-
1. c
2. d
3. b
4. b
5. a

If you :-
• got 6 or more you do not need to proceed .
• got less than 6 you have to study this modular unit well .

2- Post test :-
1. a
2. b
3. a
4. c
5. d

If you :-
• got 6 or more , so congratulation your performance , go on studying modular unit three .
• got less than 6, go back and study the second unit ; or any part of it ; again, and then do the post test again .
**Quiz 1**

polymixins are detergents that dissolve lipoprotein membranes

*Medical uses* treatment of gastrointestinal overgrowth by gram – bacteria

there action on the living organism

**Quiz 2**

Antibiotic:-

Two type according to action

3. bacteriostatic
4. bactericidal

**Quiz 3**

1-ISONIAZID

- hypersensitivity reactions leading to fever
and/or skin rashes
- arthritis
- vasculitis
- hepatotoxicity
- central- and/or peripheral neuropathies (if vitamin B6 deficiency)
- hemolytic anemia (if glucose-6-phosphate dehydrogenase deficiency)

**Quiz 4**

ANTI-LEPROSY DRUGS

1-DAPSONE
2-CLOFAZIMINE
3-RIFAMPICIN
4-OFLOXACIN
5- AZITHROMYCIN
Sources :-

1- Basic & Clinical Pharmacology (Basic and Clinical Pharmacology)

2- Katzung and Trevor's Pharmacology Anthony J. Trevor (Author), Bertram G. Katzung (Author), Susan B. Masters (Author) : McGraw-Hill Medical; Latest edition640 pages

3- Lippincott's Illustrated Reviews: Pharmacology (Lippincott's Illustrated Reviews Series) Richard D Howland (Author), Mary J Mycek (Author), Richard A Harvey (Author), Pamela C Champe (Author)
Paperback: 559 pages Publisher: Lippincott Williams & Wilkins; Latest edition

4- Goodman & Gilman's The Pharmacological Basis of Therapeutics Laurence Brunton (Author), John Lazo (Author), Keith Parker (Author)
Publisher: McGraw-Hill Professional; Latest edition

1/ Over view
Antibiotics; classification; bacteriocidal

1/A – Target population:

This lecture is designed for second year Technical Institute students Department of nursing. It will be assumed that students have an adequate Knowledge in Antibiotics.

Teaching Methods: Lectures, Discussions, Data show, Seminars, and Handouts.

1/B – Rationale:

A. The student shall be able to describe specificity of antibiotic
B. The student shall be able to know classification of antibiotic.
C. The student shall understand dose and side effect of these drug

1/C – Central Idea:

1 – Definition
2 - classification of antibiotic
2 – mode of action, side effect, therapeutic uses & dose of bacteriostatic

1/D – Instructions:

41. Study overview thoroughly.
42. Identify the goal of this modular unit.
43. Do the pre test
44. After studying the text of this modular unit, do the post test
1. The student shall appreciate the general concepts of mechanism of actions, choice of antibiotics, spectrum of activity and resistance, antibiotic combinations, antibiotic prophylaxis, pharmacokinetics and toxicity.

2. The student shall be able to describe the chemistry, mechanism of action, resistance, pharmacokinetics, toxicity and therapeutic uses for sulfonamides, trimethoprim-sulfamethoxazole, penicillins, cephalosporins, other beta-lactam antibiotics, vancomycin, aminoglycosides, tetracyclines, chloramphenicol, macrolides and ketolides, clindamycin, spectinomycin, streptogramins, oxazolidinones, fosfomycin, bacitracin, metronidazole, fluoroquinolones, cyclic lipopeptides, polymyxins, and urinary tract antiseptics.

Circle the correct answer :-

2. antibiotic mean:-
   a- bactericidal                  b- bacteriostatic
   c- anti-inflammatory drug       d- bactericidal & bacteriostatic

2- antibiotic which cell wall inhibiter:
   a- penicillin                  b- cephalosporin
   c- a&b                         d- amino glycoside

3- long duration of penicillin G (benzyl penicillin)
   a - every 6 – 12 hr             b- every 2 – 4 hr
c- every 24 hr          d- every 32 hr
4- Amino glycosides     b- nephrotoxicity
a- has ototoxic effect   c- shock        d- a&b

5- Terramycin is trade name of

a- chlortetracycline     b- Terramycin
b- Achromycin             c- doxycyclin

Note
- Check your answers in key answer page 249
- ( 2 ) degree for each.

4/ the module contents

ANTIBIOTICS
- antibiotics used in the treatment of neoplastic diseases act on cellular events preceeding mitosis, thus are relatively specific for the highly mitotic cells of neoplasms due to the same reason, they have the same effect on physiological tissues and less active

*Quiz / 1*

define antibiotics

*Note*
- Check your answers in key answer page 250

Antibiotic:-
Two type according to action
5. bacteriostatic
6. bacteriocidal
Classify according mechanism work :-
6. cell wall inhibitors; penicillin, cephalosporin
7. protein biosynthesis inhibitors; aminoglycoside, tetracycline, chloramphenicol
8. nucleic acid inhibitors; DNA, inhibitor, RNA
9. cell membrane inhibitors; polymyxin
10. competitive antagonist; sulfanamides

PENICILLIN
It is bactericidal; acts as cell wall inhibitor
1. penicillin G; (benzyl penicillin), soluble crystalline, act rapidly for short period / every 6–12 hr / I.m. inj / not give orally it destroyed by gastric juice, has powerful effect against G+ve organism
2. long acting; e.g. benzathine penicillin, pen. / I.m 1-2 daily / long acting several day – week
3. penicillinase resistant; e.g. methicillin, nafcillin → i.m cloxacillin, oxacillin, dicloxacillin → give orally
4. broad spectrum penicillin; ampicillin, hetacilline, amoxycillin, carbenicillin against G+ve, G-ve / all give orally only carbenicillin / I.m

Side effect of penicillin:
1. allergy
2. renal failure
3. convulsion and coma

Quiz / 2
Classification of antibiotic

Note
- Check your answers in key answer page 250

Aminoglycosides
Bactericidal / against G-ve
Used as inj / narrow spectrum G.I.T penetrate C.S.F / not used in meningitis
Side effect:
1. has ototoxic effect
2. not give to pregnancy / penefrate placenta
3. nephrotoxicity

Compound;-
Streptomycin, neomycin, kanamycin, gentamycin, tebramycin

Tetracycline;
Include many compounds;-

240
1. tetracycline (Achromycin)
2. chlortetracycline (Aureomycin)
3. oxytetracyclin (Terramycin)
4. doxycyclin (Vibramycin)
5. minocyclin (Minocin)

it broad – spectrum /given orally.

Toxicity effect:
1. colouring teeth and bone deformation in embryo and children
2. liver toxicity
3. photosensitivity

**Quiz /3**

Enumerate tetracycline compound

**Note**
- Check your answers in key answer page 250

Lincomycin
Has great effect against G+ve bacteria easily absorbed by G.I.T
Used for chronic bone inflammation
Brand name: lincocin(R)

Chloramphenical
It broad spectrum against G-ve / G +ve bacteria
It passing placenta so not give in pregnancy.

Side effect:

1. Aplastic anaemia by depress R B C formation in bone marrow
2. Nusea , vomiting and diarrhea
3. Baby _ Gray syndrome

Samaphenicol R, chloramycetin R

Cephalosporines:-

It cell wall inhibitors , broad spectrum

1. Cephalo thin (Keflir) R  it broad spectrum against G+ve bacteria , give by
   intection only
2. Cephalozodin (Kefzol) R
Used as inj . against klebsella and E-col:
3. Cephaloridin (Ceporan)\(^R\)  
4. cephalexin (Keflex)\(^R\)  
   Broad spectrum used to treat septicaemia and meningitis  1g/ every 12 hr in high  
   does 1gm/8hr  

**Quiz / 2**

Enumerate side effect of cloramphenicol

**Note**

- Check your answers in key answer page 250

---

**5/ Post test**

Circle the correct answer :-

1: broad spectrum penicillin  
   a - hetacilline.  
   b - amoxicillin  
   c - carbenicillin  
   c - all of them

2- A plastic anemia's Side effect of  
   a- penicillin  
   b- cephalosporin  
   c- clormphenicol  
   d- amino glycoside

3- Keflir is trade name of  
   a - Cephalothin  
   b - Cephalozodin  
   c - Cephaloridin  
   d - cephalexin

4- coloring teeth and bone deformation in embryo is side effect of :  
   a- penicillin  
   b - tetracycline  
   c - Cephalothin  
   d -

11.5- cell membarane inhibitors  
   a- tetracycline  
   b - amino glycoside  
   c - polymyxin  
   d - cephalexin

**Note**
- Check your answers in key answer page 249.
- (2) degree for each.

**6/ key answer :-**

1- Pre test :-
1. d
2. c
3. a
4. d
5. 

If you :-
- got 9 or more you do not need to proceed.
- got less than 9 you have to study this modular unit well.

2- Post test :-
1. d
2. c
3. a
4. b
5. c

If you :-
- got 9 or more, so congratulation your performance, go on studying modular unit three.
- got less than 9, go back and study the second unit; or any part of it; again, and then do the post test again.

*Quiz 1*

antibiotics used in the treatment of neoplastic diseases act on cellular events preceding mitosis, thus are relatively specific for the highly mitotic cells of neoplasms due to the same reason, they have the same effect on physiological tissues and less active

*Quiz 2*
1) cell wall inhibitors; penicillin, cephalosporin
2) protein biosynthesis inhibitors; aminoglycoside, tetracycline, chloramphenicol
3) nucleic acid inhibitors; DNA, inhibitor, RNA
4) cell membrane inhibitors; polymyxin
5) competitive antagonist; sulfanamides

**Quiz 3**

Include many compounds:
6. tetracycline (Achromycin)
7. chlortetracycline (Aureomycin)
8. oxytetracyclin (Terramycin)
9. doxycyclin (Vibramycin)
10. minocyclin (Minocin)

**Quiz 4**

4. Aplastic anaemia by depress RBC formation in bone marrow
5. Nusea, vomiting and diarrhea
6. Baby_Gray syndrome
accumulation of drug may result in drug toxicity ex alcoholic

**Sources:**

1- Basic & Clinical Pharmacology (Basic and Clinical Pharmacology)
2- Katzung and Trevor's Pharmacology Anthony J. Trevor (Author), Bertram G. Katzung (Author), Susan B. Masters (Author): McGraw-Hill Medical; Latest edition 640 pages
3- Lippincott's Illustrated Reviews: Pharmacology (Lippincott's Illustrated Reviews Series) Richard D Howland (Author), Mary J Mycek (Author), Richard A Harvey (Author), Pamela C Champe (Author)
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Publisher: McGraw-Hill Professional; Latest edition
1/ Over view

Dry used for diabetes; insulin, hypoglycemic drugs

1/ A – Target population:-

This lecture is designed for second year Technical Institute students Department of nursing. It will be assumed that students have an adequate Knowledge in Dry used for diabetes.

Teaching Methods:
Lectures, Discussions, Data show, Seminars, and Handouts.

1/ B – Rationale :-

A. The student shall be able to acquaint students with pharmacodynamics, pharmacokinetics, clinical uses and adverse effects of drugs used in the treatment of diabetes

B. The student shall be able to know Two type of {D.M}

C. The student shall to enumerate type of drug and dosages to treat this condition
1/ C – Central Idea :-
1- define pancreas and diabetes mellitus
2- mention types of diabetes mellitus
3- determine Signs and symptoms of insulin deficiency
4- know Insulin and oral hypoglycemic drug

1/ D – Instructions: -

45. Study over view thoroughly.
46. Identify the goal of this modular unit.
47. Do the pre test
48. After studying the text of this modular unit, do the post test

2/ Performance Objectives

A. The students shall be able to describe the chemistry and production, pharmacokinetics, physiological actions, therapeutic uses, toxicity or abnormal production of: Insulin, amylin analogs, incretions, sulfonylureas, meglitinides, biguanides, thiazolidinediones, alpha-glycosidase inhibitors, glucagon and somatostatin.

B. The student shall understand the relationship between hypothalamic and pituitary hormones.

C. The student shall demonstrate knowledge on the chemistry and production, mechanism of action and physiological actions, major therapeutic uses, and toxicities for growth hormone, growth hormone antagonists, somatostatins, and prolactin.

3/ Pre test
Circle the correct answer :-

3. Diabetes mellitus Clinical syndromes characterized by an:-
   a- normal blood glucose. b- elevation of blood glucose
c- decrease of blood glucose c- no 0ne of them

2- IDDM
   a- insulin dependent diabetes mellitus
   b- non insulin dependent diabetes mellitus
c- a&b d- no 0ne of them

3- NIDDM
   a- adult diabetes mellitus b- child diabetes mellitus
c- young diabetes mellitus d- occur at any age

4-: rapid onset with long action
   a- isophune insulin suspension b- lente insulin
c- semilente insulin suspension d- all of them

5- Intermediate action insulin preparation
   a- isophune insulin suspension b- lente insulin
c- semilente insulin suspension d- all of them

Note
- Check your answers in key answer page 261.
Dry used for diabetes; insulin, hypoglycemic drugs

Pancreas: - glucagon + somatostatin hormones
Islets of langerhans {Bcells} insulin hormone regulation blood glucose

Diabetes mellitus {D.M}
Clinical syndromes characterized by an elevation of blood glucose caused by relative or absolute deficiency of insulin or diabetes mellitus is an inability of the body to remove glucose from the blood stream, thus leading to chronic hyperglycemia.

Two type of {D.M}
1. insulin dependent diabetes mellitus juvenile diabetes mellitus {I.D.D.M}

Type one {IDDM}
The disease characterized by an absolute deficiency of insulin due to chemicals toxin or autoimmune antibody primarily occurs in children
- caused by an inability of the beta-cells of the endocrine pancreas to secrete insulin thus leading to decreased stimulation of the insulin dependent glucose transporters and following decreased removal of glucose from the blood stream
2. non insulin dependent diabetes mellitus {NIDDM}
“adult-onset diabetes mellitus”, “obesity-related diabetes mellitus”
- caused by decreased responsiveness of the insulin dependent glucose transporters to insulin, and following decreased removal of glucose from the blood stream

Quiz / 1
Define diabetes mellitus

Note
- Check your answers in key answer page 262

Signs and symptoms of insulin deficiency
1. poly dypsia  
2. poly phagia  
3. poly urea

Type one  
Diabetics require exogenous insulin to avoid hyper glycemia this type most 
commonly affects juveniles but can also occur amory adults.

Insulin administration  
Because insulin is protein it degraded in gastro intestinal tract if taken orally it is 
there fore generally administered by sub coetaneous injection.

NOTE. (in hypoglycemic emergency regular insulin is injected intravenously )  
Human insulin is absorbed more quickly then beef or pork hormones.  
Adverse reaction of insulin  
1. site of injection  → dystrophy allergy 
2. dose → hyper or hypoglycemia 

Quiz / 2  
Enumerate types of diabetes mellitus  

Note  
- Check your answers in key answer page 262

Insulin preparations  
A*- Rapid action insulin preparations (regular)  
1. short acting soluble crystalline zinc  
2. given subcutaneously or intravenously  
B*-Intermediate action insulin preparation  
1. semilente insulin suspension.  
Not suitable for (I.V) administration has onset of action and peak effect are rapid but 
slower than for regular  
2. isophune insulin suspension  
delay in absorption because bind to protamine and inter mediate action  
3. lente insulin  
rapid onset with long action ( the most wildly used of this type to insulin given only 
sub eataneously) 
C*-Prolonged action insulin preparation slow onset of action and lousy duration.  

1) INSULIN
- insulin acts on insulin-dependent glucose transporters ("GLUT4") found exclusively in striated muscle, adipose tissue and liver

A) SHORT/RAPIDLY ACTING INSULIN PREPARATIONS
no
B) INTERMEDIATELY ACTING INSULIN PREPARATIONS 18-24 hours
C) LONG/SLOWLY ACTING INSULIN PREPARATIONS

- 24-36 hours

D) REGULAR INSULIN PREPARATIONS

- For 'at any time of the day' meals

- Regular insulin

E) SLOWLY ACTING INSULIN PREPARATIONS

- For 'before bedtime'

- Nocturnal insulin
Enumerate types of Insulin preparations

2) GLUCAGON
- glucagon acts on receptors found exclusively in striated muscle (including the heart), adipose tissue and liver

Oral hypoglycemic agents
These agents are useful in treatment of patient who has (NIDDM) non insulin diabetes mellitus
- oral hypoglycaemic agents are drugs that decrease blood glucose
- however, their ability to decrease blood glucose is exponentially inferior to conventional insulin preparations thus they may only be used in the treatment of diabetes mellitus type 2

A*_ Salfonyl urea
Mechanism of action
1. stimulation of insulin release from B cells
2. reduction of serum glycogen level
3. increasing the ability of glucose to inter to tissues

Type of sulfony urea

1-1* generation → tolbutamide- administered orally
- may cross the placental barrier
2- 2nd generation →
1. glibenclamide (Daonil)
2. glitazones (dimacron)

**NOTE:** not given to pregnant woman and replace by insulin

**Side effect:**
1. skin rash
2. hepatitis
3. anemia

Another drug: Repaginide & nateglinide & piogitazone

**Quiz / 4**
mention Mechanism of action of Sulfonyl urea

**Note**
- Check your answers in key answer page 262

B* _ Biguanides _ metformin

**Mechanism of action**
1. inhibit the glucose absorption from intestine
2. inhibit Glico neo genesis in liver
3. its property to reduce hyperlipidemia (L.D.L and V.L.D.L)

* biguanides act on receptors not currently identified, and by mechanisms not completely elucidated
* Metformin may use alone or with sulfonylurea urea.

**Adverse effect:**
Lactic acidosis the drug contra indicated in renal and hepatic in sufficiency.

C* _ Glycosidase inhibitor (Acarbose)

**Mechanism of action**
Inhibit the enzyme _glycosidase in intestine leading to decrease absorption of starch disaccharides.

Use in (N.I.D.D.M) as immunotherapy or with other groups also in (I.D.D.M)

Side effects:-
1. flatulence
2. diarrhea
3. abdominal cramping

5) ALPHA-GLUCOSIDASE INHIBITORS
- alpha-glycosidase inhibitors inhibit alpha-glycosidase, thus preventing the hydrolysis of the oligosaccharides and following inhibition of monosaccharide absorption by the enterocytes

5/ Post test

Circle the correct answer :-

1- glucagon acts on receptors found exclusively in
   a- striated muscle
   b- adipose tissue
   c- liver
   d- all of them

2- Type of sulfony urea 2nd generation
   a - Dao nil
   b - dimacron
   c - a & b
   d - metformin

3- Mechanism of action Sulfonyl urea
   a- stimulation of insulin release from B cells
   b- reduction of insulin release from B cells
   c- decreasing the ability of glucose to inter to tissues
d- reduction of insulin release from alpha cells

4- LONG/SLOWLY ACTING INSULIN PREPARATIONS:

a- 14-16 hours  b- 24-36 hours

c- less than 10 hours  d- 26 hours

5- Acarbose used in

a- IDDM  b- NIDDM

c- a & b  d- CHF

Note

- Check your answers in key answer page 261.
- (1) degree for each.
6/ key answer :-

1- Pre test :-
   1. b
   2. a
   3. a
   4. b
   5. d

   If you :-
   • got 6 or more you do not need to proceed .
   • got less than 6 you have to study this modular unit well .

2- Post test :-
   1. d
   2. c
   3. a
   4. b
   5. c

   If you :-
   • got 6 or more , so congratulation your performance , go on studying modular unit three .
   • got less than 6 , go back and study the second unit ; or any part of it ; again , and then do the post test again .
Quiz 1
Diabetes mellitus {D.M}
Clinical syndromes characterized by an elevation of blood glucose caused by relative of absolute deficiency of insulin or diabetes mellitus is an inability of the body to remove glucose from the blood stream, thus leading to chronic hyperglycemia

Quiz 2
Two type of {D.M}
1. insulin dependent diabetes mellitus juvenile diabetes mellitus {I.D.D.M}
2. non insulin dependent diabetes mellitus {NIDDM}

Quiz 3
A*- Rapid action insulin preparations (regular)
   1- short acting soluble crystalline zinc
   2- given subcutaneously or intravenously
B*- Intermediate action insulin preparation
   1. semilente insulin suspension.
   2. isophune insulin suspension
   3. lente insulin

Quiz 4
4. stimulation of insulin release from B cells
5. reduction of serum glycogen level
6. increasing the ability of glucose to inter to tissues

Sources :-
1- Basic & Clinical Pharmacology (Basic and Clinical Pharmacology)  

2- Katzung and Trevor's Pharmacology Anthony J. Trevor (Author), Bertram G. Katzung (Author), Susan B. Masters (Author) : McGraw-Hill Medical; Latest edition 640 pages

3- Lippincott's Illustrated Reviews: Pharmacology (Lippincott's Illustrated Reviews Series) Richard D Howland (Author), Mary J Mycek (Author), Richard A Harvey (Author), Pamela C Champe (Author)  
Paperback: 559 pages Publisher: Lippincott Williams & Wilkins; Latest edition

4- Goodman & Gilman's The Pharmacological Basis of Therapeutics Laurence Brunton (Author), John Lazo (Author), Keith Parker (Author)  
Publisher: McGraw-Hill Professional; Latest edition
Drug used for central revues system; analgesics, hypnotics, sedatives

1/A - Target population:

This lecture is designed for second year Technical Institute students Department of nursing. It will be assumed that students have an adequate Knowledge in Drug used for central revues system.

Teaching Methods:
Lectures, Discussions, Data show, Seminars, and Handouts.

1/B - Rationale:

The lecture provides knowledge about central nervous system pharmacology, with specific consideration of the drug pharmacodynamics, pharmacokinetics, therapeutic uses and unwanted effects use in Parkinson’s, schizophrenia, anxiety, mania, depression, epilepsy, narcotic analgesics and drug abuse,

1/C - Central Idea:

1 – Know DISEASE OF central nervous system
2- KNOW USES OF DRUG EFFECT ON CENTRAL NERVOUS SYSTEM

1/D - Instructions:

49. Study overview thoroughly.
50. Identify the goal of this modular unit.
51. Do the pre test
52. After studying the text of this modular unit, do the post test

2/ Performance Objectives
1. Determine pharmacological apparatus of central nervous system
2. Determine central nervous system stimulant
3. Determine pharmacokinetic & pharmacognosy of nootropic agent and their doses, therapeutic uses and side effect

3/ Pre test

Circle the correct answer:

2. Enhancement of cerebral Microcirculation:
   a. vasodilatation.    b. Increasing RBC plasticity
   c. Reducing blood viscosity  d. all of them

2. Side effect of PIRACETAM
   a. hyperactivity        b. insomnia
   c. a&b                d. nephrotoxicity

3. VINPOCETINE administered
   a. IV          b. IM
   C-S/c           d. rectal

4. Main types of neurodegenerative disorders:
   a. Alzheimer's disease   b. Huntington's disease
   c. Parkinson's disease   d. all of them

5. Side effect of PENTOXYFILLINE
   a. hypotension         b. cardiac arrythmias
   c. a&b                d. no one of them

6. Neuroprotection mean
   a. increasing availability and/or   b. antioxidation
   c. Effect of monoamines   d. effect of acetylcholine

7. Disease is a progressive dementia of idiopathic origin it occurs primarily due to loss of neurons:
   a. alzheimer’s disease   b. huntington’s disease
   c. parkinson’s disease   d. no one of them

8. Unselective neuronal called:
   a. cholinergic neuronal loss   b. HIPPOCAMPUS.
   c. a&b                d. no one of them

9. Cholinesterase inhibitors drugs are
   a. TACRINE        b. DONEPEZIL
   c. RIVASTIGMINE   d. all of them

10. L-DOPA coadministered with carbidopa- (a peripheral DOPA decarboxylase inhibitor.)
**Nootropic Agents**

**Overview**
- Nootropic drugs are drugs that enhance the intellectual capacity they act by one or more of 4 mechanisms.

<table>
<thead>
<tr>
<th>No</th>
<th>MECHANISM DESCRIPTION</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Enhancement of cerebral Microcirculation</td>
<td>increasing cerebral blood flow (vasodilatation) - increasing RBC plasticity - inhibiting platelet aggregation - reducing blood viscosity</td>
</tr>
<tr>
<td>2</td>
<td>Enhancement of cerebral metabolism</td>
<td>- increasing cerebral energy supply - enhancing cerebral energy utilization</td>
</tr>
<tr>
<td>3</td>
<td>Enhancement of cerebral neurotransmission</td>
<td>- increasing availability and/or effect of acetylcholine - increasing availability and/or effect of monoamines</td>
</tr>
<tr>
<td>4</td>
<td>Neuroprotection</td>
<td>neutralizing free radicals (“antioxidation”)</td>
</tr>
</tbody>
</table>

**Quiz / 1**
Define nootropic drugs

*Note*
Check your answers in key answer page 273

Relevant Drugs

<table>
<thead>
<tr>
<th>no</th>
<th>DRUG NAME</th>
<th>General information</th>
<th>Medical uses</th>
<th>Side effects</th>
</tr>
</thead>
</table>
| 1  | PIRACETAM | - enhances cerebral microcirculation  
- enhances cerebral metabolism  
- enhances cerebral neurotransmission (acetylcholine)  
- neuroprotective  
- administered orally or IV | treatment of stroke  
- treatment of dementia (including alzheimer’s disease, see 46) | hyperactivity  
- insomnia |
| 2  | VINPOCETINE | enhances cerebral microcirculation  
- enhances cerebral metabolism  
- administered IV | - treatment of stroke  
- treatment of perfusion disorders of the eye and the inner ear (including tinnitus) | - hypotension  
- tachycardia |
| 3  | PENTOXYFILLINE | - theobromine derivative (see 48)  
- enhances cerebral microcirculation | - treatment of stroke  
- treatment of perfusion disorders of the eye and the inner ear | - hypotension  
- cardiac arrythmias  
- dizziness |

DRUG TREATMENT OF neurodegenerative disorders.
Centrally- acting  muscle relaxants

Overview
- there are 3 main types of neurodegenerative disorders
1-alzheimer’s disease Overview
- alzheimer’s disease is a progressive dementia of idiopathic origin it occurs primarily due to loss of neurons in 2 locations of the CNS
HIPPOCAMPUS - unselective neuronal loss BASAL FOREBRAIN - cholinergic neuronal loss

Relevant Drugs
- 2 categories
1) cholinesterase inhibitors
- cholinesterase inhibitors inhibit cholinesterase in the cholinergic synapses, thus inhibiting acetylcholine breakdown and following increased acetylcholine concentration in those synapses

<table>
<thead>
<tr>
<th>no</th>
<th>Drug name</th>
<th>Side effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TACRINE</td>
<td>cholinergic side effects</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- hepatotoxicity</td>
</tr>
<tr>
<td>2</td>
<td>DONEPEZIL</td>
<td>cholinergic side-effects</td>
</tr>
<tr>
<td>3</td>
<td>RIVASTIGMINE</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>GALANTHAMINE</td>
<td>cholinergic side-effects</td>
</tr>
</tbody>
</table>

2) NOOTROPIC DRUGS
- enhances the intellectual capacity, thus counteracting the dementia

**PARKINSON’S DISEASE Overview**
- parkinson’s disease is a progressive motility disorder it occurs primarily due to loss of dopaminergic neurons running from substantia nigra to corpus striatum (“nigrostriatal tract"
- these dopaminergic neurons are inhibitory neurons that act on D2 receptors of cholinergic neurons in the corpus striatum, thus loss of inhibition causes hyperactivity of these cholinergic neurons
- parkinson’s disease is characterized by 3 (4) symptoms

**SYMPTOM DESCRIPTION**
1-HYPOKINESIA - voluntary movement is hard to initiate and -to stop
- due to loss of dopaminergic neurons
2-TREMOR - at rest
- due to hyperactivity of cholinergic neurons3-RIGIDITY - increased resistance to voluntary movement
- due to loss of dopaminergic neurons and hyperactivity of cholinergic neurons
4- (DEMENTIA) - decreased mental capacity- due to loss of other types of neurons elsewhere in the CNS
- biosynthesis and breakdown of dopamine is done in 5 steps (similar to that of catecholamines)

**HOMOVANILLIC ACID**

**Relevant Drugs**
- 2 categories

1) DOPAMINE REPLLENISHERS
- 4 types

**DRUG NAME DESCRIPTION**
L-DOPA General information
- Precursor of dopamine
- increases dopamine biosynthesis
- administered orally
- coadministered with carbidopa (a peripheral DOPA decarboxylase inhibitor,) to inhibit peripheral use of dopamine
- causes downregulation of dopamine receptors, thus tolerance will develop over time

**Side effects**
- dyskinesia (involuntary movements of face and limbs)
- on-off effect (rapid fluctuations of symptoms)
- schizophrenia-like syndrome
- nausea
- anorexia

**SELEGILINE**
*General information*
- selective MAO-B inhibitor (thus only acts in the CNS) - decreases central monoamine breakdown

**ENTACAPONE**
*General information*
- COMT inhibitor - decreases central- and peripheral monoamine breakdown

**AMANTIDINE**
*General information*
- antiviral drug
- increases presynaptic dopamine release and decreases presynaptic dopamine reuptake

2) **D2 RECEPTOR AGONISTS**
- 3 types

<table>
<thead>
<tr>
<th>DRUG NAME</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>BROMOCRIPTINE</td>
<td><em>Medical uses</em></td>
</tr>
<tr>
<td>- Treatment of galactorrhea</td>
<td></td>
</tr>
<tr>
<td>- Treatment of gynecomastia - treatment of parkinson’s disease</td>
<td></td>
</tr>
</tbody>
</table>

LISURIDE

PERGOLIDE

3) **MUSCARINIC RECEPTOR ANTAGONISTS**
- block muscarinic receptors, thus inhibiting the effect of the hyperactive cholinergic neurons in the corpus striatum

**Quiz / 3**
Mention symptoms parkinson’s disease is characterized

**Note**
- Check your answers in key answer page 273

3-HUNTINGTON’S DISEASE

*Overview*
- huntington’s disease is, like parkinson’s disease, a progressive motility disorder
- however, huntington’s disease is due to loss of GABA neurons running in opposite direction to that of the dopaminergic neurons affected in parkinson’s disease (from corpus striatum to substantia nigra)
- these GABA neurons are inhibitory neurons of the dopaminergic neurons in the substantia nigra, thus loss of inhibition causes hyperactivity of these dopaminergic neurons, thus huntington’s disease exhibit opposite symptoms to that of parkinson’s disease

*Relevant Drugs*
- 2 categories

1) **GABA AGONISTS**
- 1 type

<table>
<thead>
<tr>
<th>DRUG NAME</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>BACLOFEN</td>
<td></td>
</tr>
</tbody>
</table>

2) **D2 RECEPTOR ANTAGONISTS**
- “antipsychotic drugs”
- block D2 receptors, thus inhibiting the effect of the hyperactive dopaminergic neurons
CENTRALLY-ACTING MUSCLE RELAXANTS

Overview

DRUG ABUSE AND DEPENDENCE: GENERAL PRINCIPLES, OPIOIDS, ANTI-ANXIETY AND HYPNOTIC DRUGS, INHALANTS, ETHANOL

Overview
- drug abuse is recurrent use of drugs that are illegal and/or cause harm to the subject of interest
- drug dependence is the state of mind when drug use becomes compulsory (rather than voluntarily) and takes precedence over other needs of the subject of interest
- drug dependence has 2 components

COMPONENT TYPE

PSYCHOLOGICAL DEPENDENCE  Positive reinforcement
- occurs when the abuse-drug is used
- stimulation of the mesolimbicmesocortical dopaminergic pathway of the CNS (reward center) and following feeling of reward

Conditioning
- occurs when the abuse-drug is withdrew
- the association of items, locations or people with the abuse-drug induced feeling of reward

PHYSIOLOGICAL DEPENDENCE

Tolerance
- occurs when the abuse-drug is used
- physiological opposition of the biochemical responses of the abuse-drug over time, thus decreasing its effectiveness

Negative reinforcement
- occurs when the abuse-drug is withdrawal
- the physiological result of the physiological contradiction of the biochemical responses of the abuse-drug, when the abuse-drug is not used

OPIOIDS

Overview

ANTI-ANXIETY AND HYPNOTIC DRUGS

INHALANTS

ETHANOL

Quiz / 4

Explain Tolerance

Note
- Check your answers in key answer page 273

5/ Post test

Circle the correct answer:

1: Enhancement of cerebral metabolism
   a- enhancing cerebral energy utilization.  b- Vasodilatation.
   C-increasing RBC plasticity  d- reducing blood viscosity

2- Medical uses BROMOCRIPTINE
a- treatment of galactorrhea    b- treatment of gynecomastia

- Treatment of Parkinson's disease   - all of them

- (rather than) and takes precedence over other needs of the subject of interest

3- Drug dependence is the state of mind when drug use
a- becomes compulsory    b- voluntarily

c- Normal dose   d- all of them

4- Occurs when the abuse-drug is withdrawal:
a- Tolerance    b- Conditioning

c- Negative reinforcement   d- dependence

5- Relevant Drugs Huntington’s disease is
a- GABA AGONISTS    b- D2 RECEPTOR ANTAGONISTS

c- a&b    d- no one of them

6- The GABA neurons are
a- inhibitory neurons of the dopaminergic neurons in the substantia nigra

   b- Stimulating neurons of the dopaminergic neurons in the substantia nigra

c- Inhibitory neurons of the dopaminergic neurons in the any place

   d- No one of them

7- AMANTIDINE
a- antibacterial    b- antiviral drug

c- Antifungal    d- antihelmanthic

8- MAO-B inhibitor (, thus):
a- only acts in the

c- Act on GIT & CNS.   d- act on respiratory system only

9- Side effects of L-DOPA
a- schizophrenia   b- nausea

c- dyskinesia   d- all of them

10- DEMENTIA
a- increased resistance to voluntary movement   b- due to hyperactivity of cholinergic neurons

c- decreased mental capacity   d- to loss of dopaminergic neurons

Note
- Check your answers in key answer page 272 .
- ( 1 ) degree for each .

6/ key answer :-

1- Pre test :-
6. d 6-b
7. b 7-a
8. a 8-b
9. d 9-d
10. c 10-b

If you :-

- got 9 or more you do not need to proceed.
- got less than 9 you have to study this modular unit well.

2- Post test :-

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6.</td>
<td>a</td>
</tr>
<tr>
<td>7.</td>
<td>d</td>
</tr>
<tr>
<td>8.</td>
<td>a</td>
</tr>
<tr>
<td>9.</td>
<td>c</td>
</tr>
<tr>
<td>10.</td>
<td>d</td>
</tr>
</tbody>
</table>

If you :-

- got 9 or more, so congratulation your performance, go on studying modular unit three.
- got less than 9, go back and study the second unit; or any part of it; again, and then do the post test again.
**Quiz 1**

nootropic drugs are drugs that enhance the intellectual capacity they act by one or more of 4 mechanisms: Enhancement of cerebral Microcirculation, Enhancement of cerebral metabolism, Enhancement of cerebral neurotransmission & neuroprotection

**Quiz 2**

- alzheimer’s disease is a progressive dementia of idiopathic origin it occurs primarily due to loss of neurons in 2 locations of the CNS
- HIPPOCAMPUS - unselective neuronal loss
- BASAL FOREBRAIN - cholinergic neuronal loss

**Quiz 3**

parkinson’s disease is characterized by 3 (4) symptoms

SYMPTOM DESCRIPTION

1- HYPOKINESIA - voluntary movement is hard to initiate and -to stop
- due to loss of dopaminergic neurons
2- TREMOR - at rest
- due to hyperactivity of cholinergic neurons
3- RIGIDITY - increased resistance to voluntary movement
- due to loss of dopaminergic neurons and hyperactivity of cholinergic neurons
4- (DEMENTIA) - decreased mental capacity
- due to loss of other types of neurons elsewhere in the CNS
- biosynthesis and breakdown of dopamine is done in 5 steps (similar to that of catecholamines)

**Quiz 4**

*Tolerance*

- occurs when the abuse-drug is used
- physiological opposition of the biochemical responses of the abuse-drug over time, thus decreasing its effectiveness
Sources:

1- **Basic & Clinical Pharmacology (Basic and Clinical Pharmacology)**

2- **Katzung and Trevor's Pharmacology** Anthony J. Trevor (Author), Bertram G. Katzung (Author), Susan B. Masters (Author) : McGraw-Hill Medical; Latest edition640 pages

3- **Lippincott's Illustrated Reviews: Pharmacology (Lippincott's Illustrated Reviews Series)** Richard D Howland (Author), Mary J Mycek (Author), Richard A Harvey (Author), Pamela C Champe (Author)
   Paperback: 559 pages Publisher: Lippincott Williams & Wilkins; Latest edition

4- **Goodman & Gilman's The Pharmacological Basis of Therapeutics** Laurence Brunton (Author), John Lazo (Author), Keith Parker (Author)
   Publisher: McGraw-Hill Professional; Latest edition
1/ Overview

Anti-epileptics, anti-depressants

1 / A – Target population: -
This lecture is designed for second year Technical Institute students Department of nursing. It will be assumed that students have an adequate Knowledge in anti-epileptics, anti-depressants

Teaching Methods:
Lectures, Discussions, Data show, Seminars, and Handouts.

1 / B – Rationale: -

A. The student shall be able to describe specificity of anti-epileptics
B. The student shall be able to know type of anti-depressants.

1 / C – Central Idea: -

1- Know cause and type of epilepsy and know drug dose, mode of action which that effect
2- Know cause and type of depressant and know drug dose, mode of action which that effect

1 / D – Instructions: -

1. Study over view thoroughly.
2. Identify the goal of this modular unit .
3. Do the pre test
4. After studying the text of this modular unit , do the post test

2/ Performance Objectives

1- determine types of monoamine neurotransmitters
2- determine symptoms of depression and main treatment
3- determine symptoms of epilepsy and main treatment

3/ Pre test

Circle the correct answer: -
1- monoamine neurotransmitters
a- DOPAMINE                       b- SEROTONIN
b- NORADRENALINE                  d- all of them

2- alteration between depression and mania every 2-3 weeks
   a- BIPOLAR DEPRESSION            b- manic depression
   c- UNIPOLAR DEPRESSION           d- a&b

3- EMOTIONAL SYMPTOMS
a- loss of libido                   b- misery
b- sleep disturbance                d- loss of appetite

4- TCAS act as
a- ANTIDEPRESSANS                  b- antiepileptic
b- vasodilatation                  d- diuretic

5- TRICYCLIC ANTIDEPRESSANS are administered
a- orally                          b- I/V
b- I/M                              d- S/C

6- CNS SIDE EFFECTS as therapeutic dose
a- excitement                      b- delirium
b- orthostatic hypotension          d- respiratory depression

7- NON-SELECTIVE TCAS-:
   a- IMIPRAMINE                     b- AMITRIPTYLINE
   c- a&b                            c- fluoxetine

8- MONOAMINE OXIDASE INHIBITORS:
   a- SERTALINE
   b- phenelzine.
   c- fluoxetine.
   d- PAROXETINE

9- the seizure stays in it’s location of origin
   a- Complex seizure                 b- Grand mal seizures
   c- Simple Seizure                  d- GENERALISED SEIZURES

10- epileptic seizures are sudden high frequency neuronal discharges ()
    a- hypoactivity in the CNS
    b- hyperactivity in the CNS
    c- normal activity in the CNS      d- increase heart rate
Note

- Check your answers in key answer page 284.
- ( 1 ) degree for each.

4/ the module contents

ANTIDEPRESSANTS
Overview
- there are 3 types of monoamine neurotransmitters
  1-SEROTONIN
  2-NORADRENALINE
  3-DOPAMINE
- not relevant in depression
- depression is a disorder of mood due to functional deficit of monoamine neurotransmitters(primarily serotonin)
- there are 2 types of depression
  1-UNIPOLAR DEPRESSION
  2-BIPOLAR DEPRESSION - “manic depression” alteration between depression and mania every 2-3 weeks

Quiz / 1
  Mention types of monoamine neurotransmitters

Note
- Check your answers in key answer page 285
- there are 2 groups of symptoms of depression
  1-EMOTIONAL SYMPTOMS
    - misery
    - apathy
    - pessimism
    - low self esteem
    - loss of motivation
    - indecisiveness
  2-BIOLOGICAL SYMPTOMS - retardation of thought
    - loss of libido
    - loss of appetite
    - sleep disturbance

Relevant Drugs
- 3 categories

Quiz / 2
  Mention emotional symptoms of depression

Note
- Check your answers in key answer page 285
1) TRICYCLIC ANTIDEPRESSANTS (TCAS)
- TCAs are competitive non-selective monoamine uptake 1 inhibitors, thus inhibiting reuptake of monoamines released into the synaptic cleft
- they have active metabolites, thus increasing their effectiveness and duration of action
- they also downregulate presynaptic autoreceptors, thus further increasing their effectiveness
- their antidepressive effect takes weeks to develop due to latency in receptor downregulation
- they are administered orally
- they are lipophilic, thus accumulate in adipose tissue over time
- they are also partial muscarinic receptor antagonists, thus having atropine-like side effects
- general side effects of TCAs may be divided in 2 groups
  
A) CNS SIDE EFFECTS
  * Therapeutic dose*
  - sedation
  - confusion
  - orthostatic hypotension
  (hyperactivity of the vasomotor center of the CNS)
  * Overdose*
  - excitement
  - delirium
  - convulsions
  - respiratory depression
  - coma
B) PERIPHERAL SIDE EFFECTS
  * Therapeutic dose*
  - muscarinic receptor antagonist side effects
  - ECG disorders (prolongation of QT interval)
  - impotence
  * Overdose*
  - ventricular fibrillation (prolongation of QT interval)
  - death (ventricular fibrillation)
  
2 groups
A) NON-SELECTIVE TCAS
- 2 types
  1-IMIPRAMINE
  2-AMITRIPTYLINE
B) NORADRENALINE-SELECTIVE TCAS
- 2 types
  1-DESIPRAMINE
  2-CLOMIPRAMINE
2) SEROTONIN-SELECTIVE UPTAKE 1 INHIBITORS
- inhibits serotonin reuptake by monoamine uptake 1 specifically
- like TCAs, their antidepressive effect takes weeks to develop
- 4 types

**DRUG NAME DESCRIPTION**

fluoxetine
- **General information**
- administered orally

**Medical uses**
- treatment of depression
- treatment of anxiety
- treatment of obsessive-compulsive disorders

**Side effects**
- nausea
- anorexia
- insomnia
- decreased libido
- failure of orgasm

**FLUVOXAMINE General information**
- same as fluoxetine

**PAROXETINE General information**
- same as fluoxetine

**SERTALINE General information**
- same as fluoxetine

3) **MONOAMINE OXIDASE INHIBITORS (MAOIS)**
- MAOIs allosterically inhibit enzymatic catabolism of monoamines by monoamine oxidase in the presynaptic neuronal cytoplasm
- this increases cytoplasmic concentration of monoamines, and following passive diffusion of monoamines into the synaptic cleft
- like TCAs, they also downregulate presynaptic autoreceptors, thus increasing their effectiveness
- their antidepressive effect takes weeks to develop due to latency in receptor downregulation
- 2 groups
  A) **IRREVERSIBLE MAOIS**
  - 3 types
    phenelzine
    **General information**
    - administered orally
    **Medical uses**
    - treatment of depression
  
  **Side effects**
  - excitement
  - insomnia
  - tremor
  - convulsions (if overdose)
  - increased appetite
  - weight gain
  - atropine-like side effects
  - severe hypertension (if simultaneous administration of indirectly acting sympathomimetics

**IPRONIAZID General information**
- same as phenelzine

**TRANYLCYPROMINE General information**
- same as phenelzine

B) **REVERSIBLE MAOIS**
- 1 type
  **MOCLOBEMIDE General information**
ANTIEPILEPTIC DRUGS

Overview
- epilepsy is a neurologic disorder characterized by epileptic seizures
- epileptic seizures are sudden high frequency neuronal discharges (hyperactivity) in the CNS
- there are 2 groups of epileptic seizures

1-PARTIAL SEIZURES General information
- localized seizure not exceeding the cerebral hemisphere from which it originates
- 2 types
  a-Simple Seizure
  - the seizure stays in its location of origin
  - no loss of consciousness
  - symptoms depend on where the seizure is located (motor seizure, sensory seizure, autonomic seizure, psychomotor seizure etc.)
  b-Complex seizure
  - the seizure spreads from its location of origin to other areas of the CNS, including the reticular formation
  - loss of consciousness (hyperactivity of the reticular formation)
  - symptoms depend on where the seizure originates from and where it spreads

2-GERERALISED SEIZURES General information
- global seizure involving both hemispheres
- 2 types
  a-Grand mal seizures
  - “tonic-clonic seizures”
  - loss of consciousness
  - rigid extensor spasm
  - cessation of respiration
  - micturition
  - defecation
  - salivation
  - all of this is followed by series of violent synchronous jerks that gradually dies out
  b-Petit mal seizures
  - “absence seizures”
  - rhythmic oscillating seizure of thalamic relay neurons
  - loss of consciousness
  - vacant stare
  - no motor abnormalities

- the exact pathophysiological origin of epilepsy is unknown, and the same applies to the pharmacological mechanisms of the drugs used to treat it

Relevant Drugs
- 3 categories
  1) drugs affecting partial & grand mal seizures
  - 3 types
  PHENYTOIN General information
  - inhibits sodium channels, thus blocking the initiation and propagation of action potentials
- use dependent, thus inhibiting more efficacious sodium channels that more frequently open
  (eg. sodium channels of seizure-affected neurons)
- administered orally
- metabolized by the liver
- causes induction of hepatic enzymes, thus causing increased metabolism of itself and
  following tolerance over time

**Medical uses**
- treatment of partial- and grand mal epileptic seizures
- treatment of cardiac arrhythmias

**Side effects**
- vertigo
- ataxia
- nystagmus
- headache
- confusion
- intellectual deterioration
- gum hypertrophy
- hirsutism (abnormal growth of body hair, due to increased androgen secretion)
- macrocytic, hyperchromic anemia (disorder of folate metabolism)
- skin rashes
- teratogenesis

**CARBAMAZEPINE General information**
- also mood-stabilizing
- same as phenytoin

**Medical uses**
- treatment of partial- and grand mal epileptic seizures
- treatment of manic depression (mood stabilizer)

**Side effects**
- sedation
- ataxia
- mental deterioration
- water retention
- leucopenia (bone marrow depression)
- skin rashes

**PHENOBARBITAL General information**
- a barbiturate
- also facilitates increased sensitivity of GABA A receptors, thus increasing
  inhibition of excitatory neurotransmission

---

**Quiz / 3**
Mention **Side effects** **CARBAMAZEPINE**

**Note**
- Check your answers in key answer page 285

**Side effects** **CARBAMAZEPINE**

2) **DRUGS AFFECTING PETIT MAL SEIZURES**
- 1 type

**ETHOSUXIMIDE General information**
- inhibits T-type calcium channels, thus blocking rhythmic oscillations of thalamic relay neurons
- administered orally

**Medical uses**
- treatment of petit mal seizure

**Side effects**
- vertigo
- nausea
- apathy
- anorexia

3) drugs affecting all types of epileptic seizures
- 2 types

**VALPROATE General information**
- facilitates increased sensitivity of GABA A receptors, thus increasing inhibition of excitatory neurotransmission
- also inhibits GABA transaminase, thus decreasing inactivation of GABA in the neuromuscular junction and following even stronger inhibition of excitatory neurotransmission
- also inhibits sodium channels, thus blocking the initiation and propagation of action potentials
- also mood-stabilizing

**Medical uses**
- administered in conjunction with other antiepileptic drugs in treatment of all types of epilepsy
- treatment of manic depression (mood stabilizer)

**Side effects**
- hair loss
- liver damage
- teratogenesis

**LONG-ACTING BENZODIAZEPINES**

---

**Quiz / 4**

Mention GENERALISED SEIZURES

**Note**
- Check your answers in key answer page 245

---

5/ Post test

Circle the correct answer:-

1. BIOLOGICAL SYMPTOMS:-
   a- loss of libido        b- loss of appetite
   c- sleep disturbance    c- all of them

2. Medical uses of fluoxetine
   a- treatment of depression        b- treatment of anxiety
3- Grand mal seizures
   a- loss of consciousness   b- rigid extensor spasm
   c- cessation of respiration   d- all of them

4- Side effects VALPROATE
   a - hair loss   b- liver damage
   c- teratogenesis   d- allof them

5- Medical uses0f ETHOSUXIMIDE
   a- treatment of petit mal seizure   b- treatment of vomiting
   c- treatment of asthma   d- treatment of gastric ulcer

6- mode of action of ETHOSUXIMIDE
   a- inhibit of ACH   b- inhibits T-type calcium channels
   c- inhibits prostaglandin synthesis   d- antihistaminic

7- MONOAMINE OXIDASE INHIBITORS:
   a- phenelzine   b- IPRONIAZID
   c- a&b   d- PHENYTOIN

8- followed by series of violent synchronous jerks that gradually dies out
   a- Grand mal seizures
   b- Petit mal seizures.
   c- Complex seizure.
   d- Simple Seizure

9- antidepressive effect takes to develop due to latency in receptor downregulation
   a- days   b- weeks
   c- months   d- years

10- Petit mal seizures
   a- loss of consciousness   b- rhythmic oscillating seizure of thalamic relay neurons
   c- vacant stare   d- no motor abnormalities

Note
- Check your answers in key answer page 284.
- ( 1 ) degree for each.

6/ key answer :-
1- Pre test :-
   1. a 6- c
   2. d 7- c
   3. b 8- b
   4. a 9-c
   5. a 10-b

   If you :-
   * got 9 or more you do not need to proceed .
   * got less than 9 you have to study this modular unit well .

2- Post test :-
   1. d 6- b
   2. c 7- c
   3. d 8- a
   4. d 9- b
   5. a 10- d

   If you :-
   * got 9 or more , so congratulation your performance , go on studying modular unit three .
   * got less than 9 , go back and study the second unit ; or any part of it ; again, and then do the post test again .

**Quiz 1**
- there are 3 types of monoamine neurotransmitters
  1-SEROTONIN
  2-NORADRENALINE
  3-DOPAMINE

**Quiz 2**
1-EMOTIONAL SYMPTOMS of depression
- misery
- apathy
- pessimism
- low self esteem
- loss of motivation
- indecisiveness

**Quiz 3**
*Side effects CARBAMAZEPINE*

- sedation
- ataxia
- mental deterioration
- water retention
- leucopenia (bone marrow depression)
- skin rashes

**Quiz 4**
2-GERERALISED SEIZURES *General information*
- global seizure involving both hemispheres
- 2 types
  a-Grand mal seizures
  - “tonic-clonic seizures”
  - loss of consciousness
  - rigid extensor spasm
  - cessation of respiration
  - micturition
  - defecation
  - salivation
  b-Petit mal seizures
  - “absence seizures”
  - rhythmic oscillating seizure of thalamic relay neurons
  - loss of consciousness
  - vacant stare
  - no motor abnormality

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2- Katzung and Trevor's Pharmacology Anthony J. Trevor (Author), Bertram G. Katzung (Author), Susan B. Masters (Author) : McGraw-Hill Medical; Latest edition640 pages
3- Lippincott's Illustrated Reviews: Pharmacology (Lippincott's Illustrated Reviews Series) Richard D Howland (Author), Mary J Mycek (Author), Richard A Harvey (Author), Pamela C Champe (Author) Paperback: 559 pages Publisher: Lippincott Williams & Wilkins; Latest edition
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by George A. Mashour MD PhD (Hardcover - Jan 25 2010) Consciousness, Awareness, and Anesthesia

1/ Overview
Non-steroidal anti-inflammatory drugs; voltarin, mefenamic acid and drugs used for uric acid.

1/A – Target population:

This lecture is designed for second year Technical Institute students Department of nursing. It will be assumed that students have an adequate knowledge in Non-steroidal anti-inflammatory drugs; voltarin, mefenamic acid and drugs used for uric acid.

Teaching Methods:
Lectures, Discussions, Data show, Seminars, and Handouts.

1/B – Rationale:
A. The student shall be able to describe specificity of anti-inflammatory drugs
B. The student shall be able to know uses of voltarin.

1/C – Central Idea:
Study all pharmacokinetic, pharmacognosy and therapeutic uses
And side effect of Non-steroidal anti-inflammatory drugs; voltarin, mefenamic acid drugs.

1/D – Instructions:
1. Study overview thoroughly.
2. Identify the goal of this modular unit.
3. Do the pre-test.
4. After studying the text of this modular unit, do the post-test.

2/ Performance Objectives

1. Determine Inflammation & Anti-inflammatory drugs
2. Determine the non-steroidal anti-inflammatory drugs (N.S.A.I.Ds) are group of chemically dissimilar agents.

3/ Pre-test

Circle the correct answer:

...
1. Inflammation is abnormal protective response to tissue injury caused by:
   a. physical trauma  
   b. toxic chemical  
   c. microbiologic agents  
   d. all of them

2. Aspirin act as
   a. N.S.A.I.D.S  
   b. bronchodilator  
   c. anticholinergic  
   d. antimuscarinic agent

3. Drug for arthritis
   a. probenecid  
   b. chloroquine  
   c. paracetamol  
   d. celecoxib

4. Drug for gout:
   a. chloroquine  
   b. probenecid  
   c. paracetamol  
   d. celecoxib

5. Normal (P.G.I2)
   a. inhibits gastric acid secretion  
   b. stimulate gastric acid secretion  
   c. has no effect on gastric acid secretion  
   d. no one of them

6. (P.G.E2) and (P.G.F2)
   a. stimulate synthesis of protective mucus in the stomach  
   b. stimulate synthesis of protective mucus in small intestine  
   c. a & b  
   d. inhibit synthesis of protective mucus in the stomach

7. The presence of aspirin this P.G is not formed:
   a. leading to ulceration  
   b. hemorrhage.  
   c. diminish mucus protection  
   d. all of them

8. Doses of aspirin (daily) of aspirin can inhibit the thromboxane (TxA2):  
   a. 6 to 8 mg  
   b. 16 to 18 mg.  
   c. 60 to 80 mg.  
   d. 160 to 180 mg.

9. Ponstan is trade name of
   a. Mefanamic acid  
   b. Diclofenac  
   c. Indometacin  
   d. Acetaminophen

10. Oxicam derivatives they administered once daily
    a. tow dose daily  
    b. three dose daily 
    c. once daily  
    d. four dose once daily

Note

- Check your answers in key answer page 295.
- (1) degree for each.
Anti-inflammatory drugs

Inflammation: is abnormal protective response to tissue injury caused by physical trauma toxic chemical or microbiologic agents

1. Anti-inflammatory drugs (N.S.A.I.D.S)
   Non steroidal anti inflammatory drugs
   Aspirin, Diclofenac, Lbuprofen, Naproxen, Piroxicam
   2. (cox_2 inhibitors) celecoxib
   3. (non_narcotic analgesics) actamino phen (paracetamol)
   4. (drug for arthritis)
   chloroquine_ gold salts methotrate _ D- pencillamine
   5. (drug for gout)
   Allopurinol, colchicines, probenecid, sulfinpyrazone

Prostaglandins: many of the non steroidal anti intamatory drug (N.S.A.I.D.S) acting inhibiting the synthesis of prostaglandins.

Quiz / 1
Define anti-inflammatory drugs

Note
- Check your answers in key answer page 296

Phospholipids
(From cell membrane)
Corticosteroids (-) + Brady kin in
Phospholipids Az
Arachidonic acid
Cycle oxygenize (Co+)
I (N.S.A.I.Ds)
Prostaglandins
(Synthesize of prostaglandin)

[Non steroidal anti inflammatory drugs]
The non steroidal anti inflammatory drugs (N.S.A.I.Ds) are group of chemically dissimilar agents that differ in their anti pyretic analgesic and anti inflammatory activity they act by inhibiting the cycle oxygenize enzyme.
(A) Aspirin and other salicylates
Action:-
1. anti _ inflammatory action
   because aspirin inhibit cyclooxygenase activity it diminishes the formation of prostglandins aspirin inhibits inflammation in arthritis
2. Anti pyretic action
Fever occurs when the set point of the anterior hypothalamic ther more gulatory center is elevated aspirin resets the thermostat to ward normal aspirin has no effect on normal body temperature

**Quiz / 2**

Mention action of Aspirin and other salicylates

**Note**

- Check your answers in key answer page 296

3. Analgesic action
   By decreasing P.G.E2 synthesis aspirin and other N.S.A.I.ervativeDs depress the sensation of pain, so aspirin used in many manta the pain of low to moderate intensity

4. Respiratory action
   Aspirin alveolus ventilaion

5. Gastro intestinal effect
   (P.G.E2)and (P.G.F2) Normal (P.G.I2) inhibits gastric acid secretion. Where as stimulate synthesis of protective mucus in both the stomach and small intestine in the presence of aspirin this P.G is not formed that cause gastric acid secretion and diminish mucus protection leading to ulceration and hemorrhage.

6. Effect of aspirin on platelets
   Low doses of aspirin (60 to 80 mg daily) of aspirin can inhibit the thromboxane (TxA2) production platelets so platelets aggregation is reduced producing an anti coagulant effect Therapeutic use as aspirin
   A- anti pyretic and analgesic
   B- Drug of choice in treatment of rheumatoid arthritis
   C- External application as keratolytic (rough skin )and methyl salicylate as muscle pain killer
   D- Cardio vascular low dose use prophylactic to decrease the incidence of transient ischemic attack and an stable angina to avoid coronary artery thrombosis
   D- Colon a cancer there is evidence that chronic use of aspirin reduce the in cadence of colon rectal cancer.

Prop ionic acid derivative
Include ibuprofen (brufen) and ketoprofen fenoprofen . All these drugs have anti inflammatory antipyretic and analgesic activity
Thy most common adverse effect is gastrointestinal dyspepsia bleeding side effect involving the C.N.S such as headache tinnitus and dizziness.

In dole acetic acids
These group of drugs include indometacin (indocid) sulindc.
Indomethacin (indocid) this (N.S.A.I.D) is more potent than aspirin as anti inflammatory agent
Therapeutic use --
   Rhauvnatiod arthritis acute gouty arthritis and osteo arthritis of hip

Oxicam derivatives
Only piroxicam (sotulin) and meloxicam (mobic)available in Iraq they used to treatment of rheumatoid arthritis unclosing spordylitis and osteo arthritis of hip and.

Fen mates
Mefranamic acid (ponstan) like other N.S.A.I.D in use and side effect

* Diclofenac (voltarin)
  Approved for long term use in the treatment of rheumatoid arthritis osteo arthritis and anky losing spondilitis its more potent than indo methacin.

* The selective coxz inhibitory
  (celecoxib and rofecoxib (dioxx))
  The doesn’t block coxi they approved for treatment of osteo arthritis and rhanatoid arthritis but not for analyesia its ability to reduce acute pain is poor
* Adverse effect
  Abdominal pain, diarrhea, and dyspepsia
  Non narcotic analgesic
  Non narcotic analgesic unlike the N.S.A.I.D.s have little or anti inflammatory activity they have therapeutic advantage over narcotic analgesic in that they do not cause physical dependence or tolerance.

* Acetaminophen (paracetamol)
  Act by inhibiting prostaglandin synthesis in the C.N.S this explains their antipyretic and analgesic properties.
* Therapeutic use ;-- analgesic and anti pyretic effect of those patients with gastric complaints and in those for whom do not require the anti inflammatory action of aspirin , act aminophenol is the analgesic – anti pyretic of choice for children with viral infection or chicken pox (recall that aspirin increase the risk of Reyes syndrome
* Adverse effect ;-- nephro toxicity , hepatotoxicity .

* Anxiety;-- is unpleasant state of tension characterized by mental disturbances the symptoms of severe anxiety are similar to those of fear (such as tachycardia sweating palpitation.
  Benzodiazepines
  Benzodiazepines are mostly used because it’s safe and effective.

**Quiz / 3**
Define anxiety

**Note**
- Check your answers in key answer page 296

* Mode of action;--
  The act on amino butyric acid (G.A.B.A) to it’s receptor on the cell membrane triggers an opening of chloride channel which lead to an increase in chloride conductance the benzodiazepine bind to specific high affinity sites on cell membrane the benzodiazepine receptors are found only in central nervous system (C.N.S)
  (Therapeutic uses of benzodiazepines)
    1. Anxiety disorders.
    Should be used only for short period of time because of addiction potential
    2. Muscular disorder.
Diazepam is useful in treatment of skeletal muscle spasms such as occur in muscle strain and in treating spasticity from degenerative disorders such as multiple sclerosis and cerebral palsy.

3. **Seizures.**

Clonazepam is useful in the chronic treatment of epilepsy where as diazepam is the drug of choice in terminating grand mal epileptic seizures and status epilepticus.

Chlordiazepoxide diazepam and oxazepam are useful in acute treatment of alcohol withdrawal.

4. **Sleep disorder**

not all benzodiazepines are useful as hypnotic agents although all have sedative or calming effects the three most commonly prescribed benzodiazepine for sleep disorders are long acting flurazepam, temazepam and short acting trizolam.

**An aesthetics**

These are drugs used to loss of sensation and unconscious.

* **Preanaesthetic medication**

These are drugs used to increase the effect of general anesthetic and prevent the complication

* These drugs are:

1. narcotic analgesics, morphine sulphate.
2. Tranquilizer-narcotic combinations methadone-promazine.

**Classification of An aesthetics**

1. General an aesthetics
2. local an aesthetics

---

### General an aesthetics

<table>
<thead>
<tr>
<th>Non volatile an aesthetics</th>
<th>Volatile an aesthetics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. dissolve in water</td>
<td>1. inhalation</td>
</tr>
<tr>
<td>2. give injection or orally</td>
<td>2. liquid</td>
</tr>
<tr>
<td></td>
<td>E.X, chloroform, ethyl chloride</td>
</tr>
<tr>
<td></td>
<td>3. gasses</td>
</tr>
<tr>
<td></td>
<td>E.X, nitrous oxide, cyclopropane</td>
</tr>
</tbody>
</table>

* **Inhalation agents:**

1. ethyl ether
2. vinyl ether
3. nitrous oxide
4. halothane

* **Intravenous agent:**

Thiopentone sodium

**Stages of an anaesthesia**

1. stage of analgesia
2. stage of delirium
3. stage of surgical
4. stage of modularly paralysis

**Drugs used to treat rheumatoid arthritis**
1. aspirin (relief of pain and muscle stiffness)
2. ibuprofen

Drugs used to treat gout
1. drugs with analgesic or anti-inflammatory effect indomethacin
2. uricosuric drugs to increase elimination of urate sulphipyrazine
3. drugs which block uric acid synthesis allourinol

Myasthenia gravis:
- pyridostigmine (mestinon) 60 mg
- neostigmine 15 mg

In myasthenia gravis; there is reduction in the number of acetylcholine receptors in treatment we increase the concentration of acetylcholine at the neuro muscular junction.

**Quiz / 4**
Mention stages of ansthesia

**Note**
- Check your answers in key answer page 296

---

**5/ Post test**

Circle the correct answer :-

Fever occurs when the set point of the anterior hypothalamic thermoregulatory center is elevated aspirin resets the thermostat to ward normal aspirin has no effect on normal body temperature

1: aspirin Anti-pyretic action

a- has effect on skin vpiration.
b- has effect on normal body temperature
c- resets the thermostat to ward normal c- no one of them

2 voltarin is trade name of
a- Mefanamic acid b- Diclofenac
c- indometacin d- Acetaminophen

3- surgical Stages of an aesthesia
a- first stage b- second stage
c- third stage d- four stage

4- Drugs used to treat rheumatoid arthritis:
a- pyridostigmine b- neostigmine
c- allourinol d-

5- **drug choise** Myasthenia gravis
a -pyridostigmine b- neostigmine
c- ibuprofen d-a&b

6- Thiopentone sodium
a- Intravenous agent     b- intramuscular
c- intradermal        d- Inhalation
    5. Muscular disorder.
7 treatment of skeletal muscle spasms -:
a- aspirin            b- Diazepam
c- allourinol        d- pyridostigmine
8- Non volatile anesthetics:
a- . Inhalation
b-. Liquid
E.X, chloroform
c-. Dissolve in water
d-. Gases
9- Short acting benzodiazepine for sleep disorders
a- flurazepam    b- trizolam
c- temazepam    d- Diazepam
5. Halothane
10- Inhalation agents
    a - Ethyl ether     b- Vinyl ether
c- Nitrous oxide    d- All of them

Note
- Check your answers in key answer page 295 .
- ( 1 ) degree for each .
6/ key answer :-

1- Pre test :-
1. d 6-c
2. a 7-d
3. b 8-c
4. b 9-a
5. a 10-c

If you :-
- got 9 or more you do not need to proceed .
- got less than 9 you have to study this modular unit well .

2- Post test :-
1. c 6-a
2. b 7-b
3. c 9-c
4. d 8-b
5. d 10-d

If you :-
- got 9 or more , so congratulation your performance ,   go on studying modular unit three .
- got less than 9 , go back and study the second unit ; or any part of it ; again, and then do the post test again .

**Quiz 1**
Inflammation:- is abnormal protective response to tissue injury caused by physical trauma toxic chemical or microbiologic agents
1. Anti inflammatory drugs (N.S.A.I.D.S)
   Non steroidal anti inflammatory drugs
   Aspirin, Diclofenac, Luprofen, Naproxen, Piroxicam
2. (cox_2 inhibitors) celecoxib
3. (non_narcotic analgesics) actamino phen (paracetamol)
4. (drug for arthritis)
   chloroquine, gold salts methotrate, D- pencillamine
5. (drug for gout)
   Allopurinol, colchicines, probenecid, sulfinpyrazon

**Quiz 2**
(A) Aspirin and other salicylates

Action:--
1. anti _ inflammatory action
   because aspirin inhibit cyclooxygenase activity it diminishes the formation of prostglandins aspirin inhibits inflammation in arthritis
2. Anti pyretic action
   Fever occurs when the set point of the anterior hypothalamic ther more gulatory center is elevated aspirin resets the thermostat to ward normal aspirin has no effect on normal body temperature
3. Analgesic action
   By decreasing P.G.E2 synthesis aspirin and other N.S.A.IervativeDs depress the sensation of pain, so aspirin used in many manta the pain of low to moderate intensity
4. Respiratory action
   Aspirin alveolus ventilation
5. Gastro intestinal effect

**Quiz 3**
Anxiety;-- is unpleasant state of tension characterized by mental disturbances the symptoms of severe anxiety are similar to those of fear (such as tachycardia sweating palpitation.

Benzodiazepines
Benzodiazepines are mostly used because it’s safe and effective

**Quiz 4**
Stages of an aesthesia
5. stage of analgesia
6. stage of delirium
7. stage of surgical
8. stage of modularly paralysis

Sources :-
Hormones: pituitary Hormones

1 / A –Target population:-

This lecture is designed for second year Technical Institute students Department of nursing. It will be assumed that students have an adequate Knowledge in Hormones: pituitary Hormones.

Teaching Methods:
Lectures, Discussions, Data show, Seminars, and Handouts.

1 / B –Rationale :-
1- the student should know types hormones in body
2- the student should know deficiency of hormones and related disease
2- know best treatment and therapeutic doses

1 / C –Central Idea :-
Study hormones and their classification and deficiency causes disease and study their drug and their trade name.

1 / D –Instructions:-
1. Study over view thoroughly.
2. Identify the goal of this modular unit.
3. Do the pre test
4. After studying the text of this modular unit, do the post test

2/ Performance Objectives

The objectives of the lecture to give the students basic knowledge on endocrine pharmacology including hypothalamic, thyroid, pancreatic, and gonadal disorders and the drugs or agents used to correct these disorders. The course gives a sound knowledge of the pharmacodynamics, pharmacokinetics, therapeutic uses, adverse reactions and drug resistance of many of the important groups of chemotherapeutic agents.

3/ Pre test

Circle the correct answer:

1. Hormones secretion of ANTERIOR LOBE:
   a- regulatory hormones secreted by the hypothalamus
   b- blood-borne end-products of the peripheral cells
   c- a & b
   d- nervous signals originating from peripheral receptors

2. GH mean
   a- somatropin
   b- oxytocin
   c- vasopresin
   d- thyroxin
   (“IGF-1”) by the liver

3. Stimulation of GHRs causes synthesis and secretion of insulin-like growth factor 1
   a- by the stomach
   b- by the liver
   c- by the kidney
   d- by the pancreas

4. IGF-1 stimulation include:
   a- MUSCLE
   b- ADIPOSE TISSUE
   c- MUSCLE AND ADIPOSE TISSUE
   d- no one of them

5. Of IGF-1 stimulation in muscle through
   a- increased protein uptake
   b- increased protein anabolism
c- decreased protein catabolism d- all of them
6- SOMATROPIN administered
a- intradermal b- subcutaneously
c- intramuscular d- intravenous
7- treatment of turner’s syndrome (“dwarfism”): 
   a- STIMULATION b- TETRACOSACTIDE
   c- prolactin d- VASOPRESSIN
8- increased glucocorticoid synthesis and secretion mean:
   a- ZONA FASCICULATA b- ZONA RETICULARIS.
c-a&b. d- no one of them
9- ACTH mean 
   a- growth hormone b- adrenocorticothropic hormone 
c- prolactin hormone d- thyroid-stimulating hormone
10- TETRACOSACTIDE administered 
    a- intradermal b- subcutaneously 
c- intravenous d- intramuscular

Note
- Check your answers in key answer page 312.
- (1) degree for each.

4/ the module contents

Hormones: pituitary Hormones
- pituitary hormones are synthesized and secreted by the pituitary gland (“hypophysis”) the pituitary gland consists of 2 lobes ANTERIOR LOBE - consists of endocrine cells synthesizing and storing hormones secretion of hormones from these cells is regulated by regulatory hormones secreted by the hypothalamus and/or by blood-borne end-products of the peripheral cells that these hormones stimulate
**POSTERIOR LOBE** - consists of terminal axons of neurons whose cell bodies reside in the hypothalamus the cell bodies in the hypothalamus synthesize hormones which then are transported to the terminal axons of the posterior lobe for storage. Secretion of hormones from these terminal axons is regulated by nervous signals originating from peripheral receptors.

**Quiz / 1**

Explain pituitary hormone

**Note**

- Check your answers in key answer page 313

**ANTERIOR LOBE HORMONES**

**Relevant Drugs**

1) **GROWTH HORMONE**
- growth hormone (“GH”, “somatropin”) acts on GH receptors (“GHRs”) found exclusively in the liver
- stimulation of GHRs causes synthesis and secretion of insulin-like growth factor 1 (“IGF-1”) by the liver
- IGF-1 acts on IGF-1 receptors (“IGF-1Rs”) found in most cells, thus inducing growth and/or division of the stimulated cells
- consequences of IGF-1 stimulation include

**TISSUE CONSEQUENCE**

1. **MUSCLE** - increased protein uptake
   - increased protein anabolism
   - decreased protein catabolism
2. **ADIPOSE TISSUE** - increased deliberation of free fatty acids
   - increased beta-oxidation
3. **MUSCLE AND ADIPOSE TISSUE** - decreased glucose uptake
   - decreased glycolysis
4. **BONE** - increased osteoblast activity, decreased osteoclast activity

- regulation of GH secretion is done by 2 mechanisms

**REGULATION MEDIATOR**

STIMULATION - growth hormone-releasing hormone (“GHRH”)

INHIBITION - dopamine (through action on D2 receptors)

- IGF-1
- 1 type

**DRUG NAME DESCRIPTION**

**SOMATROPIN** *General information*
- recombinant GH
- administered subcutaneously

*Medical uses*
- treatment of turner’s syndrome (“dwarism”)

2) **ADRENOCORTICOTROPHIC HORMONE**
- adrenocorticotropic hormone (“ACTH”) acts on ACTH receptors (“ACTHRs”) exclusively found in zona fasciculata and zona reticularis of the adrenal cortex
- consequences of ACTH stimulation include
  TISSUE CONSEQUENCE
  zona fasciculata - increased glucocorticoid synthesis and secretion
  zona reticularis - increased sex hormone synthesis and secretion

- regulation of ACTH secretion is done by 2 mechanisms
  STIMULATION - corticotropin-releasing hormone(“CRH”)

- ADH (through action on V3 receptors)
  INHIBITION - glucocorticoids (mainly hydrocortisone)

- 1 type
  DRUG NAME DESCRIPTION
  TETRACOSACTIDE General information
  - synthetic analogue of ACTH
  - administered intramuscularly
  Medical uses
  - diagnosis of adrenocortical insufficiency

3) PROLACTIN
- prolactin (“PRL”) acts on PRL receptors (“PRLRs”) exclusively found in the mammary glands of the breasts

- consequences of PRL stimulation include
  TISSUE CONSEQUENCE
  MAMMARY GLAND - increased milk production(together with oestrogens- upregulation of oestrogen receptors
  - regulation of PRL secretion is done by 2 mechanisms
  STIMULATION - prolactin-releasing hormone(“PRH”)

  INHIBITION - dopamine (through action on D2 receptors)

A) D2 RECEPTOR ANTAGONISTS
- D2 receptor antagonists inhibit the inhibitory action of dopamine on PRL secretion, thus facilitating PRL secretion and following increased milk production

4) THYROID-STIMULATING HORMONE
- thyroid-stimulating hormone (“TSH”) acts on TSH receptors (“TSHRs”) exclusively found in the follicles of the thyroid gland
- consequences of TSH stimulation include
  TISSUE CONSEQUENCE
  THYROID FOLLICLES - increased secretion of thyroid hormones (tetraiodothyronine and triiodothyronine)

- regulation of TSH secretion is done by 2 mechanisms
REGULATION MEDIATOR
STIMULATION - thyrotropin-releasing hormone ("TRH")
INHIBITION - thyroxin
- triiodothyronine
- not used clinically

5) FOLLICLE-STIMULATING HORMONE AND LUTENIZING HORMONE
- follicle-stimulating hormone ("FSH") and lutenizing hormone ("LH") act on FSH receptors ("FSHRs") and LH receptors ("LHRs"), respectively, exclusively found in the gonads
- consequences of FSH and LH stimulation may be divided in 2 groups
A) FSH STIMULATION
- consequences include
TISSUE CONSEQUENCE
OVA - development of the primordial follicles to yield mature follicles
- oestrogen synthesis and secretion by the mature follicles
TESTES - maturation of spermatozoa ("spermatogenesis", together with testosterone)

Quiz / 2
Define follicle-stimulating hormone

Note
- Check your answers in key answer page 313

B) LH STIMULATION
- consequences include
TISSUE CONSEQUENCE
OVA - rupture of the mature follicles and following ovulation
- progesterone synthesis and secretion by the remnants of the ruptured follicles ("corpus luteum")

TESTES - testosterone synthesis and secretion

- regulation of FSH and LH secretion is done by 2 mechanisms
REGULATION MEDIATOR
STIMULATION - gonadotropin-releasing hormone ("GnRH")
INHIBITION - estrogen
- progesterone
- testosterone
- 1 group
A) ORAL CONTRACEPTIVES
- oral contraceptives inhibit the release of FSH and LH from the anterior pituitary, thus preventing ovulation and following prevention of pregnancy
Hormones of the posterior pituitary

1. desmopressin
2. oxytocin
3. vasopressin (A.D.H)

1. Steroid Hormones

POSTERIOR LOBE HORMONES

Relevant Drugs
- 2 categories
  1) antidiuretic hormone
  - antidiuretic hormone ("ADH", "vasopressin") acts on ADH receptors ("ADHRs") found in several tissues
  - there are 3 types of ADH receptors

<table>
<thead>
<tr>
<th>RECEPTOR TYPE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
</table>
| V1            | Location: vascular smooth muscle  
|               | Consequence: vasoconstriction |
| V2            | Location: distal tubules and collecting ducts of the kidney  
|               | Consequence: insertion of aquaporins in the luminal surface of the distal tubules and collecting ducts of the kidney and following sodium excretion and water reabsorption |
| V3            | Location: pituitary gland  
|               | Consequence: ACTH secretion  

- regulation of ADH secretion is done by 1 mechanism

REGULATION MEDIATOR

STIMULATION - stimulation of osmoreceptors in the hypothalamic capillaries by high blood osmolality  
- stimulation of baroreceptors in the carotid bodies by low blood pressure

- 3 types

DRUG NAME DESCRIPTION

VASOPRESSIN

General information

- ADH itself
- non-selective ADH-receptor agonist
- administered IV, intramuscularly and/or subcutaneously

Medical uses

- treatment of hemorrhagic esophageal varices
- treatment of diabetes insipidus

TERLIPRESSIN

General information

- synthetic ADH analogue
- selective V1 receptor agonist

**Medical uses**
- treatment of hemorrhagic esophageal varices

**DESMOPRESSIN General information**
- synthetic ADH analogue
- selective V2 receptor agonist
- administered nasally

**Medical uses**
- treatment of diabetes insipidus

**Quiz / 3**
Mention **General information** of ESTRADIOL

**Note**
- Check your answers in key answer page 313

2) **OXYTOCIN**
- oxytocin acts on oxytocin receptors exclusively found in the smooth muscle cells of the uterus and surrounding the mammary glands of the breasts
- consequences of oxytocin stimulation include
  - **TISSUE CONSEQUENCE**
  - **UTERUS** - very strong rhythmic contractions leading to labor
  - **MAMMARY GLANDS**
    - ejection of milk
- regulation of oxytocin secretion is done by 1 mechanism

**REGULATION MEDIATOR**
- **STIMULATION** - extreme distension of the uterus (end of pregnancy)
- suckling of the nipples (breast feeding)
- 2 groups
  - **A) OXYTOCIN RECEPTOR AGONISTS**
    - oxytocin receptor agonists (“oxytocic drugs”) stimulate oxytocin receptors, thus facilitating contractions of the uterus and following induction of labor
  - **B) OXYTOCIN RECEPTOR ANTAGONISTS**
    - oxytocin receptor antagonists (“tocolytic drugs”) inhibit the action of oxytocin on oxytocin receptors, thus inhibiting contractions of the uterus and following prevention of labor

**Estrogens**
1. estradiol
2. ethinyl estradiol
3. mestranol

**Progestin**
1. medroxyprogesterone
2. nor ethidone

**Anti estrogens**
1. clomiphene
2. tamoxifen

**Androgens**
1. danazol
2. nandrolone
3. testo stevone

Anti androgen
2. finasteride

flatamide

OESTROGENS, ANTI-OESTROGENS, PROGESTOGENS,
ANTI-PROGESTOGENS

Overview
- oestrogens and progestogens are the female sex hormones
- they are steroid hormones synthesized and secreted by 4 different tissues

TISSUE DESCRIPTION
OVA - during puberty and adulthood
PLACENTA - during pregnancy
ADRENAL CORTEX - only a small basal output
- only significant during childhood and menopause
TESTIS - only a small basal output
- in males
- like all other steroid hormones, oestrogens and progestogens are synthesized from cholesterol

OESTROGENS

Overview
- there are 3 main types of endogenous oestrogens (listed from least to most potent)

TYPE DESCRIPTION
OESTRONE
OESTRIOL
OESTRADIOL
- oestrogens act on oestrogen receptors found in most tissues, but with a high prevalence in the ovaries, uterus, vagina and breasts
- oestrogens also have a weak action on aldosterone receptors - consequences of oestrogen stimulation may be divided in 2 groups
1) SEXUAL CONSEQUENCES
- include
CONSEQUENECE DESCRIPTION
DEVELOPMENT OF
PRIMARY SEXUAL
CHARACTERISTICS
- development of the ova, uterus and vagina
DEVELOPMENT OF
SECONDARY SEXUAL
CHARACTERISTICS
- redistribution of fat to the breasts and hips
REGULATION OF THE
MENSTRUAL CYCLE
- proliferation of the endometrium of the uterus ("endometrial proliferative phase")

- upregulation of progestogen receptors in the ova, uterus and anterior lobe of the pituitary gland
REGULATION OF PREGNANCY
- inhibition of FSH and LH secretion of by the anterior lobe of the pituitary gland (thus inhibiting menstruation)
- development of the mammary glands (together with progestogens)
- increased milk production (together with prolactin)

- weak rhythmic contractions of the uterus

2) NON-SEXUAL CONSEQUENCES
- include

TISSUE CONSEQUENCE
LIVER - increased synthesis of coagulation factors
- increased synthesis of antithrombin III and plasminogen
- increased synthesis of HDL cholesterol
- decreased synthesis of LDL cholesterol
BONE - increased osteoblast activity
- decreased osteoclast activity
- regulation of oestrogen secretion is done by LH

Relevant Drugs
- 2 groups
1) NATURAL OESTROGENS
- 2 types

DRUG NAME DESCRIPTION
ESTRADIOL General information
- “oestradiol”
- administered orally, subcutaneously and/or dermally

Medical uses
- treatment of primary hypogonadism
- treatment of secondary hypogonadism (“menopause”)
- treatment of post-menopausal osteoporosis

Side effects
- thrombosis/embolism (due to increased synthesis of coagulation factors)
- breast cancer
- nausea/vomiting
- hypertension (due to sodium/water retention by action on aldosterone receptors)
- generalized edema (due to sodium/water retention)

ESTRIOL General information
- “oestriol”
- administered orally and/or vaginally
- same as estradiol (see above)

2) SYNTHETIC OESTROGENS
- 2 types

DRUG NAME DESCRIPTION
ETHINYLESTRADIOL General information
- synthetic oestrogen derivative
- administered orally, intramuscularly, subcutaneously and/or dermally

**Medical uses**
- same as estradiol - prevention of pregnancy ("oral contraceptive", then administered coherently with a progestogen)

**MESTRANOL General information**
- same as ethinylestradiol (see above)

**ANTI-OESTROGENS**

**Overview**
- anti-oestrogens are drugs that either inhibit the action of oestrogen on oestrogen receptors or inhibit the synthesis of oestrogen

**Relevant Drugs**
- 2 categories

1) **OESTROGEN RECEPTOR ANTAGONISTS**
- oestrogen receptor antagonists antagonize the action of oestrogen on oestrogen receptors
- oestrogen receptor antagonists also have an oestrogen receptor agonist action to a varying degree in different tissues
- 2 types

**DRUG NAME DESCRIPTION**

**TAMOXIFEN General information**
- oestrogen receptor antagonist in the breasts, thus inhibiting the increased risk of breast cancer associated with oestrogen
- oestrogen receptor agonist everywhere else

**Medical uses**
- treatment of breast cancer (oestrogen receptor antagonist action)
- treatment of post-menopausal osteoporosis (oestrogen receptor agonist action)

**CLOMIPHENE General information**
- oestrogen receptor antagonist in the anterior lobe of the pituitary gland, thus inhibiting negative feedback of oestrogen on the anterior lobe of the pituitary gland
- oestrogen receptor agonist everywhere else

**Medical uses**
- treatment of anovulation (oestrogen receptor antagonist action)

2) **OESTROGEN SYNTHESIS INHIBITORS**
- oestrogen synthesis inhibitors inhibit aromatase (see 55), thus inhibiting synthesis of oestrogens
- 2 types

**DRUG NAME DESCRIPTION**

**ANASTRAZOLE Medical uses**
- treatment of breast cancer

**FORMESTANE Medical uses**
- same as anastrazole

**PROGESTOGENS**

**Overview**
- the main endogenous progestogen is progesterone
- progesterone acts on progestogen receptors primarily found in the ova and uterus
- progesterone also has a weak action on aldosterone receptors - consequences of progesterone stimulation may be divided in 2 groups
1) SEXUAL CONSEQUENCES
- include
CONSEQUENCE DESCRIPTION
REGULATION OF THE MENSTRUAL CYCLE
- secretion by the endometrium of the uterus (“endometrial secretory phase”)
- downregulation of estrogen receptors in the ova and uterus
REGULATION OF PREGNANCY
- development of the mammary glands (together with oestrogens)
- strong rhythmic contractions of the uterus
2) NON-SEXUAL CONSEQUENCES
- include
CONSEQUENCE DESCRIPTION
LIVER - increased synthesis of LDL cholesterol
- decreased synthesis of HDL cholesterol
- regulation of progesterone secretion is done by FSH

Relevant Drugs
- 2 categories
1) PROGESTERONE AND PROGESTERONE DERIVATIVES
- 2 types
DRUG NAME DESCRIPTION
HYDROXYPROGESTERONE General information
- administered orally, intramuscularly, vaginally and/or rectally
Medical uses
- treatment of ectopic endometrial tissue (“endometriosis”)
- treatment of endometrial hyperplasia
- treatment of endometrial cancer
Side effects
- irregular menstrual cycles
- irregular menstrual bleeding
- irritability
- depression
- thrombosis/embolism (due to increased LDL cholesterol and decreased HDL cholesterol)
- hypertension (due to sodium/water retention by action on aldosterone receptors)
- generalized edema (due to sodium/water retention)
MEDROXYPROGESTERONE General information
- same as hydroxyprogesterone
2) SYNTHETIC PROGESTOGENS
- 5 types
DRUG NAME DESCRIPTION
NORETHISTERONE General information
- also a weak testosterone receptor agonist
- administered orally
Medical uses
- same as hydroxyprogesterone
- prevention of pregnancy (“oral contraceptive”, then administered alone or coherently with an oestrogen

Side effects
- same as hydroxyprogesterone
- increased muscular mass (due to action on testosterone receptors)
- acne (due to action on testosterone receptors)

ETHYNOLO

General information
- same as norethisterone

LEVONORGESTREL

General information
- administered orally

Medical uses
- same as norethisterone Side effects
- same as hydroxyprogesterone

DESOGESTREL

General information
- same as levonorgestrel

GESTODENE

General information
- same as levonorgestrel

ANTI-PROGESTOGENS

Overview
- anti-progestogens are progestogen receptor antagonists, thus inhibiting the action of progesterone on progestogen receptors

Relevant Drugs

DRUG NAME DESCRIPTION

MIFEPRISTONE Medical uses
- 1st trimester abortion (then administered coherently with misoprostol

ORAL CONTRACEPTIVES

Overview
- oral contraceptives are drugs that inhibit FSH and LH release from the anterior lobe of the pituitary gland
- this causes inhibition of development of primordial follicles to mature follicles of the ova, and inhibition of rupture of these mature follicles and following ovulation
- , thus oral contraceptives prevent pregnancy
- oral contraceptives are administered orally (duh!)

Relevant Drugs
- 3 categories

1) COMBINED PILL
- the combined pill is a combination of 1 oestrogen and 1 progestogen
- oestrogens and progestogens inhibit FSH and LH release from the anterior lobe of the pituitary gland by negative feedback
- the combined pill is taken for 21 consecutive days, followed by a 7 day break to induce menstruation (without previous ovulation)
- there are 3 groups of combined pills

A) MONOPHASIC COMBINED PILL
- the same ratio of the oestrogen and the progestogen is taken for all the 21 days

B) BIPHASIC COMBINED PILL
- the 21 days are divided in 2 periods, and 2 different ratios of the oestrogen and the progestogen are taken in these periods
C) TRIPHASIC COMBINED PILL
- the 21 days are divided in 3 periods, and 3 different ratios of the oestrogen and the progestogen are taken in these periods
- side effects of the combined pill include

STEROID SIDE EFFECT
OSTEOTROGEN - breast cancer
- nausea/vomiting
PROGESTOGEN - irritability
- depression
- acne (if the progestogen also is a weak testosterone agonist)
- increased muscle mass (if the progestogen is a weak testosterone agonist)

OSTEOTROGEN/PROGESTOGEN
- thrombosis/embolism
- hypertension
- generalized edema

2) PROGESTOGEN-ONLY PILL
- the progestogen-only pill consists of only 1 progestogen (duh!)
- progestogen alone also inhibit FSH and LH release from the anterior lobe of the pituitary gland by a negative feed back mechanism, though less efficiently than in combination with an oestrogen
- the progestogen-only pill is taken continuously
- 1 group
- side effects of the progestogen-only pill are the same as the progestogen- and oestrogen/progestogen side effects of the combined pill

3) postcoital contraception pill “emergency pill”
- the postcoital contraception pill is a modified progestogen-only pill or a modified combined pill with a much higher concentration of progestogen and/or oestrogen
- it powerfully inhibits FSH and LH release from the anterior lobe of the pituitary gland, thus preventing pregnancy
- the post-coital contraception pill is taken less than 72 hours after unprotected intercourse, and then repeated 12 hours later

Quiz / 4
Mention group of compind pill

Note
- Check your answers in key answer page 313

5/ Post test

Circle the correct answer :-

1- FSH mean:-
a- follicular stimulating hormone.  b- Luteinizing hormone

c- androgen                                      c- progesterone

2- oral contraceptives inhibit the release
   a- FSH                                      b- LH
   c- FSH & LH                                 d- progesterone

CLOMIPHENE General information
- oestrogen receptor antagonist in the anterior lobe of the pituitary gland, thus inhibiting
  negative feedback of oestrogen on the anterior lobe of the pituitary gland
- oestrogen receptor agonist everywhere else
- (oestrogen receptor antagonist action)

3- Medical uses of CLOMIPHENE
   a- treatment of an ovulation
   b- treatment of endometriosis
   c- treatment of dwarfism
   d- treatment of rhinitis

4- the 21 days are divided in 2 periods, and 2 different ratios of the
   estrogen and the progestogen are taken in these periods:

   a- TRIPHASIC COMBINED PILL
   b- BIPHASIC COMBINED PILL
   c- MONOPHASIC COMBINED PILL
   d- a&b

after unprotected intercourse

5- the post-coital contraception pill is taken less than
   a- 7 hours                                   b- 17 hours
   c- 37 hours                                 d- 72 hours

6- side effects of the combined pill include
   a- breast cancer                            b- nausea/vomiting
   c- a&b                                      d- no one of them

7- effect of GH on BONE:
   a- decreased osteoblast activity
   b- increased osteoclast activity
   c- Increased osteoblast activity, decreased osteoclast activity
   d- decreased osteoblast activity & increased osteoclast activity

8- INHIBITION of TSH secretion:
   a- thyroxin                                 b- triiodothyronine
   c- TRH.                                    d- a&b

9- THYROID FOLLICLES
   a- increased secretion of thyroid hormones
   b- increased tetraiodothyronine
   c- increased triiodothyronine
   d- all of them

10- the main endogenous progestogen is
   a- progesterone                             b- oestrogen
   c- prolactin                                d- estradiol

Note
- Check your answers in key answer page 312.

- (1) degree for each

6/ key answer :-

1- Pre test :-

1. c 6-b
2. a 7- a
3. b 8- c
4. c 9- b
5. d 10- d

If you :-
- got 9 or more you do not need to proceed.
- got less than 9 you have to study this modular unit well.

2- Post test :-

1. a 6- c
2. c 7- c
3. a 8- d
4. b 9-d
5. d 10-a

If you :-
- got 9 or more, so congratulation your performance, go on studying modular unit three.
- got less than 9, go back and study the second unit; or any part of it; again, and then do the post test again.

Quiz 1

- pituitary hormones are synthesized and secreted by the pituitary gland ("hypophysis") the pituitary gland consists of 2 lobes
ANTERIOR LOBE - consists of endocrine cells synthesizing and storing hormones secretion of hormones from these cells is regulated by regulatory hormones secreted by the hypothalamus and/or by blood-borne end-products of the peripheral cells that these hormones stimulate

POSTERIOR LOBE - consists of terminal axons of neurons whose cell bodies reside in the hypothalamus the cell bodies in the hypothalamus synthesize hormones which then are transported to the terminal axons of the posterior lobe for storage secretion of hormones from these terminal axons is regulated by nervous signals originating from peripheral receptors

Quiz 2

FOLLICLE-STIMULATING HORMONE AND LUTENIZING HORMONE
- follicle-stimulating hormone (“FSH”) and lutenizing hormone (“LH”) act on FSH receptors (“FSHRs”) and LH receptors (“LHRs”), respectively, exclusively found in the gonads

Quiz 3

ESTRADIOL. General information
- “oestradiol”
- administered orally, subcutaneously and/or dermally

Medical uses
- treatment of primary hypogonadism
- treatment of secondary hypogonadism (“menopause”)
- treatment of post-menopausal osteoporosis

Quiz 4

- there are 3 groups of combined pills
A) MONOPHASIC COMBINED PILL
- the same ratio of the oestrogen and the progestogen is taken for all the 21 days
B) BIPHASIC COMBINED PILL
- the 21 days are divided in 2 periods, and 2 different ratios of the oestrogen and the progestogen are taken in these periods
C) TRIPHASIC COMBINED PILL
- the 21 days are divided in 3 periods, and 3 different ratios of the oestrogen and the progestogen are taken in these periods

Sources :-

1- Basic & Clinical Pharmacology (Basic and Clinical Pharmacology)
1/ Over view

Thyroid hormones

1 / A – Target population :-
This lecture is designed for second year Technical Institute students Department of nursing. It will be assumed that students have an adequate background in Thyroid hormones

Teaching Methods:
Lectures, Discussions, Data show, Seminars, and Handouts.

1 / B – Rationale :-
The student will know thyroid hormone and their releases in body and know pharmacological effect of thyroid hormone

1 / C – Central Idea :-
1- determine pharmacological effect of THYROID HORMONES, ANTITHYROID DRUGS
2- determine therapeutic uses, dose, trade name and side effect of their drugs related

1 / D – Instructions:-

1. Study over view thoroughly.
2. Identify the goal of this modular unit.
3. Do the pre test
After studying the text of this modular unit, do the post test.

2/ Performance Objectives:

The objectives of the course are to give the students basic knowledge on endocrine pharmacology including hypothalamic, pituitary, thyroid, pancreatic, and gonadal disorders and the drugs or agents used to correct these disorders. The course gives a sound knowledge of the pharmacodynamics, pharmacokinetics, therapeutic uses, adverse reactions and drug resistance of many of the important groups of chemotherapeutic agents used in the treatment of infectious diseases and cancer.

3/ Pre test:

Circle the correct answer:

1. the thyroid gland synthesizes and secretes hormones:
   a. TETRAIODOTHYRONINE   b. TRIIODOTHYRONINE
   c. CALCITONIN             d. all of them
2. thyroid hormones are synthesized from
   a. iodine     b. tyrosine
   c. a&b        d. thyroglobulin
3. iodide covalently bound to 1 tyrosine called
   a. monoiodotyrosine    b. diiodotyrosine
   c. tetraiodothyronine  d. no one of them
4. increased glycolysis mean:
   a. CHO metabolism      b. protein metabolism
   c. fat metabolism      d. all of them
5. basedow-grave’s disease due to
   a. hyperthyroidism     b. hypothyroidism
   c. increase prolactin level d. increase progesterone
Note

- Check your answers in key answer page 321.
- (2) degree for each.

4/ the text:

THYROID HORMONES, ANTITHYROID DRUGS

Overview
- the thyroid gland synthesizes and secretes 3 hormones
1-TETRAIODOTHYRONINE - “T4”
- “thyroxin”
- 2 diiodotyrosine molecules covalently bound to each other
2-TRIIODOTHYRONINE - “T3”
- 1 monoiodotyrosine- and 1 diiodotyrosine molecule covalently bound to each other

Quiz / 1
Mention hormone of thyroid gland

Note
- Check your answers in key answer page 322

3-CALCITONIN
- however, thyroid hormones in its strictest sense only encompass tetraiodothyronine and triiodothyronine, thus these are the hormones covered here
- thyroid hormones are synthesized from iodine and tyrosine in the follicular cells of the thyroid gland, and stored as thyroglobulin in the colloid of the thyroid follicles
- synthesis of thyroid hormones is done by oxidation of iodine to oxidized iodine (“iodide”) and oxidation of tyrosine to oxidized tyrosine
- this oxidation is done by the enzymatic action of thyroperoxidase and its coenzyme hydrogen peroxide (an oxidizing agent)
- then, iodide and oxidized tyrosine spontaneously join to form 2 different molecules

MOLECULE DESCRIPTION
monoiodotyrosine- 1 iodide covalently bound to 1 tyrosine
diiodotyrosine - 2 iodides covalently bound to 1 tyrosine
- 2 diiodotyrosine molecules covalently bound to each other will form tetraiodothyronine,
while 1 moniodotyrosine- and 1 diiodotyrosine molecule covalently bound to each other will form triiodothyronine
- however, triiodothyronine is converted to triiodothyronine in the peripheral tissues
- , thus triiodothyronine may be considered the only main endogenous thyroid hormone
- triiodothyronine acts on thyroid hormone receptors found in most cells
- consequences of triiodothyronine stimulation may be divided in 2 groups

**Quiz / 2**

Mention *iodide* and oxidized tyrosine spontaneously

**Note**

- Check your answers in key answer page 322

1) **DIRECT METABOLIC CONSEQUENCES**
- include

**CONSEQUENCE DESCRIPTION**

**CARBOHYDRATE METABOLISM** - increased glucose uptake
- increased glycolysis
- increased gluconeogenesis

**FAT METABOLISM**
- increased deliberation of free fatty acids from adipose tissue
- increased beta-oxidation
- increased synthesis of HDL cholesterol
- decreased synthesis of LDL cholesterol

**PROTEIN METABOLISM**
- increased protein uptake
- increased protein anabolism
- decreased protein catabolism

2) **INDIRECT METABOLIC CONSEQUENCES**
- include

**TISSUE CONSEQUENCE**

**CARDIOVASCULAR SYSTEM** - increased heart rate ("positive chronotropic effect")
- increased force of contraction("positive ionotropic effect")
- increased myocardial excitability ("positive bathmotropic effect")
- increased AV conduction("positive dromotropic effect")

**RESPIRATORY SYSTEM** - increased respiratory rate
**GI SYSTEM** - increased food intake
**ENDOCRINE SYSTEM** - increased hormone secretion
**CENTRAL NERVOUS SYSTEM** - increased mental activity ("cerebration")
- hyperactivity and/or
  somnolence
- collectively the direct- and indirect metabolic consequences cause increased metabolic rate, increased heat production, increased growth and decreased weight

- regulation of thyroid hormone secretion is done by TSH

**Relevant Drugs**
- 2 categories
  1) THYROID HORMONES
  - thyroid hormones are used in treatment of hypothyroidism
  - 2 groups
  A) NATURAL THYROID HORMONES
  - 2 types
  DRUG NAME DESCRIPTION
  THYROXINE *General information*
  - tetraiodothyronine itself
  - administered orally
  *Side effects*
  - angina pectoris (due to positive chronotropic- and -ionotropic effect)
  - cardiac dysrhythmia (due to positive bathmotropic- and –dromotropic effect)
  - cardiac failure (due to angina pectoris and cardiac dysrhythmias)
  - osteoporosis
  TRIIODOTHYRONINE *General information*
  - same as thyroxin

**Quiz / 3**
Enumerate FAT METABOLISM

**Note**
- Check your answers in key answer page 322

B) SYNTHETIC THYROID HORMONES
- 2 types
  DRUG NAME DESCRIPTION
  LEVOTHYROXINE *General information*
  - synthetic tetraiodothyronine
  - same as thyroxin
  LIOTHYRONINE *General information*
  - synthetic triiodothyronine
  - same as thyroxin

2) ANTIITHYROID DRUGS
- antithyroid drugs are used in treatment of hyperthyroidism (“toxic goiter”, “basedow-grave’s disease”)

- 5 groups
  A) IODIDE
  - iodide inhibits synthesis of hydrogen peroxide, thus inhibiting oxidation of iodine and tyrosine and following inhibition of formation of thyroid hormones
  - 1 type
  DRUG NAME DESCRIPTION
POTASSIUM IODIDE General information
- “lugol solution”
- administered orally
Side effects
- angioedema
- rashes
- conjunctivitis
- fever
B) RADIOACTIVE IODINE
- radioactive iodine is almost completely taken up by the thyroid follicles where it emits beta- and gamma-radiation, thus destroying parts of the thyroid gland
- 1 type
DRUG NAME DESCRIPTION
RADIOIODINE General information
- administered orally
Side effects
- hypothyroidism
- teratogenesis
C) THIOUREYLENES
- thioureylenes inhibit thyroperoxidase, thus inhibiting oxidation of iodine and tyrosine and following inhibition of formation of thyroid hormones
- 4 types
DRUG NAME DESCRIPTION
methimazole General information
- administered orally
- may cross the placental barrier
Side effects
- non-toxic goiter (due to absence of negative feedback on the anterior lobe of the pituitary gland)
- exophthalmus (due to absence of negative feedback on the anterior lobe of the pituitary gland)
- leukocytopenia
- jaundice
- rashes
- nausea
CARBIMAZOLE General information
- pro-drug
- converted to methimazole in the body
- same as methimazole (see above)
THIOURACIL General information
- same as methimazole (see above)
METHYLTHIOURACIL General information
- same as methimazole (see above)
D) NON-SELECTIVE BETA ANTAGONISTS
- non-selective beta antagonists inhibit the action of catecholamines on beta-adrenergic receptors, thus decreasing the tachycardia,
dysrhythmia, tremor and agitation associated with hyperthyroidism
E) GLUCOCORTICOIDS
- glucocorticoids suppress the immune defense system, thus preventing the exophthalmus associated with hyperthyroidism

**Quiz 4**
Mention *General information* about SYNTHETIC THYROID HORMONES drugs

*Note*
- Check your answers in key answer page 322

**5/ Post test :-**

Circle the correct answer :-
1 - triiodothyronine stimulation may be protein metabolism:
   a- increased protein uptake.   b- increased protein anabolism
   c- a&b                      d- increased protein catabolism
2- triiodothyronine effect on cardiovascular system
   a- increased myocardial excitability b- decreased myocardial excitability
   c- decreased AV conduction     d- decreased force of contraction
3- non-selective beta antagonists
   a- stimulate the action of catecholamines on beta-adrenergic receptors, thus decreasing the tachycardia
   b- inhibit the action of catecholamines on beta-adrenergic receptors, thus decreasing the tachycardia
   c- inhibit the action of catecholamines on alpha-adrenergic receptors, thus decreasing the tachycardia
   d- inhibit the action of catecholamines on beta-adrenergic receptors, thus increasing the tachycardia

4- *Side effect of RADIOIODINE:*
   a- hypothyroidism       b- angioedema
   c- rashes              d- conjunctivitis

5- ANTITHYROID DRUGS
   a- IODIDE        b- RADIOACTIVE IODINE
   c- thioureylenes d- all of them

*Note*
- Check your answers in key answer page 321
6/ key answer :-

1- Pre test :-
   1. d
   2. c
   3. a
   4. d
   5. a

   If you :-
   • got 9 or more you do not need to proceed .
   • got less than 9 you have to study this modular unit well .

2- Post test :-
   1. c
   2. a
   3. b
   4. a
   5. d

   If you :-
   • got 9 or more , so congratulation your performance ,    go on studying modular unit three .
   • got less than 9 , go back and study the second unit ; or any part of it ; again, and then do the post test again .

Quiz 1
- the thyroid gland synthesizes and secretes 3 hormones
1-TETRAIODOTHYRONINE - “T4”
2-TRIIODOTHYRONINE - “T3”
3-CALCITONIN

**Quiz 2**

iodide and oxidized tyrosine spontaneously join to form 2 different molecules

**MOLECULE DESCRIPTION**

monoiodotyrosine - 1 iodide covalently bound to 1 tyrosine

diiodotyrosine - 2 iodides covalently bound to 1 tyrosine

- 2 diiodotyrosine molecules covalently bound to each other will form tetraiodothyronine, while 1 monoiodotyrosine- and 1 diiodotyrosine molecule covalently bound to each other will form triiodotyronine

**Quiz 3**

**FAT METABOLISM**

- increased deliberation of free fatty acids from adipose tissue
- increased beta-oxidation
- increased synthesis of HDL cholesterol
- decreased synthesis of LDL cholesterol

**Quiz 4**

- synthetic triiodothyronine

- same as thyroxine excreted, accumulation of drug may result in drug toxicity ex alcoholic

---

**Sources :-**

2- Katzung and Trevor's Pharmacology Anthony J. Trevor (Author), Bertram G. Katzung (Author), Susan B. Masters (Author) : McGraw-Hill Medical; Latest edition 640 pages
3- Lippincott's Illustrated Reviews: Pharmacology (Lippincott's Illustrated Reviews Series) Richard D Howland (Author), Mary J Mycek (Author), Richard A Harvey (Author), Pamela C Champe (Author) Paperback: 559 pages Publisher: Lippincott Williams & Wilkins; Latest edition
4- Goodman & Gilman's The Pharmacological Basis of Therapeutics Laurence Brunton (Author), John Lazo (Author), Keith Parker (Author) Publisher: McGraw-Hill Professional; Latest edition
1/ Over view

Vitamins: Types, classification, Sources, Diseases caused due to Deficiency of Vitamin

1/ A – Target population:-

This lecture is designed for second year Technical Institute students Department of nursing. It will be assumed that students have an adequate Knowledge in.

Teaching Methods:
Lectures, Discussions, Data show, Seminars, and Handouts.

1/ B – Rationale :-

1- the student should study the of vitamin
2- the student study disorder due to their vitamin
3- the student should study treatment of these disorders

1/ C – Central Idea :-

Vitamin divided to two types and every one has several effect on body and deficiency of vitamin cause disease and should know drug to treat this disorder

1/ D – Instructions:-

1. Study over view thoroughly.
2. Identify the goal of this modular unit.
3. Do the pre test
4. After studying the text of this modular unit, do the post test

2/ Performance Objectives

The objectives of the lecture are to give the students basic knowledge on vitamine pharmacology including vitamine dissolve in water and vitamine dissolve in fat and study deficiency and disorders and the drugs or agents used to correct these disorders.
Circle the correct answer :-

1. vitamin dissolve in water:
   a- vitamin A.                     b- vitamin B
   c- vitamin D                     c- vitamin K

2. thiamine name of vitamin
   a- vitamin B1                     b- vitamin B2
   c- vitamin B6                     d- vitamin Bt2

3. Disease of vitamin B2 deficiency
   a- craking of lips                b- glossitis and photophobia
   c- a&b                           d- treat pellagra and atherosclerosis

4. benadon dose:
   a- tab 3 – 4 mg                   b- tab 30 – 40 mg
   c- tab 130 – 140 mg               d- tab 230 – 240 mg

5. scurvy disease occur due to
   a- vitamin A.                    b- vitamin B
   c- vitamin C                     c- vitamin K

Note
- Check your answers in key answer page 327.
- (2) degree for each.

4/ the module contents

Vitamin’s:-
It organic compound found in more food in small amount necessary for metabolic function.
Classify into
1. vitamin dissolve in water (b, c)
2. vitamin dissolve in fat (a, d, e, k)

**Quiz / 1**
Enumerate classification of vitamin

**Note**
- Check your answers in key answer page 328

1. vitamin B1 (thiamine)
disease of deficiency: beri–beri ~ by neuritis, weakness, edema, cardiac, insufficiency

Brand name:- Benerva
Tab, 100 – 300 mg
Inj, 50 ml / ml

2. B2 (Riboflavin)
Disease of def: ~ craking of lips, glossitis and photophobia

3. Nicotinic Acid (niacin)
Disease of def: pellagra disease ~ by (cutaneous inflammation, glossitis, dry mouth, hypotension)

Used to:
1. treat pellagra and atherosclerosis
2. angina pectoris

**Quiz / 2**
Define nicotinic acid and their uses

**Note**
- Check your answers in key answer page 328

Pyridoxine (B6):
- disease of deficiency, inflammation of skin and spam
benadon (R) as tab 30 – 40 mg
   inj 100 mg
also used to vomiting in pregnancy
also treat of Parkinson’s disease

**Quiz / 3**
Define Pyridoxine (B6)

**Note**
- Check your answers in key answer page 328

Biotin:
Deficiency. cause dermatitis pantthenic acid it def lead to changes in C. N. S in human

Ascorbic acid (vitc):
Deficiency. scurvy disease w~ by weakness, anemia, gum bleeding
Cebion (R), redoxon (R), as tab, inj, drop

Vit (A) :- deficiency. night blindness, skin disease (hyper keratinisation) as tab, cap, drop
Vit (D) :-
Deficiency. _ rickets in children
- osteomalacia in adults

\[
\begin{align*}
genevis – D2  
\text{vigorasan – D3} 
\end{align*}
\]
as

Vit (K) :-
Deficiency not occur only if we use antibiotic lead to kill intestinal microform.
Synkavit (R)

**Quiz / 4**
Define Vit c

**Note**
- Check your answers in key answer page 328

Vit E :- for vital used to
1. treat in fertility
2. treat cardiovascular dis
3. treat repeated abortion.

**5/ Post test**

Circle the correct answer :-

1- Benerva is trade name of
a- Pyridoxine.  b- Biotin
c- thiamine    d- Nicotinic Acid

2- vitamin B1 dose
a- 50ml / ml Inj  b- 150ml / ml Inj
c- 250ml / ml Inj  d- 350ml / ml Inj

3- Biotin Deficiency cause
a- dermatitis  b- changes in C. N. S in human
c- a&b  d- dry mouth

4- Synkavit (R) is trade name of:
a- vitamin A. b- vitamin B

c- vitamin C d- vitamin K

5- Vit E for vital used to treat

a- dermatitis b- infertility
c- anemia d- gum bleeding

Note
- Check your answers in key answer page 327.
- (2) degree for each.

6/ key answer :-

1- Pre test :-
   1. b  
   2. a  
   3. c  
   4. d  
   5. c  

If you :-
   • got 6 or more you do not need to proceed.  
   • got less than 6 you have to study this modular unit well.

2- Post test :-
   1. c  
   2. a  
   3. c  
   4. d  
   5. b  

If you :-
   • got 6 or more, so congratulation your performance, go on studying modular unit three.
   • got less than 6, go back and study the second unit; or any part of it; again, and then do the post test again.

Quiz 1

Vitamin’s :-
It organic compound found in more food in small amount necessary for metabolic function.

Classify into
3. vitamin dissolve in water (b, c)
4. vitamin dissolve in fat (a, d, e, k)

**Quiz 2**

Nicotinic Acid (niacin)
Disease of def: pellagra dis w by (cutaneous inflammation, glossitis, dry mouth, hypotension)

Used to:
1. treat pellagra and atherosclerosis
2. angina pectoris

**Quiz 3**

disease of deficiency, inflammation of skin and spam

benadon (R) as tab 30-40 mg
inj 100mg
also used to vomiting in pregnancy
also treat of Parkinson’s disease

**Quiz 4**

Ascorbic acid (vitc):
Deficiency, scurvy disease w by weakness, anemia, gum bleeding

Cebion (R), redoxon (R), as tab, inj, drop

### Sources:

1. Basic & Clinical Pharmacology (Basic and Clinical Pharmacology)
3. Lippincott's Illustrated Reviews: Pharmacology (Lippincott's Illustrated Reviews Series) Richard D Howland (Author), Mary J Mycek (Author), Richard A Harvey (Author), Pamela C Champe (Author)
   Paperback: 559 pages Publisher: Lippincott Williams & Wilkins; Latest edition
4. Goodman & Gilman's The Pharmacological Basis of Therapeutics Laurence Brunton (Author), John Lazo (Author), Keith Parker (Author)
1/ Over view

Tonics: Anemia, Treatment of Anemia, Iron – Drugs

1/ A – Target population:

This lecture is designed for second year Technical Institute students Department of nursing. It will be assumed that students have an adequate knowledge in Tonics: Anemia, Treatment of Anemia, Iron – Drugs.

Teaching Methods:
Lectures, Discussions, Data show, Seminars, and Handouts.

1/ B – Rationale:

1- The student study diagram the basic clotting mechanism
2- The student shall be able to describe the challenges associated with the clinical use of anticoagulants

1/ C – Central Idea:

The student shall outline the intrinsic and extrinsic clotting systems. The student shall explain the role of platelets in initiating clotting and the rationale for pharmacological intervention. The student shall list the names of the clotting factors and their numeral designations.

1/ D – Instructions:

1. Study overview thoroughly.
2. Identify the goal of this modular unit.
3. Do the pre test.
4. After studying the text of this modular unit, do the post test.
2/ Performance Objectives
Anticoagulant and Antithrombic Drugs
A. The student shall diagram the basic clotting mechanism.
B. The student shall outline the intrinsic and extrinsic clotting systems.
C. The student shall explain the role of platelets in initiating clotting and the rationale for pharmacological intervention.
D. The student shall list the names of the clotting factors and their numeral designations.
E. The student shall describe basic tests of clotting function, i.e., prothrombin time, bleeding time, partial thromboplastin time, whole blood clotting time, and indicate which tests are appropriate for laboratory control of anticoagulant therapy.
F. The student shall explain the mechanism of anticoagulant action of heparin.
G. The student shall explain the mechanism of anticoagulant action of coumarin derivatives.
H. The student shall describe various means of reversing the action of the two main types of anticoagulants.
I. The student shall list indications for the use of anticoagulants.
J. The student shall identify the mechanisms of drug interaction involving the coumarin anticoagulants.

Clinical Use of Anticoagulants
A. The student shall be able to describe the challenges associated with the clinical use of anticoagulants.
B. The student shall be able to discuss the potential for drug interactions with warfarin.
C. The student shall be able to delineate which drug interactions are clinically significant.
D. The student shall be able to describe “bridge therapy”.

3/ Pre test

Circle the correct answer :-
1- removal of the blood clot by activation of plasmin:
   a- coagulation. b- fibrinolysis
   c- platelet plug formation d- vasoconstriction

2- homeostasis consists of
   a- permanent closure b- growth of fibrous tissue by conversion of smooth
   c- platelet plug formation d- all of them

3- anticoagulants are drugs that interfere with
   a- extrinsic pathway b- intrinsic pathway
   c- a&b d- stimulate coagulation

4- HEPARIN extracted from:
a- bovine lung            b- hog intestine
b- bovine lung & hog intestine        d- horse lung

5- Side effects of HEPARIN
a= thrombocytopenia                  b= vascular endothelium complexes
b= hemorrhage                        d= all of them

c- hemorrhage

d- all of them

6- Iron Content in Instant plain oatmeal mg
a- 6.7 mg                          b- 18 mg
b- 8.2 mg                          d- 4.5 mg

c- 8.2 mg                          d- 4.5 mg

7- heparin cause hematomas if injected:

a= intramuscularly                  b= intravenously
b= intravenousistically             c= subcutaneous

8- GRANULOCYTES:

a= neutrophils                     b= eosinophils
b= eosinophils                      d= all of them

a= basophils                        d= all of them

18 mg per day

9- for women ages 19 to 50, the RDA is
a= 8 mg per day                     b= 18 mg per day
b= 18 mg per day                    d= 180 mg per day

9- for women ages 19 to 50, the RDA is
a= 8 mg per day
b= 18 mg per day

10- Side effects of streptokinase
a= hemorrhage                       b= stroke
b= hemorrhage
b= stroke

c= anaphylaxis                      d= all of them

c= anaphylaxis

c= anaphylaxis

d= all of them

Note

- Check your answers in key answer page 341.

- ( 1 ) degree for each.

4/ the module contents

Tonics : Anemia, Treatment of Anemia, Iron – Drugs
Iron deficiency is a common problem, especially for women, so common, in fact, that 5% of women between the ages of 20 and 49 have iron deficiency with anemia and 11% have iron deficiency without anemia. (1)

Anemia has a complicated technical definition, but in simple terms it means that a person's blood
contains a lower than normal amount of red blood cells or other elements that help transport oxygen throughout the body. Often caused by a lack of iron, anemia gradually starves the body of the oxygen it needs, leading to symptoms such as extreme skin pallor, shortness of breath, heart palpitations and fatigue.

Why We Need Iron
What many people don't know, however, is that iron plays a key role not only in the body's oxygen transport and delivery system, but also in the regulation of metabolism. Iron is needed to synthesize vital substances such as the brain chemical, dopamine, DNA and white blood cells. Thus iron deficiency can do much more harm than merely causing anemia; it can have widespread effects — from damaging a person's ability to think to weakening their resistance to infection.

It is a common misconception that the amount of iron our bodies absorb is directly related to the amount of iron we eat. While we do get most of our iron through food, getting enough iron is not quite as simple as eating well. For one thing, the ability of our digestive systems to absorb iron from the food we eat varies; for instance, those who are iron deficient do not absorb iron as well as those who are not.

Because dietary iron comes in different forms, the percentage of dietary iron absorbed depends on the type of food we eat and what other foods are being eaten at the same time. For example, iron from meat is easier for the body to absorb than iron from vegetable and other sources. In addition, iron absorption can be greatly increased or decreased by various factors. Certain salts, which store iron and other minerals in plant matter, interfere with the ability of the human intestine to absorb them. Chemicals called polyphenols in tea, coffee, cocoa, spinach and oregano inhibit iron absorption as well. Eating more ascorbic acid, which is common in fruits, vegetables and fortified cereals, can improve iron absorption. Calcium inhibits the absorption of iron by an unknown mechanism. This is probably why studies show a correlation between high milk intake and iron deficiency.

Quiz / 1
Define anemia

Note
- Check your answers in key answer page 342

Who Is at Risk for Iron Deficiency?
Women in their childbearing years have greater iron needs than men as a result of menstrual blood loss, the increased iron demands of pregnancy and blood loss during childbirth. In addition, anything that causes heavier than normal menstrual periods, for example uterine fibroids, may lead to iron deficiency. Adolescent girls are at particular risk because, out of concern for their weight, many follow diets that reduce the amount of meat they eat at a time in their lives when their iron needs are increasing. Iron deficiency can also be caused by other types of chronic blood loss including internal bleeding from gastritis and ulcers, inflammatory bowel disease, parasitic infections (this is more common in Third World populations than developed countries) and hemorrhoids.

The best way to prevent iron deficiency is to educate yourself about your iron needs and the best iron sources, and to use this knowledge to make sure dietary intake keeps pace with your body's demands. Recommended dietary allowances (RDAs) for men over the age of 19 and women over the age of 51 are 8 mg per day; for women ages 19 to 50, the RDA is 18 mg per day. In the typical American diet, major sources of iron are meat, poultry, fish, nuts and seeds, legumes and bean products, green leafy vegetables, raisins, whole grains and fortified cereals. The iron content of some popular high iron foods is shown in Table 1.
Table 1. Iron Content of Selected High-iron Foods.

<table>
<thead>
<tr>
<th>FOOD</th>
<th>PORTION SIZE</th>
<th>IRON (MG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total™ cereal</td>
<td>1 cup</td>
<td>18</td>
</tr>
<tr>
<td>Grape Nuts™ cereal</td>
<td>1/2 cup</td>
<td>8.2</td>
</tr>
<tr>
<td>Instant plain oatmeal</td>
<td>1 packet</td>
<td>6.7</td>
</tr>
<tr>
<td>Wheat germ</td>
<td>1 ounce (1/4 cup)</td>
<td>2.6</td>
</tr>
<tr>
<td>Broccoli</td>
<td>1 medium stalk</td>
<td>2.1</td>
</tr>
<tr>
<td>Baked potato</td>
<td>1 medium</td>
<td>2.7</td>
</tr>
<tr>
<td>Spinach</td>
<td>1 cup raw</td>
<td>0.8</td>
</tr>
<tr>
<td>Dried peach</td>
<td>5 halves</td>
<td>2.6</td>
</tr>
<tr>
<td>Raw tofu</td>
<td>1/2 cup</td>
<td>4</td>
</tr>
<tr>
<td>Lentils</td>
<td>1/2 cup</td>
<td>3.3</td>
</tr>
<tr>
<td>Kidney beans</td>
<td>1/2 cup</td>
<td>2.6</td>
</tr>
<tr>
<td>Chickpeas</td>
<td>1/2 cup</td>
<td>2.4</td>
</tr>
<tr>
<td>Beef chuck</td>
<td>3 ounces</td>
<td>3.2</td>
</tr>
<tr>
<td>Dark meat turkey</td>
<td>3 ounces</td>
<td>2.0</td>
</tr>
<tr>
<td>Blackstrap molasses</td>
<td>1 tablespoon</td>
<td>5</td>
</tr>
</tbody>
</table>

- hemostasis consists of 4 (5) mechanisms
  1- vasoconstriction - both neurally- and humorally mediated
  2- platelet plug formation - adhesion of platelets to the damaged endothelium
  3- coagulation - blood clot formation by activation of fibrin through the intrinsic- or extrinsic coagulation cascade

  4- permanent closure - growth of fibrous tissue by conversion of smooth muscle cells of the vessel walls to myofibroblasts
  5- fibrinolysis- removal of the blood clot by activation of plasmin

anticoagulant
- anticoagulants are drugs that interfere with the coagulation factors (“serine proteases”) of the extrinsic- and intrinsic coagulation pathways, thus inhibiting coagulation

Relevant Drugs
- 2 categories
  1) injectable anticoagulants
    - injectable anticoagulants bind to the allosteric seat of antithrombin III, thus activating it
    - antithrombin III is a serine protease inhibitor responsible for inhibition of activated coagulation factors
- thus activation of antithrombin III leads to decreased activation of fibrin and following inhibition of coagulation
- 2 types

**DRUG NAME DESCRIPTION**

**HEPARIN** *General information*
- endogenous compound found in the granules of mast cells
- sulfated glycosaminoglycan (large, negatively charged)
- extracted from bovine lung and/or hog intestine
- digested in the GI
- administered IV or subcutaneously (cause hematomas if injected intramuscularly due to its large molecular size)
- contains a second binding site for factor XII, XI, IX and II (thrombin), thus accelerating their inactivation by antithrombin III
- also accelerate inactivation of factor X (independently of the second binding site)

**Medical uses**
- treatment of thrombosis, DIC and emboli

**Side effects**
- hemorrhage (clotting factor inhibition)
- thrombosis/DIC (autoantibodies against heparin-platelet factor 4 complexes (and following thrombocytopenia) and platelet factor 4-vascular endothelium complexes)
- osteoporosis

**LMWHS** *General information*
- “low molecular weight heparins”
- fragments of heparin lacking the second binding site
- only accelerate inactivation of factor X
- administered subcutaneously
- same as heparin

2) **ORAL ANTICOAGULANTS**
- oral anticoagulants bind to the active site of vitamin K reductase, thus inhibiting reduction of vitamin K to its active form
- reduced vitamin K is a cofactor of alpha-carboxylase, consumed with modification of coagulation factor X, IX, VII and II (thrombin) after primary protein translation
- only the modified coagulation factors are able to be activated, thus inhibition of vitamin K reductase leads to decreased activation of fibrin and following inhibition of coagulation
- 1 type

**DRUG NAME DESCRIPTION**

**WARFARIN** *General information*
- also used in rat poison
- administered orally
- may cross the placenta
- only inhibits formation of new coagulation factors, thus previously synthetized coagulation factors will still be able to induce coagulation until they are catabolized (around 48 hours)

**Medical uses**
- treatment of thrombosis, DIC and emboli

**Side effects**
- hemorrhage (deceased clotting factor production)
- teratogenesis (may cross the placenta)

**FIBRINOLYTICS**

*Overview*
- fibrinolitics are drugs that increase activation of plasmin, thus increase fibrinolysis and following removal of blood clots

*Relevant Drugs*
- 3 types

<table>
<thead>
<tr>
<th>DRUG NAME</th>
<th>DESCRIPTION</th>
</tr>
</thead>
</table>
| STREPTOKINASE | *General information*  
streptococcal protein  
may only be administered once per year (antistreptococcal antibodies will be formed within 1 week (!))  
Medical uses  
treatment of thrombosis, DIC and emboli  
Side effects  
- hemorrhage (fibrinolysis)  
- stroke (hemorrhage)  
- anaphylaxis (antistreptococcal antibodies) |
| ALTEPLASE | *General information*  
recombinant tPA (“tissue plasminogen factor”, the physiological protein responsible for plasmin activation)  
more active on plasminogen bound to fibrin (“clot selective”)  
very short half-life  
administered by IV infusion (very short half-life)  
Medical uses  
treatment of thrombosis, DIC and emboli  
Side effects  
- hemorrhage (fibrinolysis)  
- stroke (hemorrhage) |
| RETEPLASE | *General information*  
short half-life  
administered by IV bolus  
same as alteplase |

**ANTIFIBRINOLYTICS**

*Overview*
- antifibrinolitics are drugs that inhibit activation of plasmin, thus decrease fibrinolysis and following increase the integrity of blood clots

*Relevant Drugs*
- 1 type

<table>
<thead>
<tr>
<th>DRUG NAME</th>
<th>DESCRIPTION</th>
</tr>
</thead>
</table>
| TRANEXAMIC ACID | *General information*  
administered orally or IV |

*Note*
- Check your answers in key answer page 342
**Medical uses**
- treatment of severe hemorrhages
- treatment of fibrinolytic overdose

**Side effects**
- thrombosis

**APOPROTININ**
*General information*
- inhibits proteolytic enzymes (including plasmin)

**Medical uses**
- treatment of fibrinolytic overdose

**Side effects**
- thrombosis

**ANTIPLATELET DRUGS**

*Overview*
- antiplatelet drugs are drugs that inhibit adhesion of platelets to the damaged endothelium, thus inhibiting platelet plug formation

*Relevant Drugs*
- 4 categories
  1) **COX-1 INHIBITORS**
     - inhibits COX-1, thus inhibiting TXA2 (thromboxane A2) synthesis in platelets and PGI2 (prostaglandin I2) synthesis in vascular endothelium
     - TXA2 stimulates glycoprotein IIb/IIIa receptor expression on platelets while PGI2 inhibits it
     - glycoprotein IIb/IIIa is the receptor responsible for platelet-platelet adhesion and platelet-fibrinogen adhesion
     - however, vascular endothelium is capable of syntethizing new COX-1 while platelets are not, thus platelet plug formation is inhibited
  2) **THIENOPYRIDINE DERIVATIVES**
     - inhibits ADP-mediated expression of glycoprotein IIb/IIIa, thus inhibiting platelet plug formation
     - 2 types

**DRUG NAME DESCRIPTION**

**TRICLOPIDINE**
*General information*
- pro-drug
- administered orally

**Medical uses**
- treatment of thrombosis, DIC and emboli

**Side effects**
- hemorrhages
- blood dyscrasias
- diarrhea
- skin rashes

**CLOPIDOGREL**
*General information*
- same as triclopidine

3) **GLYCOPROTEIN IIb/IIIa RECEPTOR ANTAGONITS**
- antagonizes TXA2 and ADP, thus inhibiting platelet plug formation
- 2 types

**DRUG NAME DESCRIPTION**

**ABCIXIMAB**
*General information*
- hybriade rodent/human monoclonal antibody
- administered IV
- may only be administered once (antibodies against the rodent part will be formed)

**Medical uses**
- treatment of thrombosis, DIC and emboli

**Side effects**
- hemorrhages

TIROFIBRAN **General information**
- administered IV

**Medical uses**
- treatment of thrombosis, DIC and emboli

**Side effects**
- hemorrhages

4) PGI2 AGONISTS
- inhibit expression of glycoprotein IIb/IIIa, thus inhibiting platelet plug formation
- 1 type

**DRUG NAME DESCRIPTION**
EPOPROSTENOL

32. DRUGS AFFECTING HEMATOPOIESIS

**Overview**
- all blood cells originate from pluripotent stem cells of the bone marrow
- there are 5 types of blood cells

**CELL TYPE DESCRIPTION**
ERYTHROCYTES - RBCs
PLATELETS - cell fragments of megakaryocytes
MONOCYTES - differentiate to macrophages
GRANULOCYTES - neutrophils
- eosinophils
- basophils
LYMPHOCYTES - B lymphocytes
- T lymphocytes
- anemia is a decrease in circulating RBCs
- there are 4 types of anemia

**TYPE DESCRIPTION**
APLASTIC ANEMIA - due bone marrow failure
DEFICIENCY ANEMIA - normocytic, normochromic deficiency anemia (due to
erythropoietin and/or GM-CSF deficiency)
- microcytic, hypochromic deficiency anemia (due to iron deficiency)
- macrocytic, hyperchromic anemia (due to folic acid (vitamin B9) and/or cobolamin (vitamin B12) deficiency)
HEMOLYTIC ANEMIA - due to increased sequestration of RBCs
HEMORRHAGIC ANEMIA - due to hemorrhages

**Relevant Drugs**
- 4 categories
1) IRON
- needed for the heme group of hemoglobin, thus deficiency leads to decreased hemoglobin synthesis
- is utilized by the body in the ferrous (Fe²⁺) form

5 types

**DRUG NAME DESCRIPTION**

ferrous sulfate *General information*
- administered orally

**Medical uses**
- treatment of microcytic, hypochromic deficiency anemia

**Side effects**
- nausea
- diarrhea
- abdominal cramps

FERROUS SUCCINATE *General information*
- same as ferrous sulfate

FERROUS GLUCONATE *General information*
- same as ferrous sulfate

FERROUS FUMARATE *General information*
- same as ferrous sulfate

IRON-DEXTRAN *General information*
- administered IV
- same as ferrous sulfate

2) FOLATE (“VITAMIN B9”)
- cofactor (methyl-group donor) in the synthesis of purines and pyrimidines used for DNA- and RNA synthesis, thus deficiency leads to decreased DNA and RNA synthesis
- this is especially manifested in tissues with high cell turnover (bone marrow)
- is utilized by the body in the tetrahydrofolate (FH₄) form
- is carried in the circulation as methyl-FH₄
- the methyl group is removed by cobalamin (“vitamin B12”), thus cobalamin is needed for it’s utilization
- 1 type

**DRUG NAME DESCRIPTION**

FOLATE *General information*
- administered orally (parenterally in case of malabsorption syndromes)

**Medical uses**
- treatment of macrocytic, hyperchromic deficiency anemia

3) COBOLAMIN (VITAMIN B12)
- removes the methyl group of methyl-FH₄, so that it can be utilized in purine and pyrimidine synthesis
- 1 type

**DRUG NAME DESCRIPTION**

HYDROXYCOBOLAMIN *General information*
- administered intramuscularly (cobalamin deficiency is almost always due to malabsorption syndromes)

**Medical uses**
- treatment of macrocytic, hyperchromic deficiency anemia

4) CSFS (COLONY-STIMULATING FACTORS)
- CSFs are responsible for differentiating the pluripotent stem cells to all types of committed progenitors of blood cells (except lymphocytes)
- they are also involved in final differentiation of all these cells (except basophils)
Quiz / 3
Define CSFS

Note
- Check your answers in key answer page 342

GM-CSF General Information
- “granulocyte-macrophage colonystimulating factor”
- endogenous substance
- involved in differation of all cells mentioned above
- administered IV or subcutaneously

Medical uses
- treatment of leucopenia (mainly neutropenia)

Side effects
- fever
- skin rashes
- muscle pain
- muscle weakness

G-SCF General Information
- “granulocyte colony-stimulating factor”
- endogenous substance
- involved in differation of neutrophils
- administered IV or subcutaneously

Medical uses
- treatment of neutropenia

Side effects
- dysuria
- vasculitis

Quiz / 4
Enumerate Side effects of GM-CSF

Note
- Check your answers in key answer page 342

5/ Post test

Circle the correct answer :-

1-Medical uses of heparin
a- treatment of thrombosis b- DIC
c- emboli d- all of them

2-Side effects of heparin
a- fibrinolysis b- stroke
c- Anaphylaxis  
d- all of them

3- VITAMIN B9 called
a- FOLATE  
b- COBOLAMIN

c- Thiamine  
d- no one of them

4-: granulocyte colony-stimulating factor
a- GM-CSF  
b- G-SCF

c- CSFS  
d- no one of them

HEMORRHAGIC ANEMIA - due to hemorrhages

5- HEMOLYTIC ANEMIA due to
a- hemorrhages  
b- due bone marrow failure

c- due to increased sequestration of RBCs  
d- cobolamin deficiency

Note
- Check your answers in key answer page341.
- (2) degree for each.

6/ key answer :-

1- Pre test :-

1. b 6-a
2. d 7-d
3. c 8-b
4. c 9- b
5. d 10-d

If you :-
- got 9 or more you do not need to proceed.
- got less than 9 you have to study this modular unit well.

2- Post test :-

1. d
2. d
3. a
4. b
5. c

If you :-
- got 6 or more, so congratulation your performance, go on studying modular unit three.
• got less than 6, go back and study the second unit; or any part of it; again, and then do the post test again.

**Quiz 1**
Anemia has a complicated technical definition, but in simple terms it means that a person's blood contains a lower than normal amount of red blood cells or other elements that help transport oxygen throughout the body. Often caused by a lack of iron, anemia gradually starves the body of the oxygen it needs, leading to symptoms such as extreme skin pallor, shortness of breath, heart palpitations and fatigue

**Quiz 2**
*Side effects of STREPTOKINASE*
- hemorrhage (fibrinolysis)
- stroke (hemorrhage)
- anaphylaxis (antistreptococcal antibodies)

**Quiz 3**
- CSFs are responsible for differentiating the pluripotent stem cells to all types of committed progenitors of blood cells (except lymphocytes)
  they are also involved in final differentiation of all these cells (except basophils)

**Quiz 4**
Side effects of GM-CSF
- fever
- skin rashes
- muscle pain
- muscle weakness

**Sources :-**
1- Basic & Clinical Pharmacology (Basic and Clinical Pharmacology)  

2- Katzung and Trevor's Pharmacology  
Anthony J. Trevor (Author), Bertram G. Katzung (Author), Susan B. Masters (Author) : McGraw-Hill Medical; Latest edition640 pages

3- Lippincott's Illustrated Reviews: Pharmacology (Lippincott's Illustrated Reviews Series)  
Richard D Howland (Author), Mary J Mycek (Author), Richard A Harvey (Author), Pamela C Champe (Author)  
Paperback: 559 pages Publisher: Lippincott Williams & Wilkins; Latest edition

4- Goodman & Gilman's The Pharmacological Basis of Therapeutics  
Laurence Brunton (Author), John Lazo (Author), Keith Parker (Author)  
Publisher: McGraw-Hill Professional; Latest edition

Toxicity, Toxic dose, Fatal dose.

1/ A – Target population: -
This lecture is designed for second year Technical Institute students Department of nursing. It will be assumed that students have an adequate Knowledge in dosage of drug and how to calculate.

**Teaching Methods:**
Lectures, Discussions, Data show, Seminars, and Handouts.

1 / B –**Rationale :-**
The student study definitions, the types and the rating system for toxicities. The student shall be able to list the various treatments for toxicity, toxic dose

1 / C –**Central Idea :-**
1- Determine the types and the rating system for toxicities.
2- Determine treatments for toxicity.
3- Determine presentation and treatment of toxicities due to ethanol, carbon monoxide, aspirin, barbiturates, narcotics, benzodiazepines, acetaminophen, nitrites and nitrates and cyanide.

1 / D –**Instructions :-**
1. Study over view thoroughly.
2. Identify the goal of this modular unit.
3. Do the pre test
4. After studying the text of this modular unit do the post test

2/ **Performance Objectives**

A. The student shall be able to describe the definitions, the types and the rating system for toxicities.
B. The student shall be able to list the various treatments for toxicity.
C. The student shall be able to describe the basic presentation and treatment of toxicities due to ethanol, carbon monoxide, aspirin, barbiturates, narcotics, benzodiazepines, acetaminophen, nitrites and nitrates, and cyanide.
D. The student shall be able to the effects if the following exposures on the human body: vitamins and dietary supplements, hydrocarbon solvents, pesticides, herbicides, metals (lead, cadmium, mercury, iron, aluminum) and chelating agents

3/ **Pre test**

Fill in the blank
1- ----------as the science w deals w the origin and characterization effect of poisons and it is also diagnosis and treatment of the poisoning.
2- Poisons: it is chemical substance causing death or harm of living organism by local or systemic effect
3- it is quickly appearance it is caused by high dose of poisons lead to death
4- the dose of the drug more than usual dose which known & lead to dead of person
5- the dose when taken more than limited dose lead to poisoning effect of drug

Note
- Check your answers in key answer page 347.
- ( 2 ) degree for each

4/ the module contents

Toxicology
Defined as the science with the origin and characterization effect of poisons and it is also diagnosis and treatment of the poisoning.
Poisons: it is chemical substance causing death or harm of living organism by local or systemic effect.

Types of poisoning
1. acute poison; it is quickly appearance it is caused by high dose of poisons lead to death
2. Chronic poisons; it is slowly appear it is caused by low dose of poisons not lead to death.

Quiz / 1
Define toxicology

Note
- Check your answers in key answer page 348

Factors play role in drug toxic
1. nature of drug
2. dose of drug
3. body resbonce
4. errors of drug administration
5. individual susceptibility and case of patient
6. time and duration of using

Quiz / 2
Define acute poison

Note
- Check your answers in key answer page 348

Doxology: is the science study doses of the drug in pharmacology
FETAL DOSE: the dose of the drug more than usual dose which known & lead to dead of person
Toxic dose: - the dose when taken more than limited dose lead to poisoning effect of drug

**Quiz / 3**
Enumerate Factors play role in drug toxic

**Note**
- Check your answers in key answer page 15

Dose of drug depend on the following
1: - age
2: - sex
3: - body weight
4: - metabolic rate
5: - psychological case
6: - illness

**Quiz / 4**
Enumerate Factors effect on drug dose

**Note**
- Check your answers in key answer page 348

**5/ Post test**

Circle the correct answer:-
1-Dose of drug depend on the following
a- age  b- sex

  c- Body weight  d- all of them

  3. it is quickly appearance it is caused by high dose of poisons cause death
     a- acute poison  b- chronic poison
     c- moderate poison  d- chronic chemical compound

3- the dose when taken more than limited dose lead to poisoning effect of drug
a- fetal dose  b- toxic dose

  c- therapeutic dose  d- prophylaxis dose

4- Factors play role in drug toxic
    a- nature of drug  b- dose of drug
    c- body resbonce  d- all of them

5- the science w deals w` the origin and characterization effect of poisons
a- pharmacology b- dosology
c- Toxicology d- noone of them

Note
- Check your answers in key answer page 347.
- (1) degree for each

6/ key answer :-

1- Pre test :-
1. toxicology
2. death or harm
3. acute poison
4. fetal dose
5. toxic dose

If you :-
• got 9 or more you do not need to proceed.
• got less than 9 you have to study this modular unit well.

2- Post test :-
1. d
2. a
3. b
4. d
5. c

If you :-
• got 9 or more, so congratulation your performance, go on studying modular unit three.
• got less than 9, go back and study the second unit; or any part of it; again, and then do the post test again.

**Quiz 1**
Defined as the science w deals w the origin and characterization effect of poisons and it is also diagnosis and treatment of the poisoning.

**Quiz 2**
acute poison: it is quickly appearance it is caused by high dose of poisons         death

**Quiz 3**
Factors play role in drug toxic
1. nature of drug
2. dose of drug
3. body response
4. errors of drug administration
5. individual susceptibility and case of patient

**Quiz 4**
Dose of drug depend on the following
1: age
2: sex
3: body weight
4: metabolic rate
5: psychological case
6: illness

**Sources :-**

1- Basic & Clinical Pharmacology (Basic and Clinical Pharmacology)

2- Katzung and Trevor's Pharmacology
   Anthony J. Trevor (Author), Bertram G. Katzung (Author), Susan B. Masters (Author): McGraw-Hill Medical; Latest edition 640 pages

3- Lippincott's Illustrated Reviews: Pharmacology (Lippincott's Illustrated Reviews Series)
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   Paperback: 559 pages Publisher: Lippincott Williams & Wilkins; Latest edition

4- Goodman & Gilman's The Pharmacological Basis of Therapeutics
   Laurence Brunton (Author), John Lazo (Author), Keith Parker (Author)
   Publisher: McGraw-Hill Professional; Latest edition
Toxicity with metals: like Mercury, lead and other metals

1/A - Target population:

This lecture is designed for second year Technical Institute students Department of nursing. It will be assumed that students have an adequate knowledge in Toxicity with metals: like Mercury, lead and other metals.

Teaching Methods: Lectures, Discussions, Data show, Seminars, and Handouts.

1/B - Rationale:

A. The student shall be know Toxicity with metals: like Mercury, lead and other metals.
B. The student shall be able to list the various treatments for toxicity.
C. The student shall be able to describe most metallic poisons.

1/C - Central Idea:

A. determine metallic.
B. determine all.
D. The student shall be able to the effects if the following exposures on the human body: vitamins and metals (lead, cadmium, mercury, iron, aluminum) and chelating agents.
1 / D – Instructions:

5. Study over view thoroughly.
6. Identify the goal of this modular unit.
7. Do the pre test
8. After studying the text of this modular unit, do the post test

2/ Performance Objectives

A. The student shall be able to describe the definitions, the types and the rating system for toxicities.
B. The student shall be able to list the various treatments for toxicity.
C. The student shall be able to describe the basic presentation and treatment of toxicities due to ethanol, carbon monoxide, aspirin, barbiturates, narcotics, benzodiazepines, acetaminophen, nitrites and nitrates, and cyanide.
D. The student shall be able to the effects if the following exposures on the human body: vitamins and dietary supplements, hydrocarbon solvents, pesticides, herbicides, metals (lead, cadmium, mercury, iron, aluminum) and chelating agents

3/ Pre test

Circle the correct answer:

1. metallic toxic
   a- lead.       b- cupper
   c- mercury     d-all of them

2. organic – phosphorus compound drug e. g is
   a- malathione   b- diazenone
   c- a & b       d- no one of them

1. diuretics used in
   a- Clearans of poisoning from G.I.T   b- Clearans of poisoning from blood
   c- a & b   d- no one of them
4- catheter used
  a- in urine retention       b- resp. stimulant
  c- heart attack             d- gastric pain

5- albumin record as
  a- Adsorbents               b- Demulcents& protective
  c- Diluants                 d- no one of them

Note

- Check your answers in key answer page 357.
- (1) degree for each.

4/ the module contents

Toxic Heavy Metals
Mercury, Lead, Cadmium, Chromium and Arsenic constitute greatest environmental hazard due to their extensive use.

The presence of excessive amounts of toxic metals in the body contributes to health problems. These problems can be directly linked to the metal itself as well as the toxic load stressing the immune system. We live in a world that can be described as a toxic soup. Never before has a society been so constantly exposed to such a wide array of potentially hazardous substances permeating every aspect of the environment. This exposure begins in utero and continues throughout life. We are at a point now where the effects can be accumulative and multigenerational. Conventional thinking is that a problem does not exist until a threshold is breached and toxic levels have reached an acute stage. However, what about all of the points on the continuum leading up to that point? What about levels of substances for which there is no known safe level, such as mercury and lead? Many people walking around with a wide variety of health problems have toxic levels of metals in their body. Many people who are seemingly healthy also have build-ups that can, with time, contribute to the development of health problems. Many children, including those diagnosed within the autistic spectrum disorder, also are affected by metals.

Toxic metals are taken very seriously in alternative medicine. Testing and treating for them is as important as optimum nutritional intake and a healthy lifestyle. Tests for metal levels typically include hair and urine. Hair analysis gives an indication of levels of beneficial minerals as well. Urine testing, typically done with a challenging agent that chelates toxic metals, may offer a more complete picture, particularly with mercury. Hair analysis is a test that can be performed without the recommendation of a physician by contacting a laboratory such as King James Medical Laboratory (440) 835-2150. As said,
however, hair analysis should not be relied upon as the sole indicator of whether or not a
person has high levels of toxic metals. A urine challenge test is perhaps the gold standard.
In that, a small amount of a chelating agent is administered and urine is collected over a
number of hours. A chelating agent is a substance that finds toxic metals, bonds with them
and carries them out of the body through the urine. Say for example, a test shows a person
as having mercury or lead in the urine. That is a signal that there is more where that came
from in the body.

If metal toxicity is diagnosed, there are several therapeutic approaches that may be taken.
The simplest is the use of an oral chelating agent. In some cases, the oral chelating agent
may be combined with an intravenous chelation. In still other instances, injections of the
chelating substance may be used. Some herbal substances such as cilantro and chlorella
can help. TTFD, a fat-soluble and very bioefficient form of vitamin B1 also known as
allithiaimine, also is effective in the detoxification of heavy metals. Metal detoxification
therapies should be done under the guidance of a knowledgeable health care practitioner
who has a good working knowledge of nutrition and the biochemistry of the body. The
physicians at Preventive Medicine Group are very experienced in this area. Following is a
list of metals that are of concern.

**ALUMINUM** is not a heavy metal, but it can be toxic if present in excessive amounts,
especially in the brain. It is the most abundant metallic element in the earth's crust and
permeates our air, water and oil. It is found in nearly all food and water. Other sources of
aluminum include cookware, foil, antacids, painkillers, anti-inflammatories, douches,
baking powders, food processing, antiperspirants, toothpaste, bleached flour, grated cheese
table salt and beer. Many of the symptoms of aluminum toxicity are similar to those of
Alzheimer's disease and osteoporosis. Aluminum toxicity can lead to colic, rickets,
gastrointestinal disturbances, poor calcium metabolism, extreme nervousness, anemia,
headaches, decreased liver and kidney function, forgetfulness, speech disturbances,
memory loss, seizures, reduced mental faculties, softening of the bones and weak, aching
muscles.

**ARSENIC** is the most toxic substance as rated by the Environmental Protection Agency
(EPA). It is found in a wide variety of sources including pesticides, laundry aids, smog,
tobacco smoke, bone meal, dolomite, kelp, table salt, beer, seafood and drinking water.
Symptoms associated with high arsenic include headache, confusion, drowsiness,
convulsions, and some types of cancer. Arsenic poisoning primarily affects the lungs, skin,
kidneys and liver.
CADMIUM is present in the environment and also found in the production of inks and dyes, many industrial applications, plastics, some batteries, some foods, tobacco, water, pollution, fertilizer, fungicides, pesticides and soil. Elevated levels of cadmium may result in high blood pressure, inflammation, joint pain, hair loss, dry skin, decreased immunity, loss of appetite, bone disorders, cancer and shortened life span.

IRON deficiency is a problem but too much iron in the tissues and organs leads to the production of free radicals. High levels of iron have been found in association with heart disease and cancer.

LEAD is the second most toxic substance according to the EPA. It is a cumulative poison retained in the body as a metabolic poison inhibiting enzyme functions, contributing to free radical damage, damaging the heart, kidneys, liver and nervous system. Children and pregnant women are particularly susceptible. Lead is widely used in this country and many people have high levels. Sources of lead include lead-based paints, ceramic glazes, lead crystal, car batteries, tobacco, liver water, some wines, some canned fruit, vegetables grown in lead contaminated soil, bone meal and insecticides.

MERCURY is the third most toxic substance of a list of 275 hazardous substances according to the EPA. Tooth fillings that are silver in color are actually a mixture of silver, copper, tin and zinc amalgamated or dissolved in mercury. The amount of mercury is
approximately 50% or more. Most Americans have amalgam fillings. Research has demonstrated that mercury vapor is continuously released from these fillings in measurable quantities from the moment fillings are inserted into teeth. This results in mercury being inhaled, swallowed and absorbed directly in the mouth. Mercury is also found in soil, water, some foods especially some fish, sewage sludge, fungicides and pesticides. It is present in a wide variety of everyday products including cosmetics, fabric softeners, batteries, industrial instruments, printer and tattoo inks, latex, some medications and vaccinations, some paints, plastics, polishes, solvents and wood preservatives. Studies have linked mercury exposure with a variety of illnesses including allergies, chronic fatigue, depression, GI disorders, immune system suppression, periodontal disease, neurological diseases, reproductive disorders, birth defects, kidney disease, heart disease, hypertension, respiratory disorders, skin disease, cancer and more. Mercury can interfere with any process or organ in the body since it is poisonous to all cells. If a person has a chronic health problems for which a cause has not been found and mercury fillings are or have been present in the mouth, mercury toxicity will be the major factor.

**NICKEL** is used to produce steel, some batteries, nickel plating, heating fuel and ceramics. Environmental exposure to nickel are automobile exhaust, cigarette smoke, manufacturing emissions and airborne dust. Skin absorption can come from coins, hairpins, jewelry, prosthetic joints, heart valves and some cookware. Many foods contain small amounts of nickel. Small amounts of nickel are useful in certain body functions; however, too much nickel can be toxic. Symptoms of nickel toxicity include nausea, dizziness, diarrhea, headache, vomiting, chest pain, weakness, coughing, brain and liver swelling, liver degeneration, skin rash, respiratory illness, thyroid malfunction and interference with enzymatic reactions.

Clearans of poisoning from G.I.T

1. gastric lavage
2. water + antidote
3. local or systemic emetics
4. saline laxative

*Quiz / 1*
Enumerate metallic poisons agent

*Note*
- Check your answers in key answer page 358
Clearance of poisoning from blood

1. diuretics
2. catheter (in urine retention)
3. by resp. stimulant

Antidote: substance interfere with absorption of poison and prevent its action divided into:

**Quiz / 2**

Explain clearance of poisoning from blood

**Note**
- Check your answers in key answer page 358

A. physical antidote

1. Adsorbents: it adsorbs the poison e.g. Kaolin
2. Demulcents and protective
   - to protect m.m. of G.I.T. to prevent absorption of poison e.g. egg, albumin
3. Diluents; dilute concentration of poison so to dilute the toxicity effect e.g. water

**Quiz / 3**

Define antidote

**Note**
- Check your answers in key answer page 358

Biochemical antidote

1. true chemical antidote
2. precipitating chemical antidote
3. oxidizing chemical antidote

C. pharmacology antidote:

- Atropine sulfate in case of organo – Phosphorns compound
- Antayonist toxic symptoms morphine and oxygen and R. stimulant in case dyspnea heart insufficiency Tranquilizer for spasm. cardias stimulant

**Quiz / 4**

Enumerate physical antidote

**Note**
- Check your answers in key answer page 358

**5/ Post test**

Fill in the blank

1. Clearans of poisoning from G.I.T by ------------,----------------------
2---------- substance interfere w’ absorption of poison and prevent it’s action
3- Kaolin is ----------------------
4- metallic like ------------------
5- Biochemical antidote like ---------

Note
- Check your answers in key answer page 357.
-  ( 1 ) degree for each.

6/ key answer :-

1- Pre test :-
   1.  d
   2.  c
   3.  b
   4.  a
   5.  b

If you :-
• got 9 or more you do not need to proceed .
• got less than 9 you have to study this modular unit well .

2- Post test :-
   1-local or systemic emetics, water + antidote saline laxative gastric lavage
   2- antidote
   3- Adsorbents antidote
   4- lead, cupper, mercury, arsenic
   5- true chemical, precipitating, oxidizing chemical antidote

If you :-
• got 9 or more , so congratulation your performance , go on studying modular unit three .
• got less than 9 , go back and study the second unit ; or any part of it ; again, and then do the post test again .
**Quiz 1**

a. lead  
b. copper  
c. mercury  
d. arsenic

**Quiz 2**

1. diuretics  
2. catheter ( in urine retention )  
3. by resp. stimulant

**Quiz 3**

Antidote:- substance interfere w’ absorption of poison and prevent it’s action divided in to physical antidote & chemical antidote

**Quiz 4**

1. Adsorbents : it adsorbe w’ poison e.g Kaolin  
2. Demulcents and protective  
3. Diluants ; dilute concentration of poison so ↓ toxicity effect of it e.g water

**Sources :-**


1/ Over view

Toxicity with Drugs: like digitalis, barbiturates, and other drugs

1/A – Target population:-

This lecture is designed for second year Technical Institute students Department of nursing. It will be assumed that students have an adequate Knowledge in dosage of drug and how to calculate.

Teaching Methods:
Lectures, Discussions, Data show, Seminars, and Handouts.

1/B – Rationale:

1- The student should know factor effect on drug toxicity
2- The student should know doses of drug and their types lead to toxification
3- The student should know how to treat drug toxicity

1/C – Central Idea:

Toxification of drug occur under specific condition and with errors in calculation drug dose or error in rout of drug administration and we must know phase of toxicity and best treatment
1 / D – Instructions:–

9. Study over view thoroughly.
10. Identify the goal of this modular unit.
11. Do the pre test
12. After studying the text of this modular unit, do the post test

2 / Performance Objectives

A. The student shall be able to describe the definitions, the types and the rating system for toxicities.
B. The student shall be able to list the various treatments for toxicity.
C. The student shall be able to describe the basic presentation and treatment of toxicities due to ethanol, carbon monoxide, aspirin, barbiturates, narcotics, benzodiazepines, acetaminophen, nitrites and nitrates, and cyanide.
D. The student shall be able to the effects if the following exposures on the human body: vitamins and dietary supplements, hydrocarbon solvents, pesticides, herbicides, metals (lead, cadmium, mercury, iron, aluminum) and chelating agents

3 / Pre test

Circle the correct answer:–

1. APAP mean:–
   a- Acetaminophen.  
   b- Aspirin
   c- Amphetamines
   d- CNS Stimulants

2- The fatal dose of APAP may be as low as
Drugs may produce toxic effects by a variety of mechanisms. These may be summarised as:

1) Toxic effects that are direct and predictable following an overdose of the drug.

- Check your answers in key answer page 370.
- (1) degree for each.
2) Toxic effects may be direct and predictable following repeated dosing of the drug.

3) Toxic effects may be direct and unpredictable, either following one dose or just a few doses. These effects often represent the idiosyncratic response to drugs and may be immunologic or pharmacologic in mechanism.

4) Toxic effects that are the result of some drug interaction.

COMMON DRUGS AND DRUG CLASSES THAT CAUSE TOXICITY
1. Acetaminophen (Paracetamol, APAP)
   The toxic effect of acetaminophen is due to the accumulation of the toxic metabolite N-acetyl parabenzquinone imine. Normally, APAP is.

   ![Metabolism of Paracetamol (Acetaminophen)](image)

   The fatal dose of APAP may be as low as 140 mg/Kg (9.8 G or 30 of the 325 mg tablets/capsules for a 70 Kg person) In chronic alcoholics or persons who are taking microsomal inhibitors, the fatal dose may be as low as 100 mg/Kg. Additionally, acute administration of ethanol and APAP will increase the potential for toxicity. Note that APAP may enter zero order or dose-dependent kinetics with an acute dose as low as 2 Grams. Chronic ingestion of as little as 3 G daily for one year may also cause hepatic damage. APAP toxicity will present in four distinct phases
   1) Within the first day of overdose -- anorexia, nausea, vomiting, malaise
   2) 1-2 days post-ingestion -- patient feels better, may eat, get up, but liver enzymes are elevated
   3) 3-5 days -- hepatic necrosis, liver enzymes may peak
   4) 7-8 days -- either hepatic failure and death OR if appropriate measures were taken or the overdose not extensive, improvement and recovery.

**Quiz / 1**
Enumerate mechanism of toxic effects Drugs drug

*Note*
- Check your answers in key answer page 371
Treatment -- N-Acetylcysteine -- This compound may either scavenge the toxic intermediate directly and/or regenerate additional GSH. It is given IV or PO as a 5% solution within 36 hours of ingestion. NOTE that it is most effective if given within 10 hours of ingestion. Either route of administration will require extemporaneous compounding of the drug from the solution for aerosol that is currently available. If the parenteral route is chosen, the pharmacist must observed aseptic technique in compounding the solution for injection. Oral solutions are often diluted in cola and should be administered within one (1) hour of preparation. The loading dose is 140 mg/Kg, then 70 mg/Kg q4h for 17 doses or until the risk of hepatotoxicity has passed. NOTE that this is based upon the blood level of APAP. The liver is at risk for irreversible damage if the plasma level of APAP is approximately 200 mcg/ml 4 hours post ingestion. The risk for damage continues linearly over time as a function of the log plasma concentration such that 24 hours post ingestion, the risk is still present when plasma APAP is over 5 mcg/ml.

2. Aspirin -- Aspirin, which produces a classic toxic response with salicylism and the consequent metabolic changes, exerts its toxic effect not through immune responses, active metabolites, or wayward enzyme systems, but simply as a direct result of the various actions of the drug and its active moieties. Mild ASA toxicity (salicylism) may be observed at acute doses greater than 150 mg/Kg while severe toxicity may not occur until doses greater than 400 mg/Kg are ingested. Note, however, that as little as 200 mg/Kg has been fatal in adults, which corresponds to
14 Gm or 43 of the 5 grain tablets for a 70 Kg person.

Clinical presentation most often presents initially as hyperventilation and respiratory alkalosis. The metabolic acidosis follows and increased anion gap presents as a characteristic of the acidosis. Hyperthermia, seizures, coma, and cardiovascular collapse lead to death.

Recall that the other toxicity due to other salicylates will present with the same signs, symptoms, and urgency. Methyl salicylate (oil of wintergreen) is the most toxic, with as little as 4 ml causing fatality in children.

ASA toxicity treatment is primarily supportive and preventative, through gastric lavage and activated charcoal to remove un-absorbed ASA and alkalisation of the urine to hasten its excretion, plus fluids (for dehydration), cool baths (for hyperpyrexia), bicarbonate (to counter metabolic acidosis), and anti-convulsants, if necessary.

3. Amphetamines and other CNS Stimulants
Toxicity from these drugs most often presents as consequences from substance abuse, however overdose with oral decongestants such as pseudoephedrine may also be seen clinically.
Mild toxicity presents as hypertension, tachycardia, restlessness, agitation, and psychotic episodes. As toxicity progresses, arrhythmias, increased skeletal muscle tone (ultimately causing rhabdomyolysis), hyperthermia, dehydration, and seizures can occur (as dehydration progresses, decreases in total body water volume may lead to hypovolaemia and hypotension, despite the increased vascular tone). Both vertical and horizontal nystagmus may be observed with PCP toxicity.

Quiz / 2

Enumerate phases of APAP toxicity

Diagram of salicylate toxicity levels:
- Asymptomatic
- Moderate
- Severe

Time (hr) vs. log [Salicylate]pl (ng %)
Note

- Check your answers in key answer page 371

Treatment is generally symptomatic and supportive. Siezures and hyperthermia should be treated aggressively with parenteral benzodiazepines and cool baths and evaporative cooling, respectively. In cases of extreme hyperthermia (equal to or greater than 105°F), neuromuscular blockers may be used to diminish muscle hyperactivity.

Chronic nicotine intake may cause hypertension (with resultant MI, stroke, aneurysm), COPD, emphysema, and cancer. Many of the cardiovascular effects may be due, in part, in carbon monoxide generated by burning the tobacco. Acute nicotine intoxication with fatal consequences may occur with doses as low as 60 mg. Rapid signs and symptoms of toxicity include nausea, salivation, GI pain, vomiting, diarrhoea, diaphoresis, headache, vertigo, visual and auditory disturbances, confusion, and weakness. Profound hypotension (with resulting weak, irregular reflex tachycardia), convulsions, and death due to respiratory failure ensue. Treatment is primarily supportive (assisted respiration, treatment of shock).


Toxicity from drugs possessing anti-muscarinic activity presents with a distinct profile that has been described as "red as a beet" (flushing); "hot as a hare" (hyperthermia); "dry as a bone" (decreased sweating and mucous membranes); "blind as a bat" (blurred vision); and "mad as a hatter" (behavioural effects including delerium, hallucinations, and confusion). Other signs and symptoms include tachycardia, arrhythmias, hypertension, pupillary dilatation (mydriasis), muscle twitching, and urinary retention (chronic overingestion may also cause severe constipation). Overdose with antihistaminics may also cause seizures.

Quiz / 3

Mention treatment of Amphetamines and other CNS Stimulants Toxicity

Note

- Check your answers in key answer page 371

Treatment is primarily supportive (evaporative cooling, catheterisation). In patients with profound behavioural effects, benzodiazepines or antipsychotics such as haloperidol may be given. The specific antidote is phystostigmine (eserine) which inhibits acetylcholinesterase. This drug will increase circulating levels of acetylcholine which may then counteract the effects of the reversible blockade by the anti-cholinergic drug. However, it should be administered in small (0.5-1 mg, IV) doses only with careful monitoring, since bradycardia and seizure may result if given too rapidly or in too high a dose.
5. Antidepressants (Tricyclics) -- amitryptiline, nortryptiline, imipramine, et c. This class of drugs represents one of the most common classes involved in life-threatening overdoses. Ingestion of as little as 15 mg/Kg (roughly 1 G) may be fatal. Many of the common toxic effects of the TCAs include anti-muscarinic effects. However, since they possess other mechanisms, additional toxic actions alter their toxicity profile. Recall that many of these agents also possess alpha-adrenergic blocking activity and inhibit the re-uptake of catecholamines and serotonin. Central and cardiac effects are common in overdose and have led to the 3C mnemonic for TCA overdose -- coma, convulsions, and cardiac complications. Patients may present with agitation (CNS excitation), seizures, and arrhythmias. The arrhythmias are similar to those produced by quinidine and are characterised by a widened QRS interval leading to supraventricular progressing to ventricular tachycardias. Hypotension is common.

Treatment consists of supportive care (control of seizures, acidosis, ventilation, and fluids), noradrenaline for the hypotension (NA is more effective than dopamine, since neurones may be depleted of endogenous catecholamines), and sodium bicarbonate (1-2 mEq/Kg or 50-100 mEq, bolus) for the arrhythmias (this is effective by helping to counteract the quinidine-like sodium channel blockade). NOTE that physostigmine should NOT be used, since it will increase the risk for seizures and may also cause cardiac asystole.


Overdose with beta-blockers (even those with beta-1 selectivity, which is lost at higher doses) will prevent adrenergic activity at both beta-1 and beta-2 receptors. As little as double or treble the normal therapeutic dose of propranolol may cause fatalities. Common presentation signs and symptoms include bradycardia, hypotension (partial agonists such as pindolol may cause tachycardia and hypertension at higher doses), and reduced cardiac output to the point of causing cardiogenic shock, seizures, and arrhythmias.

Treatment is generally supportive. The antidote for beta-blocker overdose is glucagon, which acts at cAMP-mediated endogenous receptors in the myocardium. This will overcome the negative inotropic effects of the beta blocker. Doses of 5-20 mg IV will counteract the cardiac and vascular effects of beta-blocker overdose.

7. Calcium channel antagonists

These agents will produce severely compromised cardiac output, bradycardia and hypotension as a toxic response. Cardiogenic shock may ensue.
Treatment is generally supportive. Administration of calcium will act antidotally for the negative inotropic effects but has little action on the SA/AV block or hypotensive effects.

8. Digitalis glycosides
Overdose with digoxin or other cardiac glycosides causes severe vomiting, visual disturbances, fatigue, confusion, hyperkalaemia, and numerous arrhythmias including AV block and ventricular arrhythmias. (Refer to the Pharmacology II notes for a compleat discussion of digoxin toxicity).

Treatment depends upon the clinical situation. Uncomplicated arrhythmias (normal digoxin and potassium levels) may be treated with lidocaine (the drug of choice) or phenytoin. Hypokalaemia-induced digoxin toxicity may be treated with parenteral potassium. The antidote Digibind® (digoxin immune fab fragments -- antibodies to the digoxin molecule) should only be used in cases of supra-therapeutic plasma concentrations of digoxin. Note that if the drug is digitoxin, ouabain, or strophanthine, Digibind may not be as effective (incompleat cross reactivity) and higher doses may need to be administered.

9. Ethanol
Acute overdose with ethanol presents primarily as CNS depression. Patients may be comatose with a greatly depressed respiratory centre. Hypotension and hypothermia are common. Nystagmus may be observed. Chronic ethanol intoxication is both hepatotoxic and cardiotoxic, causing potential cirrhosis (this may be greatly complicated by poor diet) and cardiomyopathy progressing to failure, respectively.

Treatment is primarily supportive (fluids, dopamine for blood pressure, and assisted ventilation). Detoxification for chronic ethanol intake often employs chlordiazepoxide, to prevent delerium tremens and other signs of ethanol withdrawal.

Acute overdose of these drugs presents primarily as CNS depression, especially of the respiratory centre. Signs and symptoms (in order of
progression) include drowsiness, lethargy, miosis (pinpoint pupils), flaccid muscle tone, cool skin, hypotension, bradycardia, hypoventilation, apnea and coma.

Treatment is antidotal with the opioid antagonist naloxone or naltrexone. Naloxone is preferred for its purely antagonistic effect, however given its short half-life, numerous administrations must be made in many instances. Other treatments are supportive in nature (airway support).

11. Sedative hypnotics (barbiturates and benzodiazepines)
Initial overdose may manifest as signs of disinhibition (excitable, rowdy) but quickly progresses to lethargy, stupor, coma, hypotension, and pinpoint pupils. Nystagmus may be seen. Respiratory depression is the primary concern with these CNS depressants.

Treatment is primarily supportive (maintain blood pressure, support ventilation). There are no antidotes for barbiturate toxicity, although haemoperfusion may hasten the elimination of phenobarbitone. Flumazenil, a specific benzodiazepine antagonist, may be used cautiously in cases of benzodiazepine toxicity. It should not be used empirically, since seizures may be precipitated in patients addicted to a benzodiazepine or who have ingested a TCA.

Quiz / 4

Mention treatment of barbiturates and benzodiazepines Toxicity

Note

- Check your answers in key answer page 371

12. Theophylline -- Overdose may result from mistaken administration or with drugs that inhibit theophylline metabolism, such as cimetidine, ketoconazole, or erythromycin.

Signs and symptoms of theophylline overdose include vomiting, tachycardia, arrhythmias, tremor, hypotension, hypokalaemia, and hyperglycaemia. Seizures may develop in severe intoxication.

Treatment is generally supportive. Anticonvulsant therapy is often ineffective, however phenobarbitone is preferred. Cardiac effects may be treated with a beta blocker (esmolol is preferred since it may be given parenterally and has a relatively short half-life).
5/ Post test

Circle the correct answer :-

1. Treatment of a Paracetamol by -- N-Acetylcysteine --. It is given IV as.
   a - 0.5% solution within 36 hours of ingestion.
   b - 5% solution within 36 hours of ingestion
   c - 15% solution within 36 hours of ingestion
   d - 25% solution within 36 hours of ingestion

2. Signs and symptoms of theophylline overdose include.
   a - vomiting
   b - arrhythmias
   c - hypokalaemia
   d - all of them

3. is the primary concern with these CNS depressants.
   a - Respiratory depression
   b - cardiac depression
   c - gastrointestinal depression
   d - all of them

4. Uncomplicated arrhythmias of digoxin toxicity may be treated with :-
   a - parenteral potassium
   b - lidocaine
   c - paracetmol
   d - aspirin

5. Chronic ethanol intoxication is hepatotoxic and cardiotoxic, causing potential cirrhosis
   a - hepatotoxic
   b - cardiotoxic
   c - hepatotoxic and cardiotoxic
   d - all of them

Note
- Check your answers in key answer page 370.
- (1) degree for each

6/ key answer :-

1- Pre test :-
1. a
2. c
3. d
4. a
5. d

If you :-
• got 9 or more you do not need to proceed .
• got less than 9 you have to study this modular unit well .

2- Post test :-
1. b
2. d
3. a
4. b
5. c

If you :-
• got 9 or more , so congratulation your performance , go on studying modular unit three .
• got less than 9 , go back and study the second unit ; or any part of it ; again, and then do the post test again.
**Quiz 1**
1. Toxic effects that are direct and predictable following an overdose of the drug
2. Toxic effects may be direct and predictable following repeated dosing of the drug
3. Toxic effects may be direct and unpredictable, either following one dose or just a few doses. These effects often represent the idiosyncratic response to drugs and may be immunologic or pharmacologic in mechanism
4. Toxic effects that are the result of some drug interaction

**Quiz 2**
1) Within the first day of overdose -- anorexia, nausea, vomiting, malaise
2) 1-2 days post-ingestion -- patient feels better, may eat, get up, but liver enzymes are elevated
3) 3-5 days -- hepatic necrosis, liver enzymes may peak
4) 7-8 days -- either hepatic failure and death OR if appropriate measures were taken or the overdose not extensive, improvement and recovery.

**Quiz 3**
Treatment is generally symptomatic and supportive. Siezures and hyperthermia should be treated aggressively with parenteral benzodiazepines and cool baths and evaporative cooling, respectively. In cases of extreme hyperthermia (equal to or greater than 105°F), neuromuscular blockers may be used to diminish muscle hyperactivity.

**Quiz 4**
Treatment is primarily supportive (maintain blood pressure, support ventilation). There are no antidotes for barbiturate toxicity, although haemoperfusion may hasten the elimination of phenobarbitone. Flumazenil, a specific benzodiazepine antagonist, may be used cautiously in cases of benzodiazepine toxicity. It should not be used empirically, since seizures may be precipitated in patients addicted to a benzodiazepine or who have ingested a TCA.

**Sources :-**
2. In contemporary medicine, a purer form of digitalis (usually digoxin) is obtained from Digitalis lanata.

counteract specially to outside forces.

produces, however chemicals it balances the Amiloride

an overload of sod...come about from these diseases congestive heart hypertension and specially to Amilorida is used...sometimes it needs some help from...
in the body. Amiloridum comes from an overload of sodium produced; however, chemicals it balances the body usually help from outside to counteract failure. Usually congestive heart hypertension and Amiloridum Amiloridum Amiloridum.
Aminexin is an imbalance that only recently corrected.
Totacillin, or Omnipen, is prescribed as penicillin that is a generic form of Amipenix S. This Aminobenzylpenicillin should not be taken by patients allergic to penicillin. Patients taking antibiotics should be aware that penicillin is a potential allergen.
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not take Amipenix
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allergic reaction to
Principen. Patients
Amipramidin
Your body naturally sometimes it needs help from outside to counteract an overload of sodium in the body balances the chemicals it sources.

Amipramizide is used to counteract hypertension and congestive heart failure. It is also used as a mood stabilizer in the treatment of manic-depressive illness.
of those natural increases the levels in the body, reuptake in serotonin and the antidepressant. By battle depression, it is considered an effective, popular medication. Amitril is an example of a such medication.
overload of sodium can come from these diseases. Usually, congestive heart failure. Usually, hypertension and counteract forces. Amiloride is used specifically to help from outside sources. Your body usually needs some chemicals it balances the molar. Amiloridum is used to counteract forces. Amiloride needs help from outside.
Amineurin is a chemical in the body. Amineurin imbalance that occurs in people is easily treated with proper medication. Thanks to modern medicine, we have been able to treat it and only recently are scientists discovering it is a serious disease.
Amiloridum is used to counteract an overload of sodium coming from an e diseases such as hypertension and congestive heart failure. Usually, your body needs help from outside sources. Chemicals like Amiloridum balance the chemical composition of your body.
that makes them occurs in people the chemical to modern medicine medication. Thanks with proper been able to treat it have scientists serious disease, Depression is a Amineurin in the body. Am
overload of sodium come from an these diseases failure. Usually congestive heart hypertension and to counteract Amiloridum is used sources. sometimes it produces; however, the chemicals it
This medicament is called lin. Aminobenzylpenicillin should not be taken by patients allergic to penicillin who have had an allergic reaction to Principen. Patients taking Totacillin, or Omnipen, sometimes need prescriptions of penicillin that is corrected. Amipenix S is expressed as Amineurin is an example.
Amineurin is an example of a medication that makes them depressed, which occurs in people with a serious disease, namely depression. Usually these diseases come from an overload of sodium in the body. Heart failure is a disease that usually these diseases come from. Scientists have been able to treat it with proper medication. Thanks to modern medicine, Amineurin can be used to correct an imbalance of chemicals in the body.
Depression is a serious disease, and only recently have scientists been able to treat it with proper medication. Thanks to modern medicine, the chemical imbalance that occurs in people that makes them depressed is easily corrected. Aminobenzylpenicillin is an example of penicillin that is sometimes used in depression.
prescribed as Omnipen, Totacillin, or Principen. Patients who have had an allergic reaction to penicillin-based antibiotics should not take Aminobenzylpenicillin. This medicament fights...
Your body usually balances the chemicals it produces; however, sometimes it needs help from outside sources. Amipramidin is used to counteract hypertension and congestive heart failure. Usually these diseases come from an overload of sodium in the body.
rs in people that makes them depressed is easily corrected. Amineurin is an example

Aminobenzylpenicillin is a generic form of penicillin that is sometimes prescribed as Omnipen, Totacillin, or Principen. Patients who have had an allergic reaction to penicillin-based antibiotics should not take Aminobenzylpenicillin. This medicament fights...
Aminobenzylpenicillin is a generic form of penicillin that is sometimes prescribed as Omnipen, Totacillin, or Principen. Patients who have had an allergic reaction to penicillin-based antibiotics should not take Aminobenzylpenicillin. This medicament fights
allergic reaction to penicillin-based antibiotics should not take Amipenix S. This medication fights bacterial infection.

Your body usually balances the chemicals it produces; however, sometimes it needs help from outside sources. Amipramidin is used to counteract hypertension and congestive heart failure. Usually these diseases come from an overload of sodium in the body. Amipramizide governed from penicillin at times some medicines...
Amipramizide

rescribe as Omnipen, Tocaclil, or Pricenpen.
Patients who have had an allergic reaction to penicillin-based antibiotics should not take Aminobenzylpenicillin. This medicament fights bacterial infection.

Amipenix S is a generic form of penicillin that is sometimes prescribed as Omnipen, Totacillin, or Principen. Patients who have had an allergic reaction to penicillin-based antibiotics should not take Amipenix S. This medication fights bacterial infection.
Your body usually balances the chemicals it produces; however, sometimes it needs help from outside sources.

Amipramidin is used to counteract hypertension and congestive heart failure. Usually these diseases come from an overload of sodium in the body.
Your body naturally balances the chemicals it produces; however, sometimes it needs help from outside sources. Amipramizide is used to counteract hypertension and congestive heart failure. Since these diseases come from an overload of sodium in the body, Amipril is an effective, popular medication that battles depression and is considered a pain reliever.
Amitril is a tricyclic antidepressant. By inhibiting the serotonin and the noradrenaline reuptake in a patient's body, Amitril actually increases the levels of those natural body chemicals.
of penicillin that is sometimes prescribed as Omnipen, Totacillin, or Principen. Patients who have had an allergic reaction to penicillin-based antibiotics should not take Amipenix. This medication fights bacterial infection.

Your body usually balances the chemicals it produces; however, sometimes it needs help from outside sources. Amipramidin is used to counteract hypertension and congestive heart failure. Usually these diseases come from an of people's bodies sometimes so medicines prescribed
Your body naturally balances the chemicals it produces; however, sometimes it needs help from outside sources. Amipramizide is used to counteract hypertension and congestive heart failure. Since these diseases come from an overload of sodium in the body.
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used to counteract hypertension and congestive heart failure. Since these diseases come from an overload of sodium in the body, Amitril is an effective, popular medication that battles depression and is considered a tricyclic antidepressant. By inhibiting the serotonin and the noradrenaline reuptake in a patient's body, Amitril actually increases the levels of those natural body chemicals; however, some medicines need time to read.
Your body naturally balances the chemicals it produces; however, sometimes it needs help from outside sources. Amipramizide is used to counteract hypertension and congestive heart failure. Since these diseases come from an overload of sodium in the body.
Amitril is an effective, popular medication that battles depression and is considered a tricyclic antidepressant. By inhibiting the serotonin and the noradrenaline reuptake in a patient's body, Amitril actually increases the levels of those natural substances and compounds that are beneficial for mental health.
Amipramide is used to counteract hypertension and congestive heart failure. Since these diseases come from an overload of sodium in the body, your body naturally balances the chemicals it produces; however, sometimes it needs help from outside sources.

Amipramide is useful because the disease is as specific from an overload of sodium.
overload of sodium in the body.

Amitril...
Your body naturally balances the chemicals it produces; however, sometimes it needs help from outside sources. Amipramizide is used to counteract hypertension and congestive heart failure. Since these diseases come from an overload of sodium in the body, Amipril is an effective, popular medication that battles depression and is considered a tricyclic antidepressant. By inhibiting the serotonin and the noradrenaline reuptake in the pramizide, you do not allow the chemicals to balance out.
patients body, Amitril actually increases the levels of those natural body controls; however, some medicines need similar; however, some medicines
Amipramizide is used to counteract hypertension and congestive heart failure. Since these diseases come from an overload of sodium in the body, Amipril is an effective, popular medication that battles depression and is considered a tricyclic antidepressant. By inhibiting the serotonin and the noradrenaline reuptake in a patient's body, Amipril actually increases the levels of those natural hormones.
Amitril is an effective, popular medication that battles depression and is considered a tetracyclic antidepressant. By inhibiting the serotonin and the noradrenaline reuptake in a patient's body, Amitril actually increases the levels of those natural body chemicals.