Ques-1 Define structure and function of cerebellum.

Answer-

Structure and Function

Introduction

The central nervous system can be broken down structurally as follows:

- Spinal Cord
- Hindbrain
  - Medulla (myelencephalon)
  - Pons (metencephalon)
  - Cerebellum
- Midbrain (mesencephalon)
- Forebrain
  - Telencephalon
    - Cerebral Cortex
      - Frontal Lobe
      - Temporal Lobe
      - Parietal Lobe
      - Occipital Lobe
    - Subcortical Structures
      - Basal Ganglia
      - Hippocampus and Amygdala (parts of the Limbic System)
    - Corpus Collosum
  - Diencephalon
    - Thalamus
    - Hypothalamus

The ***brainstem*** refers to the midbrain and portions of the hindbrain. Specifically, the brainstem comprises:

    - Midbrain (mesencephalon)
    - Medulla (myelencephalon)
    - Pons (metencephalon)

Spinal Cord

The spinal cord is one of the two major components of the central nervous system:

- Like the brain, it is completely encased in bone. It resides within the vertebral column
- Connects directly to the medulla section of the brain
- It is approximately 45 cm long in an adult
- Receives sensory messages and sends them to the brain
- Sends motor messages from the brain
- Also acts independently from the brain: e.g., reflexes

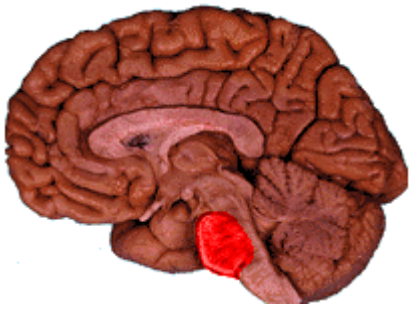
Hindbrain

- Oldest part of the brain
- Located between the spinal cord and the brain hemispheres
- Consists of the medulla, pons and cerebellum
- Contains many nuclei, including those that produce the neurotransmitters for the whole brain
- Controls many involuntary, life-sustaining processes including
    - Respiration

- Circulation
- Digestion

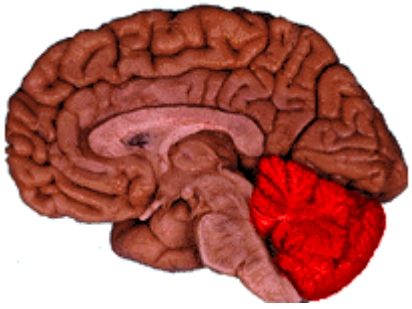
- Medulla (myelencephalon)

  - Full name: Medulla Oblongata ("oblong marrow")
  - Connects the spinal cord to pons
- Pons (metencephalon)



  - Full name: Pons Varolii. Originally means 'bridge'
  - Bridges the cerebrum and the cerebellum through cerebellar peduncles

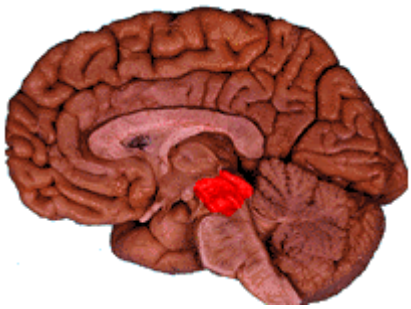
Cerebellum



  - Located directly behind the brainstem

- Use for coordination and balance
- Handles walking and posture

Midbrain



- Controls posture and walking
- Handles reflexes of eye movements

Forebrain

The forebrain is divided into two main sections:

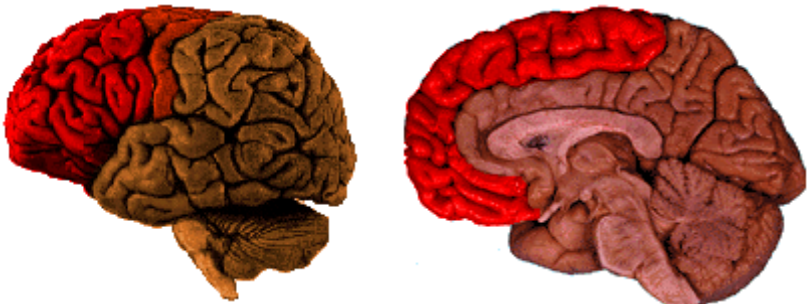
- Telencephalon
  - Cerebral Cortex
  - Basal Ganglia
  - Limbic System (hippocampus and amygadala)
- Diencephalon
  - Thalamus
  - Hypothalamus

Telencephalon

Cerebral Cortex

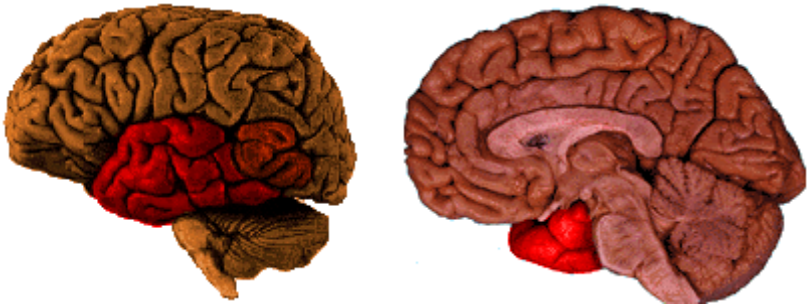
The cerebral cortex is composed of two hemispheres comprising four lobes: the frontal, temporal, parietal, and occipital lobes. The following diagrams show both lateral and midsagittal views of the cerebral cortex.

- Frontal Lobe



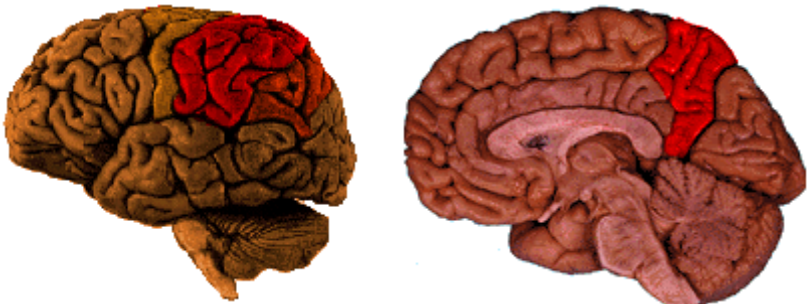
  - Most developed in humans
  - Largest of the four lobes
  - Olfactory cortex
  - Motor cortex
  - Language production
  - Memory and higher cognitive function

- Temporal Lobe



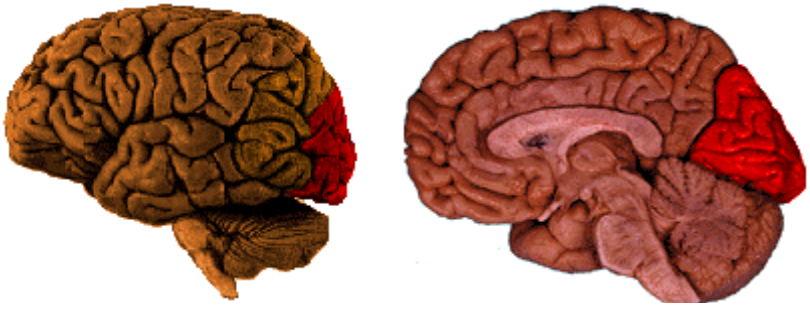
  - Auditory processing
  - Memory
  - Understanding language

- Parietal Lobe



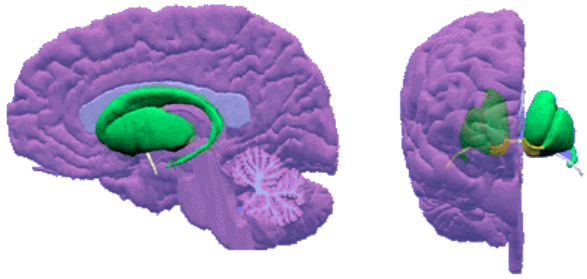
  - Somatosensory
  - Spatial processing
  - Attention

- Occipital Lobe



  - Visual processing

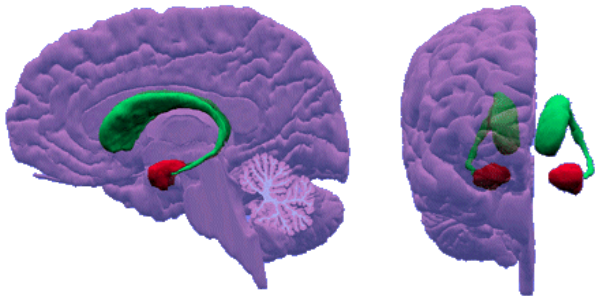
Basal Ganglia



- Movement regulation
- Skill learning

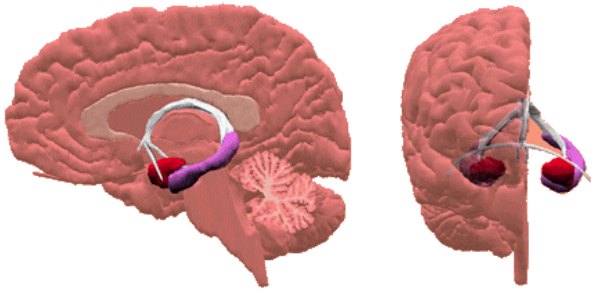
Limbic System

- Amygdala

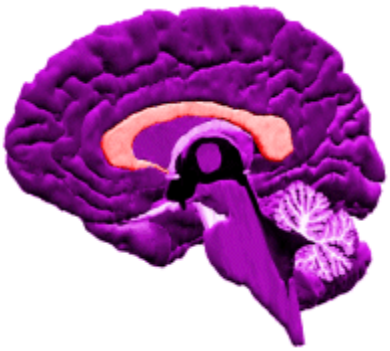


- In the above lateral and anterior views, the red golf ball shaped structure is the amygdala. The green supporting structure is the caudate nucleus.
- Emotion processing

- Hippocampus



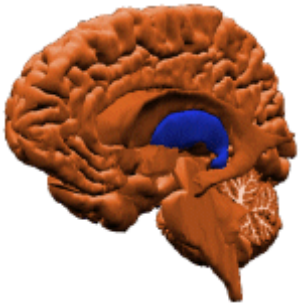
- In the above lateral and anterior views, the purple structure is the hippocampus. The amygdala is shown again as a red golf ball shaped structure.
- Responsible for the formation of long-term memories
- Damage to this area does not destroy old memories; rather, new memories can no longer be formed
- **Corpus Collosum**



- The major link between the left and right hemispheres
- Bundle of axons which allow communication of neurons across both hemispheres

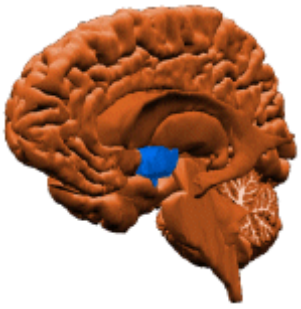
Diencephalon

- Thalamus



- Primary "gate" between sensory or motor neurons in the PNS and the cerebral hemispheres in the CNS

- Hypothalamus



- Interacts primarily with the Autonomic Nervous System (ANS)
- Maintains homeostasis: like a thermostat, it increases or decreases metabolism in order to regulate body activity

Summary of Structures

Cerebral cortex lobes:

Cerebral Hemisphere	Primary Function (Motor/Sensory)	Secondary Function (Cognitive)
Frontal	Motor	Motor planning and execution, attention, executive functions, perhaps consciousness?
Temporal	Auditory and Olfactory	Memory, language, emotion
Parietal	Somatosensory	Spatial attention
Occipital	Visual	Map of visual world

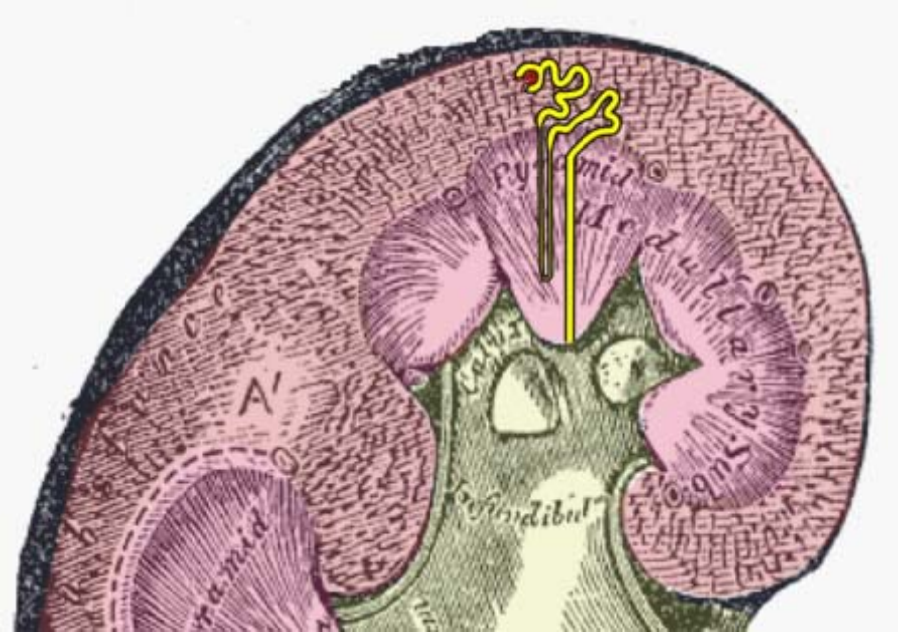
Other structures:

Section	Function
Spinal Cord	Input-output of sensory and motor information to and from the CNS-PNS
Medulla	Autonomic function (breathing, heart rate, etc.)
Pons	Auditory and vestibular (balance), sensory and motor
Cerebellum	Motor coordination and motor learning
Midbrain	Visuomotor functions, visual reflexes, auditory relays, motor coordination
Thalamus	Part of the diencephalon within the forebrain. Projects information to specific areas of the cerebrum, and controls which information is sent to the cerebral cortex
Hypothalamus	Regulates homeostasis in conjunction with the autonomic nervous system
Basal Ganglia	Centers for motor coordination
Hippocampus	Memory formation
Amygdala	Emotion processing
Corpus Collosum	Bundle of axons which connects the two hemispheres.

Ques-2 Define structure and function of nephron with the help of diagram of Kideny.

Answer:-

Kidney



The kidney is responsible for maintaining fluid balance within the body. The basic structural and functional units of the kidneys are the nephrons. Each nephron is made of intricately interwovencapillaries and drainage canals to filter wastes, macromolecules, and ions from the blood to urine. The approximately 1 million nephrons in each human kidney form 10-20 cone-shaped tissue units called renal pyramids that span both the inner and outer portions of the kidney, the renal medulla and renal cortex.

There are two main parts of a nephron: the renal corpuscle and renal tubule.

Renal Corpuscle Structure

The renal corpuscle is the initial filtering component of the nephron and is made up of two structures known as the glomerulus and Bowman's capsule. The Bowman's capsule is a double membrane that cups the glomerulus. The glomerulus is a capillary extension, a small network of thin blood vessels, receiving blood from the renal circulation. The glomerular filtration rate is a measure of kidney function.

Renal Tubule Structure

Renal tubules are a duct system beginning at the Bowmen's capsule in the cortex, looping through the renal medulla, and returning to the cortex to connect to the collecting duct system. Each renal tubule is divided into a proximal tubule, loop of Henle, and distal convoluted tubule. The proximal tubular has a brush border, that is microvilli, that increases the surface area for absorption. The distal convoluted tubule meets the afferent arteriole of the corpuscle as it joins the collecting tubule; this is called the macula densa.

Nephron Function

The blood is filtered and urine formed by the actions of the nephrons. In each nephron, high pressure in the glomerulus pushes water and small dissolved materials into the extravascular space of the Bowman's capsule and into the tubule. The proximal tubule reabsorbs water, salts, glucose, and amino acids to maintain electrolyte levels in the body. The interstitium of, that is the tissue space surrounding, the loop of Henle concentrates salts that will be excreted in the urine, creating a concentration gradient in the medulla. The limbs of Henle's loop are permeable to particular ions (descending, water and some urea; thin ascending, general ions; medullary thick ascending – sodium, potassium, chloride), with the cortical thick ascending limb draining into the distal convoluted tubule. The distal tubule contains cells specialized in active transport and maintains urine

and blood pH levels, particularly through the regulation of sodium and potassium.

Fluid then passes from the distal tubule to the collecting ducts, a tubule system that can become permeable or impermeable to water depending on the body's needs. Ultra filtration also occurs in the cortex in the cortical collecting ducts, which is regarded by some anatomy references as not being a portion of the nephron, and by others as being the final portion of the nephron. The urine then passes from the collecting ducts through the drainage system of the kidney to the ureters and bladder for urination.

Ques-3 Explain the physiological role of insulin.

Answer:-

Insulin and Its Physiological Role

Insulin, a hormone released in the human body by the pancreas, is largely associated in the minds of the public to people affected by diabetes, but little more is known to those outside the healthcare community as to the the importance that insulin plays in the physiology of the human body. This hormone, composed of a protein that is made out of 51 amino acids, the building blocks of organic life, plays a vital role in maintaining bodily homeostasis and is a necessity for sustaining human life (Mantzoros and Shanti).

In order to understand the physiological role of the hormone insulin we must first understand how hormones work in general. Hormones are released by the endocrine system into the blood stream when an aspect of bodily homeostasis has gone out of its range. The blood stream then carries the hormones to target cells in the body that contain hormone specific receptors compatible with a certain hormone or hormones. Once at the target cell, the hormone binds with the receptor and, usually through a number of chemical interactions, acts on a specified metabolic process that

either inhibits or excites the process to achieve its intended effect (Sheir, Butler and Lewis 488). Once the hormone's effect is achieved, impulses are normally triggered within the body which are in turn sent to the central nervous system and interpreted. If the effect of the hormone was enough to alter its metabolic process to the point where homeostasis is achieved, impulses are sent to the organ secreting the hormone telling it to decrease or cease secretion so as not to push the body out of the achieved homeostasis. This process is known as negative feedback, the major control mechanism of hormones in the body, including insulin, which functions to maintain a homeostatic environment in order to support life (Sheir, Butler, and Lewis 489). In having a general understanding of how hormones work, we can now start looking at insulin which interacts with cells in much the same way as hormones do in general.
As stated before, insulin is secreted by the pancreas, the pancreas are in turn made up of three types of cells: alpha, beta and delta cells. Beta cells release insulin into the body while the alpha cells release glucagon, an antagonist of insulin which will be discussed later on, and the delta cells release somatostatin, a hormone which has the ability to inhibit alpha and beta cell secretion in the pancreas (Shier, Butler, and Lewis 516).

Ques-3 write the steps involved in synthesis of thyroxine.

Answer:-

Thyroid Hormones

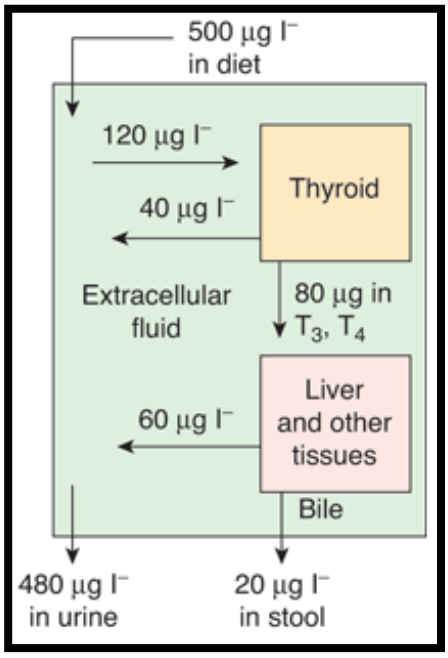
- The Thyroid Hormones belong to the Amine Group of Hormones, derived from the amino acid Tyrosine:
- Thyroxin
- Triiodothyronine

Thyroid Hormone Synthesis

- Steps involved in Thyroid Hormone Synthesis:

- Iodide Trapping
- Formation & Secretion of Thyroglobulin
- Oxidation of Iodide
- Organification & Coupling
- Storage of Thyroid Hormones
- Deiodination of Iodothronines
- Release of Thyroid Hormones
- Peripheral conversion of T4 to T3

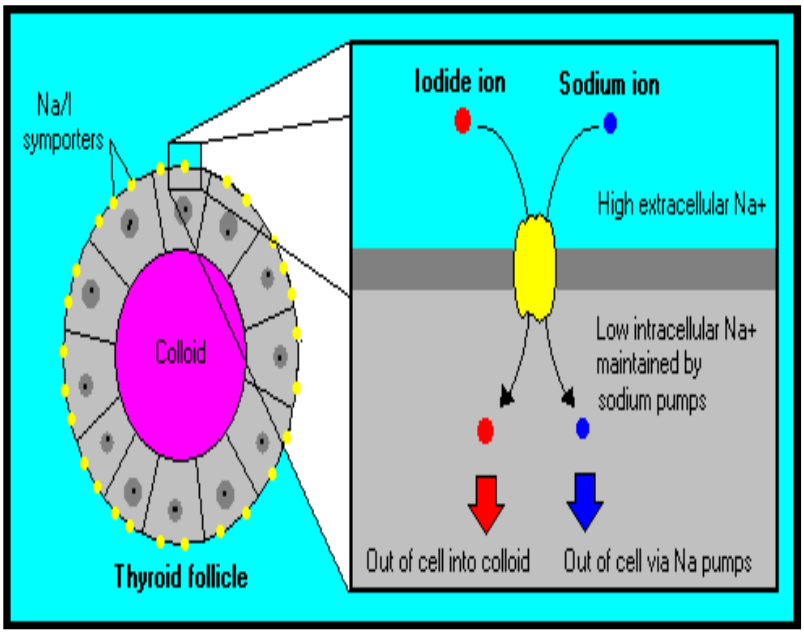
Iodine-Essential For Thyroid Hormone Synthesis



- Iodine is an essential raw material for thyroid hormone synthesis
- The minimum daily iodine intake that will maintain normal thyroid function is 150 g in adults.
- average dietary intake is approximately 500 g/d
- About 120 g/d enter the thyroid
- The thyroid secretes 80 g/d in the form of T_3 and T4
- 40 g/d diffuses back into the extracellular fluid (ECF)
- Circulating T_3 and T_4 are metabolized in the liver
- The total amount of I^- entering the ECF is 600 g/d; 20% of this I^- enters the thyroid, whereas 80% is excreted in the urine.

Iodide Trapping

- The first step in Thyroid Hormone Synthesis
- The Basolateral membrane of Thyrocytes possesses a pump called Na+/I- Symporter
- Na^+/I^- symporter transports two Na^+ ions and one I^- ion into the cell with each cycle, against the electrochemical gradient for I^-
- Concentration of TSH is the strongest regulator of Iodide Trapping Symport mechanism



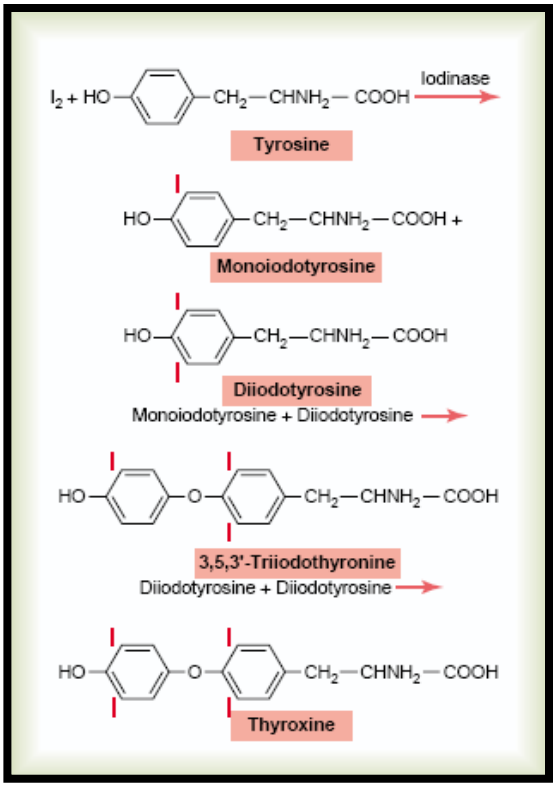
Thyroglobulin

- Thyroglobulin is synthesized by the thyroctes Thyroglobulin, is a glycoprotein molecule with a molecular weight of about 335,000.
- Each molecule of thyroglobulin is made up of 2 subunits
- Each molecule contains about 70 tyrosine residues

Oxidation of Iodide

- Once IODIDE IS INSIDE THE Thyroid cells, it is converted into an oxidized form of iodine, *either*
  - nascent iodine (I0) or
  - I3-
- Oxidized Iodine is capable of combining directly with the amino acid tyrosine

- This oxidation of iodine is promoted by the enzyme peroxidase



Organification of Thyroglobulin

- The binding of iodine with the thyroglobulin molecule is called organification of the thyroglobulin.
- Thyroid peroxidase catalyzes the iodination of tyrosine residues
- Tyrosine is first iodized to monoiodotyrosine and then to diiodotyrosine.

Coupling Reaction

- Iodotyrosine residues become coupled with one another
- Thyroid peroxidase is involved in coupling Reaction
- T_4 is formed by condensation of two molecules of DIT
- T_3 is formed by condensation of MIT with DIT
- A small amount of Reverse T_3, RT_3 is also formed, probably by condensation of DIT with MIT
- The major hormonal product of the coupling reaction is the molecule thyroxine that remains part of the thyroglobulin molecule.
- Triiodothyronine represents about one fifteenth of the final hormones.

Storage of Thyroid Hormones

- The thyroid gland is unusual among the endocrine glands in its ability to store large amounts of hormone.

- Each thyroglobulin molecule contains up to 30 thyroxine molecules and a few triiodothyronine molecules.
- Stored Thyroid Hormones maintain the body's requirement of T3 and T4 for up to 2-3 months

Release of Thyroid Hormones

- Thyroglobulin itself is not secreted into the circulation
- Thyroglobulin is digested by pinocytosis mechanism at the apical membrane
- T3 and T4 are released, diffuse into the capillaries through the basal surface

Deiodination of Iodothronines

- During digestion of thyroglobulin, iodothyronins are also freed but not released in to the blood
- Enzyme Deiodinase cleaves Iodine from them making it available for more and more thyroid hormone synthesis inside the gland

Thyroid Hormone Secretion

- About 93 per cent of the thyroid hormone released from the thyroid gland is normally thyroxine ,only 7 per cent is triiodothyronine.
- At the target tissue, most of T4 is converted to T3 as T3 is the active form that binds with receptors.

Thyroid Hormone Transport & Protein Binding

- Once into the circulation, T3 and T4 bind to plasma proteins synthesized by the liver
- These proteins include:

➢ Thyroxin-binding Globulin

➢ Thyroxin-binding Prealbumin

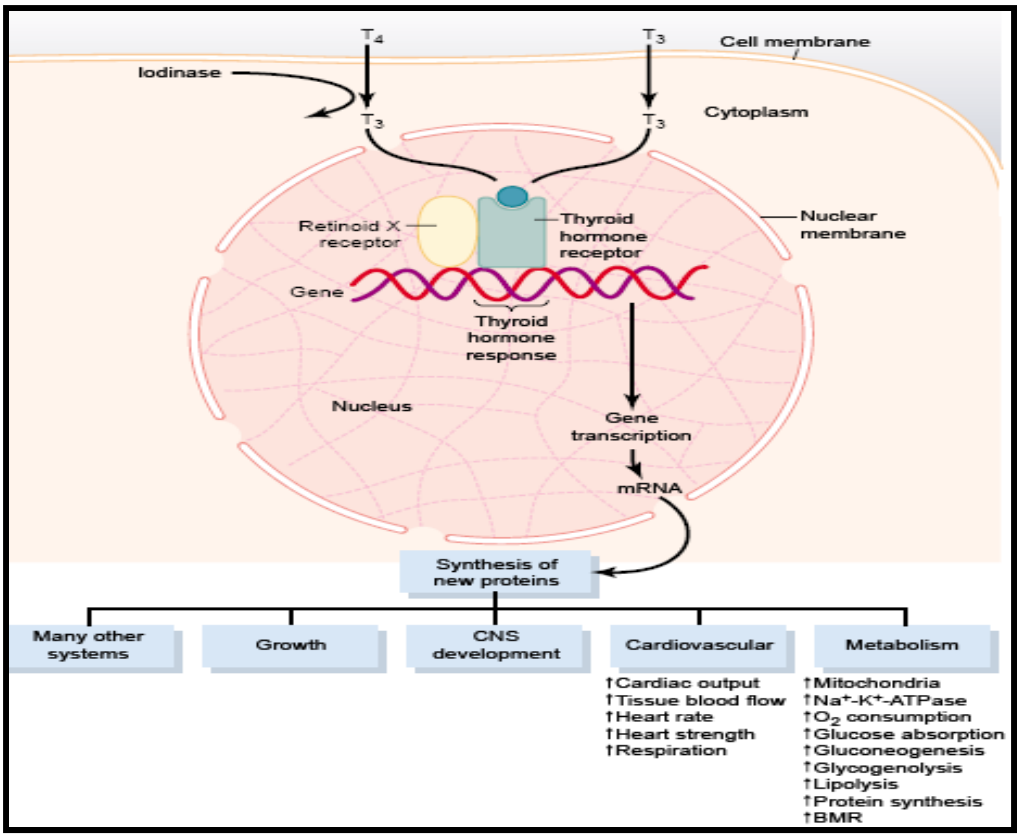
➢ Albumin

Thyroid Hormone:
Free and Protein Bound Form

- Free T3 and T4 is the physiologically active form
- Free T3 and T4 coordinates the feedback mechanism of hormone action
- 99.98% of the T4 in plasma is bound; the free T_4 level is only about 2 ng/dL
- T_3 is not bound to quite as great an extent; 0.2% (0.3 ng/dL) is free. The remaining 99.8% is protein-bound

Thyroid Hormone-Mode of Action

- Thyroid Hormones Belong to the lipophilic family of Hormones
- Upon reaching the target tissue, freely permeate the plasma membrane
- They have intranuclear receptors, Thyroid Hormone Response Elements on The DNA
- Upon binding Thyroid Hormone alter gene expression and increase cellular metabolism



Metabolic Effects of Thyroid Hormones

- Increase metabolism of Carbohydrates and Fat
- Stimulate growth and Increase BMR
- Increase GI motility
- Increase blood Flow, cardiac output, heart rate and strength of contractility
- Increase rate of secretion of other endocrine glands

Thyroid Disorders

- Hyperthyroidism
  - Grave's Disease
  - Toxic multinodular goiter
  - Toxic adenoma

- Hypothyroidism
  - Iodine deficiency Goiter
  - Hashimoto's Disease
  - Myxedema

Ques 4: write the note on coagulation of blood.

Answer:

coagulation of blood

When there is an injury and blood flows, a mechanism is provided within the body whereby blood loss is prevented. This is termed as the coagulation or clotting of blood.

The actual mechanism of blood coagulation is a complicated one, but the general principles are simple and important. Before clotting, there are some substances which must be present in the blood. They are prothrombin, calcium, fibrinogen and thromboplastin.

Prothrombin, calcium and fibrinogen are all normal constituents of blood. But thromboplastin is released only when there is a damage in a blood vessel or tissue cell the release of thromboplastin from thrombocytes or blood platelets brings about a series of changes or events which finally produces a blood clot.

Normally, prothrombin (protein present in the plasma) as such is inactive, but when acted upon thromboplastin in the presence of calcium is converted to an active substance thrombin.

Thrombin in turn acts on fibrinogen, another plasma protein, to produce an in soluble thread-like substance called fibrin.

The fibrin threads entrap blood cells to form a solid mass, the clot. After sometimes the clot shrinks', and a clear stickle fluid, serum is released, (Serum=plasma-fibrinogen).

The mechanism of clotting can be expressed in a simple formula:

1. Prothrombin + Calcium+thromboplastin = Thrombin (active) (inactive) (from damaged tissue cells and platelets)

2. Thrombin + fibrinogen = Fibrin (fine threads) (inactive)

3. Fibrin + blood cells = CLOT

Certain factors or conditions hasten the clotting of blood, while others retards

Factors hastening clotting

1. Calcium salts acts as good coagulants.

2. Vitamin K has a coagulant action because it helps in the formation of prothrombin, which is necessary for blood clotting.

3. Injury to the tissues or vessel wall helps in coagulation, so that a clean cut with a sharp knife bleeds more freely than a crushed wound in which there is bruising and damage to the surrounding tissues.

4. Contact with a foreign body as the application of surgical dressings help in the speedy formation of a clot and arrest of hemorrhage.

5. Slightly higher temperature than that of the body helps clotting and hence the use of hot swabs to stop surgical bleeding.

Factors retarding clotting:

1. Heparin is a protein normally present in the blood is formed in the liver and prevents blood clotting in the vessels.

2. Addition of sodium citrate and potassium Oxalate to the blood will combine with calcium and form insoluble salts, thereby make it inactive. These prevent coagulation. In this method, blood is preserved in the blood banks without coagulation.

3. Contact with oil, grease or paraffin wax, would retard clotting.

4. Local Cold.

5. Snake venom is another anticoagulant.

Ques 5 various methods of family planning.

Answer:

Family Planning Method

1. Fertility Awareness Method

- Calendar (Rhythm) Method
- Basal Body Temperature Method
- Cervical Mucus (Billings) Method
- Symptothermal Method
- Ovulation Awareness
- Lactation Amenorrhea Method
- Coitus Interruptus
- Abstinence

2. Hormonal Methods

- Combined Oral Contraceptive Pills (COCs)
- Mini Pills
- Estrogen/Progesterone Patch
- Vaginal Rings
- Subcutaneous Implants
- Intramuscular Injections

3. Barrier (Mechanical) Method

- Male/Female Condom
- Diaphragm
- Cervical Cap

4. Barrier (Chemical) Method

- Spermicides

5. IUD (Intrauterine Device)

6. Surgical Method

- Vasectomy
- Tubal Ligation

Contraceptives

To be ideal, a contraceptive should have the following characteristics:

- Safe
- 100% effective
- Free of side effects
- Easily obtainable
- Affordable
- Easy to use and acceptable to both user and sexual partner
- Free of effects on future pregnancies

- Fertility awareness methods rely on detecting when a woman is capable of impregnation and using periods of abstinence or contraceptive use during that time.

Calendar (Rhythm) Method - the calendar method requires a couple to abstain from coitus on the days of a menstrual cycle when the woman is most likely to conceive.

To plan for this, the woman keeps a diary of six menstrual cycles. To calculate "safe" days, she subtracts 18 from the shortest cycle documented. This number represents her first fertile day. She subtracts 11 from her longest cycle. This represents her last fertile day. If she had six menstrual cycles ranging from 25 to 29 days, her fertile period would be from the 7th day (25 minus 18) to the 18th day (29 minus 11). To avoid pregnancy, she would avoid coitus or use a contraceptive such as vaginal foam during those days.

Basal Body Temperature – just before the day of ovulation, a woman's basal body temperature (BBT) falls about 0.5 °F. At the time of ovulation,

her BBT rises a full degree because of the influence of progesterone. This higher level is then maintained for the rest of her menstrual cycle. This pattern is the basis of the BBT method of contraception.

To use this method, the woman takes her temperature each morning immediately after waking, before she undertakes any activity; this is her BBT. As soon as she notices a slight dip in temperature followed by an increase, she knows that she has ovulated. She refrains from having sex for the next 3 days (the life of the discharged ovum). Because sperm can survive for at least 4 days in the female reproductive tract, it is usually recommended that the couple combine this method with a calendar method, so that they abstain for a few days before ovulation as well.

Cervical Mucus (Billings) Method – before ovulation each month, the cervical mucus is thick and does not stretch when pulled between the thumb and finger. Just before ovulation, mucus secretion increases. With ovulation (the peak day), cervical mucus becomes copious, thin, watery, and transparent. It feels slippery and stretches at least 1 inch before the strand breaks, a property known as spinnbarkeit. All the days on which the mucus is copious, or at least 3 days after the peak day, are considered to be fertile days, or days on which the woman should abstain from sex to avoid conception.

A woman using this method must be conscientious about assessing her vaginal secretions daily, or she will miss the change in cervical secretions.

Symptothermal Method – this method of birth control combines the cervical mucus and BBT methods. The woman takes her temperature daily, watching for the rise in temperature that marks ovulation. She also analyzes her cervical mucus daily. The couple must abstain from

intercourse until 3 days after the rise in temperature or the fourth day after the peak of mucus change, because these are the woman's fertile days. The symptom thermal method is more effective than either the BBT or the cervical mucus method alone.

Ovulation Awareness – another method to predict ovulation is through the use of an over-the-counter ovulation detection kit. These kits detect the mid cycle surge of luteinizing hormone in urine that occurs 12 to 24 hours before ovulation.

Lactation Amenorrhea Method – as long as a woman is breast-feeding an infant, there is some natural suppression of ovulation. Because women may ovulate but not menstruate while breast-feeding, the woman may still be fertile even if she has not had a period since childbirth. As a rule of thumb, after 6 months of breast-feeding, the woman should be advised to choose another method of contraception.

Coitus Interruptus – is one of the oldest known methods of contraception. The couple proceeds with coitus until the moment of ejaculation. Then the man withdraws and spermatozoa are emitted outside the vagina. Unfortunately, ejaculation may occur before withdrawal is complete and, despite the care used, some spermatozoa may be deposited in the vagina.

Abstinence – the most effective way to protect against contraception. Abstinence has a theoretical 0% failure rate and is also the most effective way to prevent STIs.

- Hormonal Methods

Oral Contraception

Oral contraceptives, commonly known as the pill or COCs (Combined Oral Contraceptive Pills), are composed of varying amounts of synthetic estrogen combined with small amounts of synthetic progesterone (progestin).

The estrogen acts to suppress follicle-stimulating hormone (FSH) and LH, thereby suppressing ovulation. The progesterone action complements that of estrogen by causing a decrease in the permeability of cervical mucus, thereby limiting sperm motility and access to ova. Progesterone also interferes with tubal transport and endometrial proliferation to such degrees that the possibility of implantation is significantly decreased.

They are packaged 21 or 28 pills to a container. It is generally recommended that the first pill be taken on Sunday (the first Sunday after the beginning of a menstrual flow), although a woman may choose to begin on any day. Because pills are not effective for the first 7 days, she should be advised to use a second form of contraception during the initial 7 days on which she takes the pills.

Management if a woman forgets to take an oral contraceptive pill

1. If you forget to take one pill, take it as soon as you remember. Continue the following day with your usual schedule. Doing so might mean taking two pills on one day, if you don't remember until the second day. Missing one pill this way should not initiate ovulation.

2. If you miss two consecutive pills, take two pills as soon as you remember and two pills again the following day. Then continue the following day your usual schedule. You may experience some breakthrough bleeding

(vaginal spotting) with two forgotten pills. Do not mistake this bleeding for your menstrual flow. Missing two pills may allow ovulation to occur, so an added contraceptive should be used for the remainder of the month.

3. If you miss three or more pills in a row, throw out the rest of the pack and start a new pack of pills the following Sunday. You might not have a period because of this routine and should use extra protection until 7 days after starting a new pack of pills.

After a woman stops taking a COCs, she may not be able to become pregnant for 1 or 2 months, and possibly 6 to 8 months because the pituitary gland requires a recovery period to begin cyclic gonadotropin stimulation again. If ovulation does not return spontaneously after this time, it can be stimulated by clomiphene citrate (Clomid) therapy.

Side Effects

- Nausea
- Weight gain
- Headache
- Breast tenderness
- Breakthrough bleeding
- Monilial vaginal infections
- Mild hypertension
- Potential depression

Contraindications to Oral Contraceptive Use

- Breast-feeding and less than 6 weeks postpartum
- Age 35 years or older and smoking 15 or more cigarettes per day
- Multiple risk factors for arterial cardiovascular disease such as older age, smoking, diabetes, hypertension
- Elevated blood pressure of 160 mm Hg systolic or above or 100 mm Hg diastolic or above
- Current or history of deep vein thrombosis or pulmonary embolism
- Major surgery that requires prolonged immobilization

- Current or history of ischemic heart disease
- Stroke
- Complicated valvular heart disease
- Migraine with focal neurologic symptoms (migraine with aura)
- Migraine without focal neurologic symptoms and age 35 years or older
- Current breast cancer
- Diabetes with nephropathy, retinopathy, neuropathy, vascular disease, or diabetes of more than 20 years' duration
- Severe cirrhosis
- Liver tumors

Mini-pills – containing only progesterone. Without estrogen content, ovulation may occur but, because the progestins have not allowed the endometrium to develop fully, implantation will not take place. It does not interfere with milk production; it may be taken during breast-feeding.

Estrogen/Progesterone Patch – transdermal patches that slowly but continuously release a combination of estrogen and progesterone. Patches are applied once a week for 3 weeks. During the week on which the woman is patch free, a menstrual flow will occur.

Patches may be applied to one of four areas: upper outer arm, upper torso (front or back, excluding the breast), abdomen, or buttocks.

If a patch comes loose, the woman should remove it and immediately replace it with a new patch. No additional contraception is needed if the woman is sure the patch has been loose for less than 24 hours. If the woman is not sure how long the patch has been loose, she should remove it and apply a new patch, but this will start a new 4-week cycle, with a new day 1 and a new day to change the patch. She also should use a backup contraception method, such as a condom or spermicide, for the first week of this new cycle.

Vaginal Rings – a silicone ring that surrounds the cervix and continually releases a combination of estrogen and progesterone. The ring is inserted by the woman and left in place for 3 weeks, then removed for 1 week. Menstrual bleeding occurs during the ring-free week. The hormones released are absorbed directly by the mucous membrane of the vagina, thereby avoiding a "first pass" through the liver; this is an advantage for woman with liver disease.

Subcutaneous Implants – consists of six nonbiodegradable silastic, about the width of a pencil lead, which are filled with levonorgestrel (a synthetic progesterone) and embedded just under the skin on the inside of the upper arm. Over the next 5 years, the implants slowly release the hormone, suppressing ovulation, stimulating thick cervical mucus, and changing the endometrium so that implantation is difficult.

The implants are inserted with the use of a local anesthetic, during the menses or no later than day 7 of the menstrual cycle, to be certain that the woman is not pregnant at the time of insertion. At the end of 5 years, the implants are removed under local anesthesia.

Implants can be used during breast-feeding without an effect on milk production. The rapid return of fertility (about 3 months after removal) is an advantage for women who wish to have children.

Possible Side Effects:

- Weight gain
- Irregular menstrual cycle
- Hair loss
- Depression
- Scarring at the insertion site

- Need for removal

Intramuscular Injections - a single injection of medroxyprogesterone acetate (Depo-Provera) given every 12 weeks or injections of Lunelle (a synthetic estrogen and progesterone) given every 30 days inhibit ovulation, alter the endometrium and change the cervical mucus. The effectiveness rate of these methods is almost 100%, making them an incrreasinly popular contraceptive method. Depo-Provera contains only progesterone, can be used during breast-feeding.

Depo-Provera may impair glucose tolerance in women who are at risk for diabetes. Because there also may be slight increase in the risk for osteoporosis, women should be advised to include an adequate amount of calcium in their diet (up to 1,200 mg/day) and to engage in weight-bearing exercise daily to minimize this risk.

Return of fertility is often delayed by about 6 to 12 months.

Potential Side Effects

- Weight gain
- Irregular menstrual cycle
- Headache
- Potential depression

- **Barrier methods –** are forms of birth control that work by the placement of a chemical or other barrier between the cervix and advancing sperm so that sperm cannot enter the uterus or fallopian tubes and fertilize the ovum.

Condoms

- Male condom is a latex rubber or synthetic sheath that is placed over the erect penis before coitus begins. It prevents pregnancy, because spermatozoa are deposited not in the vagina but in the tip of the

condom. To be effective, condoms must be applied before any penile-vulvar contact, because even pre-ejaculation fluid may contain some sperm.

Female Condoms

- Female condoms are latex sheaths made of polyurethane and prelubricated with a spermicide. The inner ring (closed end) covers the cervix, and the outer ring (open end) rests against the vaginal opening.

Diaphragm – is a circular rubber disk that is placed over the cervix before intercourse; it forms a barricade against the entrance of spermatozoa.

A diaphragm is prescribed and fitted initially by a health care provider to ensure a correct fit. Because the shape of the cervix changes with pregnancy, miscarriage, cervical surgery (D & C), or therapeutic abortion, a woman must return for a second fitting.

A diaphragm should be kept in place for at least 6 hours after coitus, because spermatozoa remain viable in the vagina for that duration. It may be left in place for as long as 24 hours. If it is left in the vagina longer than this, the stasis of fluid may cause cervical inflammation (erosion) or urethral irritation. After use, the diaphragm should be washed in mild soap and water, dries it gently and stores in its protective case. With this care, a diaphragm will last for 2 to 3 years.

Contraindications:

- Uterine abnormalities
- Cystocele or rectocele
- Acute cervicitis

- History of TSS (a staphylococcal infection introduced through the vagina)
- Allergy to rubber or spermicides
- History of recurrent UTIs

To prevent toxic shock syndrome (TSS) while using a diaphragm, women should be advised that it is important to do the following:

- Wash your hands thoroughly with soap and water before insertion or removal of diaphragm or cervical cap.
- Do not use either a diaphragm or a cervical cap during your menstrual period.
- Do not leave the diaphragm in place longer than 24 hours.
- Be aware of the symptoms of TSS, such as elevated temperature, diarrhea, vomiting, muscle aches, and a sunburn-like rash.
- If symptoms of TSS should occur, immediately remove the diaphragm and telephone your health care provider.

Cervical Cap – are made of soft rubber, shaped like a thimble, and fit snugly over the uterine cervix. Cervical caps, like diaphragms, must be fitted individually by a health care provider.

Many women cannot use cervical caps because their cervix is too short for the cap to fit properly. Caps tend to dislodge more readily than diaphragms during coitus. Cervical caps can remain in place for 48 hours because they do not put pressure on the vaginal walls or urethra.

Contraindications:

- An abnormally short or long cervix
- A previous abnormal Pap smear
- A history of TSS
- An allergy to latex or spermicide
- A history of PID, cervicitis, or papillomavirus infection
- A history of cervical cancer
- Undiagnosed vaginal bleeding

Spermicides - spermicidal agents cause the death of spermatozoa before they enter the cervix. These agents are not only actively spermicidal but also change the vaginal pH to a strong acid level, a condition not conducive to sperm survival.

The advantages of spermicides include the following:

- They may be purchased without a prescription
- When used in conjunction with another contraceptive, they increase the other method's effectiveness.
- Various preparations are available, including gels, creams, sponges, films, foams, and suppositories.
  - Gels or creams are inserted into the vagina before coitus with an applicator. The woman should do this no more than 1 hour before coitus for the most effective results.
  - Films are glycerin impregnated with a spermicidal agent that is folded and inserted vaginally. On contact with vaginal secretions or precoital penile emissions, the film dissolves and carbon dioxide foam forms to protect the cervix against invading spermatozoa.
  - Cocoa butter and glycerin-based vaginal suppositories filled with a spermicide. Inserted vaginally, these dissolve and release the spermicidal ingredients. Because it takes about 15 minutes for a suppository to dissolve, it must be inserted 15 minutes before coitus.
  - Sponges are foam-impregnated synthetic sponges that are inserted vaginally to block sperm access to the cervix. They should remain in place for 6 hours after intercourse to ensure sperm destruction.

Intrauterine Device (IUD) – is a small plastic objects that is inserted into the uterus through the vagina. The mechanism of action for the method is still not fully understood. Originally, it was thought that the presence of a foreign substance in the uterus interfered with the ability of an ovum to develop as it traversed the fallopian tube. Today, the IUD is thought to be preventing fertilization as well as creating a local sterile inflammatory condition that prevents implantation. When copper is added to the device,

sperm mobility appears to be affected. This decreases the possibility that sperm will successfully cross the uterine space and reaches the ovum.

3 common Types of IUD

1. Copper T380 (Paragard) – a T-shaped plastic device wound with copper
2. Progestasert
3. Mirena } which hold a drug reservoir of progesterone in the stem

The progesterone in the drug reservoir gradually diffuses into the uterus through the plastic; it both prevents endometrium proliferation and thickens cervical mucus. The Progestasert must be changed yearly, because the progesterone supply becomes depleted. The Mirena type is effective for 5 years. The Copper T380 is effective for 10 years.

The device is inserted before the client has had coitus after a menstrual flow; so that the health care provider can be assured that the woman is not pregnant at the time of insertion. The device is inserted in a collapse position, and then enlarged to its final phase in the uterus when the inserter is withdrawn.

Side Effects:

- Spotting or Uterine Cramping
- Higher risk for PID
- Heavier menstrual flow and dysmenorrhea
- Uterine infection

Contraindications:

- Multiple sexual partners

- Nulligravida
- History of PID
- With abnormally shaped uterus
- With severe dysmenorrhea, menorrhagia
- With history of ectopic pregnancy
- With valvular heart disease
- Adolescent

- Surgical Method

Vasectomy – a small incision is made on each side of the scrotum. The vas deferens at that point is then cut and tied, cauterized, or plugged, blocking the passage of spermatozoa. The procedure can be done under local anesthesia in an ambulatory setting. The man experiences a small amount of local pain afterward, which can be managed by taking a mild analgesic and applying ice to the site.

Spermatozoa that were present in the vas deferens at the time of surgery can remain viable for as long as 6 months. Therefore, although the man can resume sexual intercourse within 1 week, an additional birth control method should be used until two negative sperm reports have been obtained, usually requiring 10 to 20 ejaculations.

Tubal Ligation – the fallopian tubes are occluded by cautery, crushing, clamping or blocking and thereby preventing passage of both sperm and ova. The most common operation to achieve tubal ligation is laparoscopy. After a menstrual flow and before ovulation, an incision as small as 1 cm is made just under the woman's umbilicus with the woman under general or local anesthesia. A lighted laparoscope is inserted through the incision. Carbon dioxide is the pumped into the incision to lift the abdominal wall upward and out of the line of vision. The surgeon locates the fallopian tubes by viewing the field through the laparoscope. An electrical current to

coagulate tissue is then passed through the instrument for 3 to 5 seconds, or the tubes are clamped and cut or filled with a silicone gel to seal them.

Contraceptive Failure Rates

Type of Contraceptive	Ideal Failure Rate (%)	Typical Use Rate (%)
No method	85	85
Lactation, amenorrhea	---	---
Spermicides	15	29
Withdrawal	4	27
Periodic abstinence	---	25
Calendar	9	---
Ovulation method	3	---
Sympto-thermal	2	---
Cervical cap (multipara)	26	32
Cervical cap (nullipara)	9	16
Sponge (multipara)	20	32
Sponge (nullipara)	9	16
Diaphragm	6	16
Female condom	5	21
Male condom	2	15
Transdermal patch	0.3	8
Vaginal ring	0.3	8
IUG (Progesterone T)	1.5	2
IUD (Copper T)	0.6	0.8
IUD (Mirena)	0.1	0.1
COCs	0.3	8
Depo-Provera	0.3	3
Norplant	0.05	0.05
Female sterilization	0.5	0.5
Male sterilization	0.1	0.15