SAI SIMAGIRS



CENEBYT ZINDIEZ

Boloid Additional supplement

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- I BIOFOGK
- Viruses occupy a place between non living and living organisms, may they are
- connecting links in between.
- Aristotle, a Greek philosopher made BIOLOGY as science, while the word was coined

- With the invention of microscope, the dimensions of biology got completely changed Till middle ages it became a descriptive subject. by JEAN LAMARCK.

required to run vital functions such as breathing, heart beat, maintenance of body Even when a person is completely inactive like sleep. Some amount of energy is

Include chemical reactions which change the products of digestion reaching the cells

and uptake of materials. A small part of the energy is utilized to maintain body Organisms need energy for biosynthesis (contraction of muscles, nerve conduction

These reactions usually release energy. As such they are called as "exgergonic"

1. In this process complex organic compounds, cell components and cell products are

Complex organic substances are broken down in to simpler substances

Anabolism results in growth in terms of body weight and height. 2. Anabolic reactions need an input of energy -""enderginic" in nature.

- Life organization is featured by shape, form, size and composition.

Life is featured by metabolism-growth-reproduction

- Organs Tissues (compound) (əldmis) sənssiT
- Metabolism is featured by metabolic activities.
- ❖Locomotion and movement

Metabolic reactions are of 2 types

- Excretion *Respiration

4 Metabolism

♣Reproduction

- **₩**Nutrition

metabolism | 7

temperature.

6 🖾 Types of Metabolism

synthesized.

❖Anabolic reactions

reactions.

meilodeta 🔲 🗆

- Energy metabolism:

so that cells can utilize the same.

There are 3 types of metabolism, they are

Catabolic end products can not be transformed by the organism.

- Intermediate metabolism -

*Response to stimulus

- meilodataM 🛅 E Organ systems
- - Multi cellular
- Composition includes organisms made up of only cell- unicellular.
 - zmeinepro pnivil ni noitezinepro 🛅 s

 - living organisms include plants, animals and human beings.
 - Biology is the study of living organisms

generated during the period.

berson.

meilodstaM 🕮 8

· So also during nutrition is impaired

• This is one reason why weight is lost during fevers increases by 5% for each degree of temperature raise.

• The chemical reactions occur more rapidly at high temperatures , therefore BMR

Normal BMR during which 2,500 K.cal is needed for a normal laborer than sedentary

- The BMR is determined by the amount oxygen consumed by the individual and heat metabolism—BMR
 - Therefore the amount of minimum energy for the body to run comes under basal
 - fluids and conduction of nerve impulses.

noisivib II9O

- Every cell after maximum growth starts dividing in to daughter cells. (cell division or
- cell multiplication).
- This division happens in unicellular individuals resulting in reproduction, while in multi
- The cell division is of two types, The mitosis and meiosis. cellular individuals, it results in growth.
- The mitosis is known as equatorial division or somatic cell division occurs only in body
- cells where the chromosomal number of the cell remains constant. It occurs in the
- The meiosis is known as reductional division, during which the chromosomal number entire life of an individual.
- 2 Cell division cont..... is reduced to half.
- constant). sexual reproduction of an individual. (the chromosomal number of species is always The significance of meiosis is to keep the chromosomal number constant during
- -- Cell-- Growth (due to metabolism)---Inter phase---- Cell division. - Mitotic cell division:
- -The entire cell division consists of 2 phases
- Karyokinesis
- Cytokinesis.
- Karyokinesis is completed in 4 phases
- 1.Prophase.2.Metapahse. 3.Anaphase and 4.Telophase
- This type of cell division is necessary sexual reproduction. 3 The Cell division -Meiosis..
- In animals it occurs at gonads (testes& ovary).
- Cells of gonads after undergoing meiosis produce gametes or sex cells (eggs and
- During meiosis cell chromosomes duplicate the amount of DNA. Sperms).

- · Meiosis consists of 2 phases:
- Meiosis-I and Meiosis II.
- -The meiosis-I is reductional division (where the chromosomal number is reduced to
- While the Meiosis-II is mitotic
- (the reductional division).
- The Prophase-1: It consists of 4 phases, the Prophase-1, Metaphase-1, Anaphase-1 and Telophase-1.
- : səbets It is along phase containing important events and can be divided in the following
- Leptotene: Individual chromosomes each consisting sister chromatids diffuse and
- 2. Zygotene: Pairing of homologous chromosomes takes palace. thread like.
- 3. Pachytene: Crossing over and exchange of chromatin material takes place.
- Diplotene: Now homologous chromosomes separate.
- to poles, micro tubules are formed -- Diakinesis: Nucleoli and nuclear membrane disappears, centrioles duplicate &move
- 1- 9sedqetaM s Meiosis-1 Cont.....
- Tetrads are arranges in equatorial plane.
- Kinetochore (microtubular kinetochore) shortens, centromeres lie equatorially and : I- əsedqenA •

chromatids move towards poles.

- Telophase-1:
- The chromosomes arrive at poles, nuclear membrane appears and spindles
- At this stage it undergoes the CYTOKINESIS, resulting in to two cells having haploid disappears.
- chromosomes.
- After the completion of this stage it enters in to Meiosis II, which is nothing but

simple mitotic division

6 🔤 Cell cycle

7 CELL CYCLE

The cell cycle is regulated by two types of proteins

-- B) Kinases: Phosphorylating enzymes.. -A) Cyclins : G1 cyclins, S cyclins and M cyclins

The eukaryotic cell has the following phases.

• 1. G1 Phase (growth and preparation of chromosomes for replication)

• Events happen: Cytoplasmic elements like ribosomes, membrane bound

organells, subtrates and enzymes for DNA replication are syntheszed.

Z. S Phase (synthesis of DNA and duplication)

RNA replication and total content of DNA doubles.

• GZ Phase :(preparatory stage of cell)

• MM disappears, nucleolus disapperrs, increased nuclear volume, spindle fiber

proteins are formed.

M-Phase: Is the actual division phase, by mitosis completed in 4 stages.

In most of the repeatedly dividing cells the cell cycle is continuous.

But in cells like nerve cells, muscle cells, RBC the G1 phase permanently enters in to G

Also in some lymphocytes re entry of G1 phase takes place from G 0.

The cell cycle is regulated by genes. Cdc2 gene is responsible for cell division cycle,

Hartwell and Tin Hunt were awarded Nobel prize for the discovery of P53 gene and its It is found normally that P53 gene mutation leads to cancer. (Paul Nurse, Leland while P53 is the gene responsible for gene regulation.

role in cancers)

6

1 8

Normal cells usually have a controlled growth.

is regulated as well. Occasionally when they loose the regulation inhibition the contact In a tissue between cell to cell contact inhibition is maintained and their multiplication

is lost, leading to erratic divisions of cell leading to tumor cells, neoplastic cell to

malignant cells

10 Types of cell division

1 The Musculoskeletal system

- 1. Exoskeleton: Chitin in Arthropods (featured by moulting and restricting the
- growth)
- Z.Endoskeletion : soild and mineralised with cartilage and bone.
- -3. Hydrostatic skeleton: Fluids acting as support. Body fluids in invertebrates.
- There is a process by which the cartilage is replaced by bone up to some extent while

- in some vertebrates the entire skeleton is cartilagenous. (Sharks).
- Z [15] The skeleton and joints)cont c) Immovable. (Skull bones)
- Meuromuscular junctions: where the motor neurons are innervated to skeletal muscles
- needed. In some fishes muscles are modified in to electrical organs. Ex Electric eel can under the influence of neuro transmitter like Ach, for which the calcium ions are
- produce 100 watt current.
- 1. Axial skeletal system and 2. Appendicular skeletal system.

b) limb bones (fore and hind limbs)

11,12 do not attach to sternum as such they are called as false ribs.

• Consists of two components a) Girdles and

1-10 pair ribs are true ribs (attached to sternum)

Appendicular Skeletal system :

- It consists of two parts namely the SKULL(skeleton of the head) and VERTEBRAL

- It forms the axis of the body without which the can not maintain posture and life.

- 3 📺 The Skeletal system

- Skull parts
- Ear ossicles 6 bones
- Thorasic 12
- rampar 2

- Thorax Sternum 1 Coccyx 5

 - Sacral 5
- Cervical 7
- The vertebral column. (26)

Ribs 24 (12 pairs)

 Phalanges 14+14. Metacarpals 10+10 Carpals wrist bones 8+8 Radius and ulna 2 - Humerus-2 Fore limb bones

- - Hyoid –Lower jaw

- - 100
- - Face 14 bones
- Cranium (brain box)- 8 bones
- COLUMN (Back bone)

- - The Axial Skeletal system:
- The skeletal system is divided in to 2 parts
- Joints are assisted by Synovial apparatus and tendons and ligaments.

 - The joints are 3 types: a) Movable b) partly movable and
- The skeletal system is featured by joints due to which the parts are movable.

- Phalanges 14+14.
- Metatarsals (foot bones) 5+5
 - Tarsals (ankle bones) 7+7

- -Patela knee cap 2
- Tibia and Fibula 2+2
 - Femur 2
 - sənod dmil bniH * \bullet

1 Diet and Nutrition

*Human food is from various sources

deficiencies, syndromes, obesity and toxicity.

Mutrients are of 2 types

Macronutrients include carbohydrates, proteins and fats.

3 Diet and Nutrition cont

7 Cholesterol-cont to heart attack.

6 Cholesterol-cont between tissues.

5 Diet & Mutrition-Fats

Carbohydrates 4 Diet and Mutrition -- cont

Contain lots of minerals, vitamins, little amount of protein but no fats.

4. Starchy foods:

1. They are the energy yielding substances

The raised cholesterol circulates in blood

Urban consumption around 500-600 mg/day may be avoided.

3. Normal person may require 250-300gms per day.

2. Fructose and galactose are fruit sugars 1. Glucose is seen in blood and grapes

Daily requirement of fats per day is about 50- 70gms

İgm of fat provides nearly 9.2 k.cals of energy.

Fats are high energy nutrients

2. Consumed bulk to bulk

Contain fats proteins and vitamins.

5. Oilseeds and nuts:

Contain lot of carbohydrates, minerals and no fats.

Consists of all nutrients except Vit-C and iron.

Leafy vegetables and fruits:

Pulses are rich in proteins and small qty of carbohydrates but no minerals.

of arteries causing atherosclerosis, arteries loose the property of dilation. It may lead Excess cholesterol functionally can not be utilized, tends to get deposited in the walls Saturated fats from vegetables can increase cholesterol (coconut oil and dalda)

Fats act as nourishing material during energy crisis, also act as packing material in

• Essential fatty acids can't be synthesized by body and be obtained from vegetable

4. Examples of carbohydrates are starch (plant), glycogen(animal) sugar. 3. Excess of carbohydrates are converted in to glycogen then in to fat.

small qty of proteins. They many lack minerals and vitamins.

Form the staple food of humanity. They are rich in carbohydrates and contain very

1. Cereals: Light Types of food

Micronutrients include vitamins and minerals.

2Micronutrients

1. Macronutrients

Malnutrition is due to under nutrition, imbalanced nutrition normally leads to

*Human food contains nutrients.

- A small amount is present in blood and rest of the calcium is in ionic form in body concentrated in these structures)
- It goes in to formation of hard structures like bones and teeth. (90% of calcium is
 - - CALCIUM (Ca)

13 🖾 Hajor minerals--Cont

- 4. The minor minerals are Iron, Manganese, copper and Iodine
- .muisəngeM
- 3. THE MAJOR MINERALS: Calcium, phosphorous, Potassium, Sodium, chlorine and
- - Major minerals and minor minerals.
 - Basing on the requirement they are of two types
 - Minerals form 4% of the body weight.

12 🔤 Micronutrients -- Minerals

- Malnutrition of proteins leads to deficiency, syndromes, obesity and toxicity
- An average mammalian cell may contain as many as 30,000 types proteins.
- deficiency)
- From 1year -5 years it causes KWASIORKOR'S disorder.(only severe protein
- calorie deficiency.)
- In infants below one year, it causes MARASMUS (deficiency of proteins and total
 - · Protein deficiencies:

11 🔲 Proteins ---cont

largest proteins.

- Smallest protein is of insulin (made up of 50 amino acids) and enzymes are the
- antibodies and antigens.
- Collagen, silk, viruses, microtubules, toxins, hormones, actin &myosin, hemoglobin,
 - Examples of proteins:
 - 2nd class proteins are formed by the body through protein synthesis
- -1_{zc} class proteins : all amino acids are not synthesized in body and obtained through
 - · Proteins are classified in to

10 Diet & Mutrition-Proteins cont

- The daily requirement is about 55-70gms.
- 1 gm of protein can yield an energy of 5.6 k.cals of energy.
- All most all enzymes, hormones and structures are made up of proteins.
 - They are made up of amino acids.
 - They form the structural elements of the body.
- Proteins are required for the body building (building blocks of the body)
 - 9 Diet & Mutrition-Proteins
 - - HDF Ib/gm2£*
 - *200mg/dl Triglycerides
 - *130mg/dl- LDL
 - *200mg/dl- total cholesterol
 - Levels of cholesterol

8 Cholesterol Cont

- LDLs: Low density lipoproteins (Bad fats) causes plaque formation in arteries opesity
- Triglycerides: These are formed by the consumption of heavy starch leading to arteries to liver
- HDL s- High density lipoproteins (good cholesterol). These fats transfer LDLs from
 - Types of cholesterol

- Calcium regulates "ion transport" across cell membranes.
- block this heart diseases)
- 14 🖾 Major minerals Calcium cont

- and this is regulated by hormone calcitonin.
- Calcium is also necessary for blood coagulation.
- About 85% of phosphorous is present in skeletal tissues-12 gms/kg

The organic phosphorous is involved in biochemical reactions (cellular& ATP formation)

Inorganic phosphorous is widely distributed in food stuffs

bones, wood and clothes

- It is obtained from green vegetables
- It is required at the rate of 0.5gm/kg wt of body or 1-3 mg in serum
- Deficiency causes personality changes and muscular tremors

- and water metabolism.
- These ions are to be taken regularly as they can not be stored in body.

It regulates the absorption and utilization of calcium and phosphorous.

It synthesized by skin through ultraviolet radiation of the Sun (Sun shine Vitamin)

Deficiency causes-Xeropthalmia (dryning of eyes), Myctalopia (Might blindness) and

- *The vitamins are purely organic substances.
- *They are accessory food factors
- Vitamins are classified on the basis of their solubility in water.

It is stored in liver.

• It is sterol in nature

Xerosis (drying of Skin)

It an anti infecting vitamin.

Vit-A, Vit-D, Vit-E and Vit-K

G-NIMATIV ® OS

Cod and Shark liver oils are the best sources.

It exists as Ergosterol or Ergocalciferol.

It is a cholesterol derivative and requirement is 400 IU

Carrots, tomatoes, milk and yellow of egg are the chief sources.

- er fat soluble or fat soluble Vitamins
- They are:

Chemically it is called as retinol

- Water soluble and water insoluble (fat soluble)

• It is a carotene derivative and oil soluble

- - Accordingly, they are two types
- - *They are required in small quantities (IU).

A -NIMATTV •

- SNIMATIV 181
- They maintain osmotic pressure, acid base balance, regulation of nutrients in to cells
 - - These substances are seen in body fluids than in tissues.
 - 17 Mineral nutrition-sodium, potassium and chlorine.
 - - - It is needed in oxidative reactions
 - muisongeM -elaronim rojeM 🖾 🗗
 - If live stock graze phosphorous deficient grasses. Loose appetite and resort to eat
 - The deficiency is unlikely in humans.
 - - 15 Major minerals-Phosphorous
- Calcium levels drop down when calcium is depleted from bone leading to osteoporosis
 - Calcium in the serum is maintained by parathyroid hormone.
 - High concentration of calcium stimulates contraction of heart muscle. (beta blockers

Cont....

G-NIMATIV IS

- It may exists as activated dehydrocholesterol, found in natural foods. In human
- It is stable vitamin as it can be processed, caned, stored and cooked.

Chemically it is known as Tocopherol

It has an anti oxidant property. fish liver oils, meat and eggs are the chief sources. They are unsaturated alcohols

destruction of germinal epithelium of gonads. It is called as anti sterility vitamin. They are required for the normal growth of reproductive organs. Its deficiency causes

- It exists in two forms. The Phylloquinone- K1 and Farnoquinone-K2.
- The chief sources are alfaalfa leaves, dark green vegetables, tomatoes, peas,
- Fruits are poor sources of this vitamin.
- It is also synthesized by a commensal bacteria present in intestine and colon.
- The water soluble vitamins are B-complex and Vit-C

Dermatitis, - Diarrhea

26 🛄 VITAMIN-B3

SE SI VITAMIN BS

Its deficiency causes Pellegra.

• It is called as Niacin or Nicotinic acid.

It is required dose per day is 1.5 mg.

Milk, vegetables, rice polishing, liver and kidney.

 It is required in 15mg. The chief source is yeast.

fissures on tongue.

- Yeast, milk, vegetables and rice polish are best sources of this vitamin.
- nervous system, anxiety and mental confusion.

Its deficiency also causes heart enlargement and muscular dystrophy.

Pellegra is light sensitive, normally called as symptoms of 4ds like

It is deficiency causes sores in the mouth, on tongue and skin. Acute deficiency causes

Chemically it known as Riboflavin, also called as yellow enzyme. Some also call it as

- Its deficiency causes Beriberi, featured by lack of appetite, effects the peripheral

Its requirement per day will be 1 mg.

- - It is known chemically as Thiamine.
 - B 1 vitamin.
 - B- COMPLEX VITAMINS:

 - 24 WATER SOLUBLE VITAMINS

- It catalyses the synthesis of Prothrombin by liver.

 - cabbage, cauliflower, eggs and liver
- - 23 🖾 VITAMIN-K Its deficiency causes muscular dystrophy.
 - .Vitamin E prevents this reaction.
- Peroxidases are produced by the oxidation of fatty acids, which are toxic to body
- Plant oils like wheat germ, rice germ and cotton seed oils, lipids of green vegetables,
 - - 3 NIMATIV S
 - Deficiency causes Rickets in children and Osteomalacia in adults
 - beings it is synthesized from ultraviolet radiation.
 - - It exists as activated ergosterol or calciferol(chief plant source is Yeast) or D2

- Death - Dementia, and
- Z8-NIMATIV 🔲 72
- It is also known as "Anti dermatitic factor". This vitamin is also called as "Yeast factor"
- This vitamin is necessary for the formation of Co-enzyme A (it is concerned with the
- Normally milk and milk products due to pigmentation of skin and hair-Anti graying factor)
- high tryptophan content prevent this deficiency
- · Meat and Royal jelly are chief sources Whole grains in milling lose this vitamin.
- 28 SITAMIN- B6
- It is chemically known as pyridoxine.
- This vitamin converts glutamic acid to Gamma Amino Butryic Acid (GABA), which is It is obtained from cereals, grains, yeast (baker's yeast).
- Its deficiency occurs normally in mal absorption and alcoholism. essential for the functioning of nervous system.
- The deficiencies are featured by nervous disturbances, convolutions, insomnia,
- vomiting and diarrhea
- **∇8** -NIMATIV 🖾 es
- · It is also known as vitamin H.
- It is called as Biotin.
- It is required in 150-300mg per day.
- Intestinal bacteria can synthesize this vitamin.
- Liver, kidney, egg yellow, milk, molasses, nuts and cereals.
- Its deficiency causes anorexia, muscular pains, loss of hair and cell growth.
- **68 NIMATIV** © 05
- It is also called as Follic acid.
- Yeast is its chief source.
- Since it is obtained from leaves(follium), it called as follic acid. It is also available from liver, mushrooms, kidney, green leaves and grasses.
- Its deficiency causes anemia and stunted growth.
- It is also required in nucleotide biosynthesis.
- It is chemically called as cynocoblamin. Coblat containing vitamin. S18 -NIMATIV BIS
- This is the only vitamin which is of not in origin of higher plants.
- However it is synthesized by bacteria in animal intestine.
- mutton, It is seen heavily in animal products like cheese, eggs, muscles, kidney, liver and
- HCL is required for its absorption in intestine which is called as Intrensic factor
- Its deficiency causes perinaceous anaemia (Nutritional) and megaloblastic anaemia (produced from parietal cells).
- the later. (inhibition of DMA synthesis in RBC) alcohol and chemotherapies are responsible for
- It is known as Linoleiac acid. **4-NIMATIV** SE

- It is obtained from vegetable oils
- It is mostly used in Soap industry as emulsifier. Example is linseed oil mostly with unknown function.

04\Jul\2013

also known to promote cysticfibrisis and dermatitis

9- NIMATIV EE

- It is related to Flavanone and hesperdines.
- It is available from fruits.
- Its deficiency causes loosing of resistance power to capillaries.
- 34 🗐 VITAMIN-C
- Chemically this vitamin is known as ascorbic acid..
 This is a water soluble vitamin.
- The chief sources are lemons, oranges and green chilies.
- Its deficiency causes scurvy. (bleeding through gums).
- It has varied functions like
- It acts as maintainer of intracellular substance, integration of capillaries, collagen
- synthesis

 It dissolves excessive cholesterol in blood.
- It is actively associated with wound healing.
- Reduces the coagulation of blood.
- _

It enhances the absorption of iron from intestine. LINUS CARL PAULING advocated the preventive properties of Vit-C against common

cold . It can also act as preventive agent against cancer.

Storage of Vit-C is impaired due to smoking.

This vitamin can be easily destroyrd by cooking, heating and mincing.

1 DISEASES AND DISORDERS

- Both disease and disorder cause lot of harm to human beings, animals and plants.
- There is difference between the disease and disorder.
- physiological or genetic disturbance. Any harm caused by parasite is known as disease while disorder is caused by
- For example Malarial fever is a disease (as it is caused by Plasmodium parasite).

2 Biseases and disorders --- cont Diabetes is a disorder (genetic fault)

- effects on hosts and host parasite relationship is one of the associations of living. *The study of parasites is known as parasitology. A parasite always cause undesirable
- .YDOJOHTA9 Hosts are always at loss. The study of harm caused by parasite in host is known as
- * The science dealing with the CAUSES of diseases is known as ETIOLOGY.
- The forecasting the disease is known as PROGNOSIS.

3 DISEASE AND DISORDERS cont---

- Disease and disorders are of 3 types
- 1. Congenital disorders
- a) hereditary congenital disease (syndromes)
- infections, Rubella infections and Herpes) b) Non hereditary congenital disease (teretogenic diseases: Ex. Toxoplasmosis
- Z. Acquired diseases.
- deposited as crystals featured by painful joints) -3. Metabolic disorders. : Ex Gout disorder (uric acid levels in blood will be very high,

← □ METABOLIC DISORDERS cont---

- Arthritis : It known as inflammation of joints, which is of two types
- -b) Rheumatoid arthritis: Inflammation of joints, swelling and muscular fatigue. - a) Degenerative arthritis: Stiffness of movable joints, pain occurring in motion
- SEABSIO OERIUDA 🖾
- communicable diseases are often infectious diseases while the other like allergies and They are normally either communicable diseases or non communicable diseases. The
- Communicable diseases are due to pathogens or parasites which are different
- varieties like
- .səsuriV.1 -
- -2 Bacteria.
- 3 Protozoa.
- 'snbun∃ + -
- 5 helminthes
- 6 💹 VIRAL DISEASES
- Varicella virus (Chickenpox virus. DNA)
- Variola virus (Smallpox virus.DNA)
- Poliomyelitis (polio virus, atrophy of muscles. RNA)
- Orthomyxovirus (Influenza virus.RMA) Hepatitis virus (A,B,C,D. types RNA)
- Herpes simplex (herpes virus)
- HTLV 111 (Human T cell Leukemia Virus)
- The Aids virus.
- VIRAL DISEASES OF ANIMALS & PLANTS
- Ranikete disease in poultry, cause avain pneumonia.
- Rinderpest disease causes cattle plauge.

16 THELMINTHS-- Nematodes

Echinococcus granulosus the dog tape worm

Taenis saginata beef tape worm

Taenis solium Porktape worm

Schistosoma haematobium blood fluke

Paragonimus Lung fluke

Fasciola hepatica Liver fluke.

15 M HELMINTH PARASITES TREMATODES & CESTODES

- Entamoeba hystolytica cause amoebiasis.
 - Leishmania donovani- Kalazar fever
- Leishmania tropica- cause oriental sore. Delhiboil.
- Trypanosoma gambiance. Cause african sleeping sickness

14 🔛 Protozoan disease cont--

- P. ovale- rare malaria fever in the nights. Sometimes fever continuous.
- P.falciparum faltal malaria or malignant malaria fever every40-48 hrs)
 - P.malariae-Quartan malaria- fever every 72 hrs.
 - Plasmodium vivax Benign, tertian malaria(at every 48 hrs fever)

easessib neozotorq 🖭 🗉

Collictotrichium sp cause red rot in sugar cane.

Clavis sp.-Ergot disease in millets.

Cercospora – cause Tikka disease in ground nut

Cause rust diseases. Puccinia sp Black, yellow and brown rusts,

Pythium –foot rot

Phytopthera late blight in potato.

12 TI PLANT FUNGAL DISEASES

- Cladosporium and monosporium ring worms cause dermal leisons.
 - Trychophyton causes Athlete's foot
 - Mycetoma cause disease called Madura foot

ri 🛄 Fungal diseases

- Corney bacterium cause a disease called as ring rot in potato.
- Xanthomonas orizae cause paddyblight (leaves develop spots-blight)

10 Plant Bacterial diseases

- Diplococcus ganorrhoeae :Cause venerial disease featured by painless ulcers.
- Haemophillus perturis: cause whooping cough (12-13 explosive cough is whoop) in immuno deficient persons.
- Mycobacterium leprae: cause ulcers, nodules and deformation of fingers. Occurs only
 - Vibrio cholera : the cholera causing bacterium.
 - Salmonella typhi : cause typhoid (food, feces and flies. Confirmative test is VIDOL.

9 BACTERIAL DISEASES cont--

- Clostridium tetani : tetanus bacteria, in soil
- Yersinia pestis, the plague bacterium.(rat flees) Calmette Gurine])
- Mycobacterium tuberculae (Tuberculosis, BCG is given as preventive vaccine.[Bacillus
 - Diplococcus pneumoniae (droplet infection, cause pneumonia)
 - Steptococcus sp (cause throat inflammation, fever and cough)

8 BACTERIAL DISEASES

- TMV (Tobacco Mosaic Virus) causes damage in Tobacco and tomato.
 - Foot and mouth disease in cattle
 - Vaccinia virus causes cowpox

- Ascaris lumbricoides round worm.
- Ancylostoma duodenale hook worm
- Enterobius vermicularis Pin worm.

- Wuchereriabancrofti Filarial worm.
- Loa loa the eye worm.

- Mania (opposite to depression, abnormal elevated moods)
- Schizophrenia The split brain mentality
- Epilepsy Uncontrollable increased neural activity by some parts of brain).

accumulated in liver, spleen and bone marrow.(enzyme replacement therapy • Gaucher's syndrome : Due to gene mutation an enzyme glucocerebrosidase, fat gets

- Klinfelter's, Polygladular syndrome, (Endocrine glands depresses). Sickle cell Some genetic disorders are called as Syndromes Ex Parkinson's, Allhzmer"s, Down's,
- anaemia, Haemophilia, DiGeorge syndrome (deletion of 22 nd chromosome Thymus
- - Muscular atrophy, Myopia and Mysthenia gravis.
- They are usually genetic in origin. Disorder may appear slowly along with age. Ex
 - 18 🛅 Degenerative disorders

promising).

19 Syndromes ---cont effected)

Alkaptoneuria Patient's urine is black on exposure to air.

- Hysteria (severe anxiety, lack of control of emotions and out bursts)
 - Phobias

 - Neurosis

 - Depression
 - 17 Psychiatric disorders.
 - · Dracunculus medinensis Madina worm

semetic disorders Syndromes

- Any change in the chromosome number or gene mutations result in disorders, which are heritable.
- The following are few such disorders.
 Color blindness. This is disorder in which the effected person will not be able to
- differentiate the colors like green and red. This condition mostly appears in recessive individuals. And also it is a sex linked trait.

 Down's syndrome: it is also called as Mongolism. It is a congenital abnormality in human beings due to TRISOMY of chromosome 21 (occurs as triplicate). As such the affected individuals have 47 chromosomes, individuals showing retarded physical
- sug wental symptoms. SYNDROMESCont
- Klinfelter's syndrome : It is an abnormality in males, who are always sterile due to improper development of testis. It is always due to an additional X chromosome (
- XXY)Turner's syndrome : This may effect the females who will be phenotypically female, with rudimentary mammary glands and sex organs. This condition is basically due to
- lack of an X chromosome (Xo instead of XX).

 Hemophilia : It is popularly called as bleeders disease. This due to a recessive gene, mostly expressed in males. It is an example for sex linked inheritence.
- Genetic disorders. Cont...
 Phenyle ketoneuria: Due to this disorder serious brain damage is caused in infants.
- Such children fail to metabolize phenyle pyruvic acid, whose accumulation causes
- serious brain damage. Even if they survive they will be idiots.

 Sickle cell anemia: This is mainly due to an abnormality caused in the hemoglobin molecule due to a recessive gene and homozygous condition, resulting the sickling of
- Thalassemia: This condition is also called as Cooley's anemia, mostly occurring in infants due to synthesis abnormal of hemoglobin, leading to severe anemia.

THE Brood

- The blood is a fluid connective tissue.
- In human beings, it forms about 8% of the body weight. 5-6 lit in an person

- averagely weighing 70 kgs.
- It has 2 components the plasma and corpuscles.
- The plasma is pale yellow transparent fluid of blood maintaining a volume of 45%.
- The blood always maintains a pH of 7.35 (weak alkaline), pH below 7 is fatal. While the corpuscles are of 55%.
- The formation of blood from bone marrow is known as haemopoisis.

Z 🔯 The Blood cont.....

- The corpuscles of blood are of 3 types namely
- they settle at a place for a long time. than others. The RBC undergoes a condition called Rouleax (piling or stagnation), if spleen by apoptosis. The people living in high altitudes are known to have more RBC RBC are known to have life of 120 days after that they arte being destroyed in contain 14 gms and 12 gms of hemoglobin in males and females respectively. The hemoglobin, due to which the blood's color is red. Every 100 ml of blood should and soon lose the nucleus and become de nucleated. They are known to contain copper, nicotinic acid and riboflavin) by stem cells. The RBC are initially nucleated formed from bone marrow, by a process called erythropoisis(require B12 vit, mm in males while in females, it will be 4-5.5 million per/cu/ mm. The RBC are - Erythrocytes: The red blood cells are numerous in number, 5-5.5 million per/cu/
- The blood undergoes a process called agglutination .It occurs on account of un 3 The Blood cont.....
- matched blood (clumping of RBC).
- Erythrocyte development depends on feedback mechanism by a hormone called
- After the life span of RBCs, are being destroyed in spleen in to protein (globulin) erythropoietin, secreted by kidney.
- which is absorbed back in to circulation(in the form of amino acids) and haeme is
- converted into biliviridin is changed to biliruben in liver and excreted as bile pigment.
- De fibrination of plasma by clotting results in clear yellow fluid called serum. THE SERUM :
- LYMPH: Colorless fluid formed of filtration of all colloidal substances, salts and water.
- Lymph flows from blood capillaries in to tissue spaces then in to veins.
- It normally regarded as middle man between blood and tissues.
- It also maintains the turgor between intercellular spaces. It returns all blood proteins from tissue fluids to blood.
- The main composition of lymph is plasma with less fibrinogen, without RBC & WBC,
- more digested food stuffs and metabolic wastes.
- s The Lymphatic system

4 The Blood con....

- The system consists of
- B) Lymph nodes (Lymphocytes and macrophages) - A) Lymphatic vessels
- −C) Lymphoid organs (Bone marrow, Spleen & Thymus)
- GENRAL DEFENSES IN BODY;
- I. Innate immunity: General defenses are maintained by barriers, inflammation, The defenses are associated immune system, which is of 2 types;

killed and 2. antibody mediated It is of two types 1. T-cell mediated (mostly fungi, bacteria, virus and protozoa are

e 🗀 Plueripotent Stem cells

• In bone marrow the stem cells, initially for a short time are totipotent and become

- Such plueripotent stem cells are differentiated in to two types of blood components. plueripotent soon.
- A) Lymphoid progenitors' and
- B) Myeloid progenitors.

These are large cells with very large nucleus and scanty cytoplasm involved in scar LYMPHOID PROGENITORS:

formation, wound healing and immunity.

processed in Thymus gland and bone marrow respectively. They get differentiated in to T lymphoid cells and B lymphoid cells, which are

function of them) The thymus cells are further differentiated in to Th, Ts and Tc cells (depending on the

The B -lymphocytes

which I turn produces specific anti bodies or immuno globulins. • The lymphoid cells migrate to bone marrow and become plasma cell on stimulation

The following are types of Immuno globulins:

- 1.1mmmunoglobulin A Ig A(secretory antibodies,pass through placenta and provide

-2. Immunoglobulin G, Ig G immunity to child up to 1 year)

-3. Immunoglobulin E, Ig E

¬4. Immunoglobulin D IgD

M pI M niludolponummI.2 -

- They are strategically placed in lymph nodes, spleen. Peyers'patches and tonsils.
- WAELOID PROGENETORS:
- leucoblasts, platelet s and Mega karyocyte. Soon after they leave bone marrow, they get differentiated in to Erythroblasts,
- formation of WBC is known as leucopoiesis. (leucopenia-below 6000 /cu/mm, • The formation of RBC from bone marrow is known as erythropoisis. While the

leucocytosis- over 8000-12000 /cu/mm

β Iμφ Γencocλτes -τλbes

3 8

- -1. Neutrophils: They form about 70% of the WBC, involved in pus formation and The leucocytes(about 75% of total granulocytes) are differentiated in to the following.
- 2. Basophiles : Large cells with horse shoe shaped nucleus and normally increase in sanitation of the tissues. They are featured by 3 lobed nucleus.
- 3. Eosinophils: They are also called as acidophil. They have the characteristic shape viral infections, otherwise they are of 1% in normal cases.
- infections than being 4% by normal value. of the nucleus as dumb bell shape. Their increase in their number during parasitic
- dendrocytes later become macrophages (increase in tuberculosis and help as -4. Monocytes: Large cells with round nucleus, can give rise to MAST cells and

scavengers)

7

Proteins

- thing from activation of essential chemical reactions to carrying messages between Virtually every process and product in living cells depends on proteins. They do every
- materials.
- Though proteins are diverse in function, are yet made from only 20 amino acids (
- The enzymes are the biggest single class of proteins. made up of few hundred to thousand amino acids).

• The information transcribed/ copied over m RNA from DNA strand-This process is

During the protein synthesis DNA acts as template, due to which a polypeptide is

information for protein synthesis by transcribing mRNA(transcription) and other types L'Crick (1958) One way flow of information suggested that DNA transmits the genetic

A sequence of 3 nitrogenous bases of DNA codes for specific amino acid of polypeptide

order, which is determined by the sequence of nucleotides in the polynucleotide chain The protein synthesis, includes arrangement of these amino acids in a sequential

Only 20 amino acids are biologically important in the formation of proteins, which are

 Chemically, the protein are polymers of amino acids and these are linked together in • All the proteins which are required by the cell are synthesized by the cell itself.

These RMA s translate the nucleotide sequence in to amino acids (translation).

This is known as one way flow of information or central dogma.

- Proteins structure and classification
- The proteins are classified in to 2 types
- The 2 nd class of proteins are made of amino acids synthesized from body. Such proteins should be obtained in to body through diet.
- 1. Structural proteins (collagen, silk, virus and microtubules)
- 4. Contractile proteins (actin and myosin) 3. Regulatory proteins (hormones)
- Transport proteins: (hemoglobin and myoglobin)
- Storage proteins (white of the egg and seeds of plants)
- Protective proteins (Antibodies and compliment)

linear fashion forming the polypeptide chain.

- Enzymes (trypsin, protease and lipase)

 Kwashiorkor (1 year to 5 years). Marasmus (infants below one year)

synthesized and released.

6 PROTEIN SYNTHESIS....cont

of DNA.

innumerable.

4 🖾 PTOTEIN SYNTHESIS

• Protein deficiencies:

chain, which is known as triplet code

- Membrane proteins (antigens)

- - - 3 Types of proteins

- 2.Toxins: Diptheria
- - Biological functions of proteins
- that are synthesized in the body by protein synthesis
- The 1st class proteins: Proteins that are made up of amino acids which are not

 - On an average mammalian cell about 3000 enzymes.
- simplest protein can contain nearly 50 amino acids while the complex proteins are
- cells, to fight infections, to make cell membranes, muscles, blood and other structural

called as transcription (requires an enzyme-RNA polymerase)

PROTEIN SYNTHESIS Cont.....

- The gene from which mRNA is transcribed is known as CISTRON (structural part of the
- gene).

 Now the coded mRNA forms a polypeptide through decoding, which is known as
- translation.

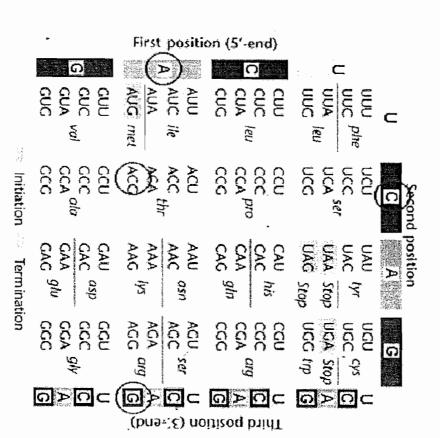
 The process of translation involves 3 types of RNAs.
- mRNA(messenger RNA), r RNA (ribosomal RNA),t RNA (transfer RNA), enzymes and protein factors

GENETIC CODE

- The genetic code is a triplet code
- The sequence of bases in mRNA decide the place of amino acid in the protein chain
- Few variations exist between standard and mitochondrial codons (UGA for example is a standard termination codon but in mitochondria it codes for Tryptophan)
- Initiation codon; AUG
- Termination codons: UAA, UGA, UAG
- To read the codon 5'-ACG-3'

 Read A from the left-hand side;.

 Read C across the top and Read G as the fourth line in that block, on the right-hand side of the table



- The nucleic acids are of 2 types.
- They are the DNA and RNA.
- It is seen in side the nucleus of all cells except adult mammalian RBC and plant virus. - The DNA : Deoxyribonucleic acid.
- In bacteriophages and virus the DNA exists as single molecule enclosed in a protein
- In bacteria, mitochondria and plastids of eukaryotic cells, the DNA is out side the in
- cytoplasm and circular
- It exists in double helical structure. It is the basic constituent of living material
- It is involved in protein synthesis

2 Deoxyribonucleic acid--- DNA

- Being a nucleic acid it is made up of large number of nucleotides as such it is a
- Each nucleotide consists of 3 chemical substances namely, polynucleotide chain.
- I. Phosphorous/ phosphoric acid
- while in 2nd strand it is attached to 5th carbon atom. This makes strands in DNA −2. Sugar (deoxyribose pentose sugar, 3rd carbon attached to base in one strand
- antiparallel)
- 3. Bases (Nitrogen bases)
- The bases are of ⁴ types
- Adenine
- Thymine
- Cytosine and
- Guanine.

3 The DNA Bases cont....

- The four nitrogen bases are separated in to 2 categories.
- The Purines: These are two ringed nitrogen compounds
- (2) enineu2 bns (A) eninebA –
- Thymine(T). - The Pyrimidines: These are single ringed nitrogen compounds Cytosine(C) and
- MOLAR RATIO OF NITROGEN BASES IN DNA.
- It is also called as Chargaff's base ratio. It is featured by
- amounts in a DNA molecule i) regardless of the source, the purine and pyrimidine component occur in equal
- Cytosine(C) equivalent to that of Guanine(G). ii) The amount of adenine (A) sine equivalent to the amount of Thymine(T) and
- iii) A=T and C triple bond G.

5 M Replication b P

- when a cell divides, it must replicate the DNA in its genome so that the two daughter Cell division is essential for an organism to grow.
- cells have the same genetic information as their parent.
- The double-stranded structure of DNA provides a simple mechanism for DNA.
- <u>replication</u>.
- <u>DNA</u> sequence is recreated by an <u>enzyme</u> called <u>DNA polymerase</u>. Here, the two strands are separated and then each strand's complementary.

- complementary base pairing, and bonding it onto the original strand. This enzyme makes the complementary strand by finding the correct base through
- As DNA polymerases can only extend a DNA strand in a 5' to 3' direction, different

cell ends up with a perfect copy of its DNA the base on the old strand dictates which base appears on the new strand, and the mechanisms are used to copy the antiparallel strands of the double helix. In this way,

7 M DNA Replication

8 PLASMID NOMINICLATURE

- The bacteria and prokaryotes are known to contain DNA not only in nucleus, but also
- Such DNA out side the nucleus is known as extra chromosomal DNA or Plasmids (4in cytoplasm.
- For example pBR 322 (one plasmid). T5Kp2)
- In which p.... stands for plasmid
- BR (Boulevard & Rodrideuz) stands for Scientist who discovered it
- 322 refers to papers of plasmid description.

9 🖾 RIBONUCLEIC ACIDRNA

- It seen in the cytoplasm and nucleolus. It may occur freely in cytoplasm as well in It is one of the nucleic acids, unlike DNA it is single stranded.
- ribosome.
- Each strand is made up of nucleotides. • In some it can occur as heredity material
- Each nucleotide consists of sugar, which is of ribose type, phosphorous group and
- nitrogen bases.
- The bases are similar to DNA bases expect the presence of Uracil instead of thymine.
- The RNA is involved in the protein synthesis.

10 M Structure cont......

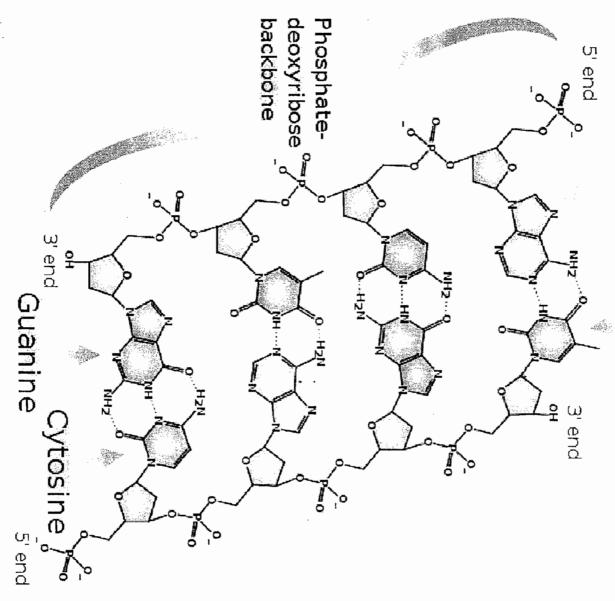
- RNA are non genetic. In all other organisms, where DNA is the hereditary material, the different types of
- In general 3 types of RNA have been distinguished. The non genetic RNA is usually synthesized from DNA template.
- & Monod 1961.It acts as template for protein synthesis) strand of DNA, carries genetic information to cytoplasm in protein synthesis, Jacob -- I. Messenger RNA or nuclear RNA--- m RNA (synthesized from complementary
- Z. Ribosomal RNA ---r RNA (in eukaryotes they are designated as 285, 185 and 55)
- -3. Transfer RNA ---t RNA (carry amino acids)

DNA Replication

template for the next strand. Bases are matched to synthesize the new partner strands. DNA replication. The double helix is unwound and each strand acts as a

Thymine

Adenine



1 MEUROTRANSMITTERS

2 MEUROTRANSMITTERS- con

- \bullet * The following are general neurotransmitters.

- GABA: Gamma Amino Butric acid. It is inhibitory in action and antagonistic to
- glutamate.

• Caffine, nicotine, heroin and Cocanie also act as neurotransmitters.

Serotonins: They normally act as antidepressants

• Morephrine: Involved in arousal of an individual.

- * Glutamate neurotransmitter: Excitory in action.

 $\bullet~*$ Acetylecholine : Normal neurotransmitters • * Dopamines : Normal neurotransmitters.

I SENES

- The term " GENE" was introduced by JOHANNSEN in (1909).
- The gene is a Mendelian factor or called as trait.
- SUTTON proposed the concept of genes
- MORGAN and BRIDGES have elaborated it.
- The concepts of genes are as follows:
- The genes determine physical as well as physiological characters that are transmitted
- The genes are situated on chromosomes. from one generation to another off springs.
- The number of genes of any individual are numerous, yet located on fixed number of
- THE GENES CONT.... chromosomes, characteristic of species.

The place occupied by a gene on a chromosome is called as locus and the genes are

- A single gene may occur in several forms with several functional traits, normally the arranged in linear manner
- alleles Ex Multiple alleles (Blood groups and corneal color of the eye). gene carries two alleles. Some genes mutate more than once and have more than two
- The genes replicate accurately during reproduction.
- Each gene is capable of synthesizing a particular protein (One gene one enzyme
- hypothesis: BEADLE and TATUM).
- · According to recent information the gene is nothing but a segment of DNA.

3 MOLECULAR STRUCTURE

- genetic phenomenon. According to him the following are units of gene. BENZER has coined a new term to denote the relationship between DNA mol and
- 1. RECON: It is the smallest unit of DNA, capable of undergoing crossing over and
- -2. MUTON: A small unit of DNA capable of undergoing mutation. (a change in the recombination.
- triplet will modify the message carried by codon.)
- capable of synthesizing a polypeptide chain of an enzyme. -3. CISTRON :It is the functional unit of the gene and it is a gene in real sense. It
- S. OPERON : It is the combination of operator, regulator and inhibitory genes. It has -4.COMPLON: It is an unit of complementation.
- an additive or suprssor effects.

• 6. REPLICON: It is a unit of replication. Several replications constitute a Chromosome. 4 Molecular structure cont...

- GENE REGULATION:
- All structural genes do not function at the same time, some of them function at a later
- A) Regulator genes. stage and therefore they are under regulation. They are
- B) Operator genes.
- C) Promotor genes.
- -The above genes regulate the function of structural genes coding for a particular D) Suppressor genes.
- enzymes or polypeptides.

STEM CELLS

- * Found in almost all multicellular organisms.
- .enoisivib * These cells renew themselves by mitotic
- other types of cells in the body. * They are capable of differentiating in to many
- *The stem-cell research has started in 1960 by Canadian Scientists Ernest A Mc

STEM CELLS Cont... Moulloch & E James.

- * Mammalian stem cells are of 2 types
- 1 Embryonic stem cells (found in blastocyst)
- Z Adult stem cells (found in all adult tissues).
- The stem cells in developing embryo differentiates in to all of the embryonic tissue
- (sbeciglized).
- * In adults the stem cells and progenitor cells act as repair system in body. Eg Blood,
- skin ect.
- * Stem cells can be grown and transformed in to specialized cells through cell

3 Properties of stem cells cultures.

- They are self renewable, go through numerous cycles of cell division.
- High plasticity is the characteristic feature of stem cells.
- Great potency (capacity to differentiate in to specialized cell types).
- Basing on the potency they are classified as
- TOTTPOTENT
- PLURIPOTENT
- MOLTIPOTENT
- UNIPOTENT

Properties of stem cells

- * LOTIPOTENT
- Cells in zygote (first few divisions) are tote potent.
- They are differentiated in to embryonic stem cells and extra embryonic stem cells.
- PLURIPOTENT
- Are the descendents of toti potent cells, further differentiate in to 3 germ layers.
- MULTIPOTENT
- UNIPOTENT Stem cells producing only closely related family of cells-Haemopoitic tissues.
- Stem cells can produce only one type of cells, but have the potency of self renewal-
- Muscle stem cells.
- EMBYONIC STEM CELLS (ESC)
- * From these cells, through ES cell lines, cell cultures are obtained

- Bone marrow transplantation is an exception.
 - It is still in the experimental stage.
- It exists as a an ultimate hope though it is expensive, with an average success rate
- of human beings in future. The stem cell treatments in the medical researches are going to revolutionize the fate
- 8 PRESENT STATUS OF STEM CELL TREATMENTS
- They do not posses any controversy as they are generated by the body continuously Most adult stem cells are lineage restricted by their tissue origin
- The adult stem cells are of two types, the somatic stem cells and germ line stem cells.

than itself It should have the ability to divide and the ability to create a cell more differentiated

What is an adult stem cell in an individual?

A PDULT STEM CELLS

9

- Cell surface antigens are mostly used to identify human embryonic stem cells factors and cell surface proteins.
- Human embryonic stem cells are also defined by the presence several transcription
 - Human ES cells grown on gelatin require human fibroblast growth factor (FBGF)
- Mouse ES cells are grown on layers of gelatin and require Leukemia inhibitory factor
 - undifferentiated condition. Embryonic stem cells require different environment for the maintenance of

 - * ES cells do not contribute to placenta or extra embryonic membranes
 - 50-150 cells which are pluripotent, give rise to 3 germ layres 4-5 days old embryo in human being contains
- blastocyst. (Morula stage of embryo) * These are derived from epiblast tissue of

 New technologies are poring in the field of adult and embryonic stem cells research **3** 6

- damage, spinal cord injuries and type-I diabetes • It is showing great deal of success in the treatments of disorders like cancer, muscle
- Adult stem cells have an advantage over embryonic stem cells in avoiding rejection
- They are socially and scientifically accepted.

10 POTENTIAL TREATMENTS

- They are used in the following treatments like
- -a) Brain damage
- b) Heart damage
- -c) Cancer
- -d) Haemopoitic
- -e) Spinal cord injury
- -f) Baldness
- g) Deafness
- -h) Blindness and vision impairment

BRAIN DAMAGE 11 STEM CELL TREATMENT... cont

- Many neurons and oligodendrocytes are lost due to brain stroke.
- to replace / renew the neural structures. The adult healthy human brain contain certain neuronal stem cells, which are needed
- These cells function in different way in adult stage, maintain the function of olfaction.
- Now new drugs are directed on these cells, which differentiate for neural replacement.

12 STEM CELLS IN THE TRATMENT OF CANCER

- Injecting neural adult stem cells in to the cancerous tumors of brain in rats- tumors
- In Harvard Medical school, the stem cells were introduced in to the intracranial tumors started regressing.
- produced cytosine deaminase an enzyme that converts a non-toxic pro-drug into a of rodents. With in days they have penetrated in to cancer area of tumor and
- As a result 80-85% of tumor got receded. chemotheraputic agent .
- New researches are concentrating on inhibition of cancer than to cure it
- 13 STEM CELLS IN THE TREATMENT OF SPINAL CORD.
- walk. umbilical cord to a patient suffering from spinal injury. Today the patient is able to Korean researchers (2004) have transplanted multipotent adult stem cells from
- messages from the <u>brain</u> to the <u>spinal cord</u>. The newly generated motor neurons into spinal motor neuron cells, the cell type that, in the human body, transmits <u>stem cells</u> into neural stem cells, then into the beginnings of <u>motor neurons</u> and finally * Researchers at the <u>University</u> of <u>Wisconsin-Madison</u> differentiated human <u>blastocyst</u>
- exhibited electrical activity, the signature action of <u>neurons</u>.
- The stem cells introduced in to the damaged parts of cardiac muscle, generated new 14 STEM CELLS IN HEART TREATMENT
- Several clinical trials have been proved to be highly successful and the process is
- commercialized.
- Dr. <u>Luc Douay</u> at the <u>University of Paris</u> developed a method to produce large 15 STEM CELL TREATMENT IN HAEMATOPOIESIS (Blood cell formation)
- The precursor red blood cells, called hematopoietic stem cells, are grown together numbers of red blood cells.
- the stem cells to complete terminal differentiation into red blood cells. natural site of red blood cell growth. <u>Erythropoietin,</u> a <u>growth factor</u>, is added, coaxing stromal cells creating an environment that mimics the conditions of bone marrow, the
- 16 🖾 STEM CELL THERAPY IN BALDSNESS * It has potential benefits in gene therapy and blood transfusion.
- Hair follicle contain stem cells.
- hair cloning Research on this area will help to control the baldness through hair manipulation or
- Cloning Mears Reality as Baldness Cure (WebMD November 2004) respond to these signals by regenerating and once again making healthy hair. Hair to nearby follicle cells which have shrunk during the aging process, which in turn treatments may be able to simply signal follicle stem cells to give off chemical signals multiplying them in cultures, and implanting the new follicles into the scalp. Later This treatment is expected to work through taking stem cells from existing follicles,

17 STEM CELLS IN THE TREATMENT OF DEAFNESS

- There has been success in regrowing cochlea hair cells with the use of stem cells.
- \bullet Various kinds of deafness can be successfully treated including some inborn errors. 18 $\fbox{\sc of}$ STEM CELL TREATMENT IN BLINDNESS & VISION IMPAIRMENT
- barts of the eyes

 Researchers have successfully transplanted the retinal stem cells in to the damaged
- Using embryonic stem cells, scientiests are able to grow thin sheet of totipotent stem cells in the laboratory.
- When these sheets are transplanted on damaged retina, stem cells have started stimulation of repair renewal.

- Plant, animal and agriculture
- Renewable resource technology
 - Environmental technology
 - Waste technology
 - Enzyme technology

in a bioreactor.

multi enzyme catalytic reaction with in microorganisms which produce desired product

Bioprocess/fermentation technology (used to produce food and beverages, now it is a

Areas of biotechnology

S

- Separation and purification of essential product
- Creation of conducive environment for biocatalyst
- Search for Specific biocatalyst (Mostly whole organisms/ microbial processes)
 - Biotechnology has 3 cores functions

4 🖼 BIOTECNOLOGY Cont

- 12. Alcohol beverages and Bio-fertilizers ect.
 - 11. Monoclonal antibodies
 - 10. Vaccines
 - 9. Antibiotics
 - 8.Vitamins
 - 7. Tissue culture
 - 6. Genetic engineering
 - 5. Steroids
 - 4. Enzymes.
 - 3. Dairy products
 - 2.Organic acids
 - 1. Food biotechnology

3 DPLICATION OF BIOTECNOLOGY

chemical engineering

- It is an interdisciplinary subject involving microbiology, genetics, biochemistry and by microbial organisms, plants and animals.
- The biotechnology is the extension of technology in biological field, mainly included wax, oils and jute
 - Technology is wide applied in the areas like chemicals, glass, soaps, paper, paints,
 - While the technology is the applicatory part science for the benefits in large scale. experimentation.
 - The science mainly deals with knowledge featured by observation and



- Production of ethanol at the end of 19th century.
- Egyptians knowing the baking of bread in 4000 BC
 - Babylonians making and drinking Beer.

ancient history dates back to

- Biotechnology concept was in fact an old concept itself dating back to 6000 BC, disciplines applied to specific problems
- skilled persons, supporting the public and sustained growth. It also involves separate
 - In 1970 it appeared as separate branch of biology. It is featured by demands of Molecular biology).
 - Multidisciplinary branch of biology (Genetics, Microbiology, Biochemistry and

1 Biotechnology

- Health care.
- 9
- Microbial enzymes are non toxic and biodegradable side the cell, Ex. Invertase and Uricoxidase) Carboxyl methylcellulose and Poly galcturonase), intra cellular proteins (secreted in
- Enzyme technology has 3 phases, production, L
- isolation and purification. In protein engineering

- Somato statin, Bendorphion(30 amino acid (Humulin), somatotropin(growth hormone),
- 8 Meuro peptide of opiate activity) and Interferon.

əserəmyloq peT se bəlleɔ osle si ti hɔus se

It is a technique used in molecular biology.

Applications of Monoclonal antibodies: generate up to 100 million different antibodies.

10 🐼 POLYMERASE CHAIN REACTION

It is mostly employed to wide array of genetic manipulations.

vitro, as such it is called as vitro enzymatic reaction

treating tumors and immuno purification of interferon

With this technique, it is possible to amplify single or few copies of DNA.

- Ex. Methylophillus, a bacterium produces methanol,
- Wethylotrophus produces an animal feed called-

specific. They are mostly powerful and antiviral.

- such they produce more proteins than plants and animals

Used to produce monoclonal antibodies which are exceptionally pure and highly

melting, during which the two strands of DNA separate and are used as templates. The selected DNA is heated to high temperatures and this process is called as DNA Most PCR s are based on thermal lighting (heating and cooling alternatively)

Enzyme used in this reaction is obtained from a bacterium called Thermus aquaticus,

 DNA polymerase is an enzyme is used in this technique to amplify a piece of DNA in • It is developed by KARY MULLIS in 1983 for which he won Nobel prize in 1993

Diagnostic (Blood groups, cancer, pregnancy and allergies), Organ transplantation,

cells in the haemopoitic portion of marrow). It is normally found that a mammal can The coupled antibody/ B-lymphocyte with multiple myeloma cells(tumor originating Cesar Milstein and Gorge Kohler were the fist to produce the monoclonal antibodies.

Candida utilis Pruteen and Spirulina an algae. Some waste products also yield single cell proteins by

- Microorganisms contain more amount of DNA and RNA than plants and animals as
 - Dried cells of microorganisms are used as food or feed(Microbial proteins).
 - Single cell proteins (SCP):

Hybridoma Technology:

6

SLEPS IN PCR.

11 🗃 PCR Cont.....

- synthesis of various hormones like Insulin
- recombinant technology has revolutionized the

- Enzyme are 2 types: Extra cellular enzymes (Secreted out side the cell, Ex
 - Most enzymes are proteins (Summer, 1920)
 - Enzyme technology: Concentrated around biocatalysts.

04\Jul\2013

- 1, Initialization : heating reaction to 94-96 OC for 1-9 minutes. (HOT START PCR)
- 2. Denaturation: 1st regular cycling event. Heating to 94-98 OC for 20-30 sec. This
 cause the separation of two strands of DNA by breaking the hydrogen bond between

psses

12 🗐 PCR Cont.....

- 3. Annealing : Suddenly the temperature is lowered to 50-56 0C.
- Annealing primers are added to strands of DNA template, Polymerase is then added which binds to strands.
- Soon the template strand can synthesize DNA.
- 4. Extension : It is also called as elongation phase, depends on the polymerase
- applied. The Taq polymerase has its optimal activity at 72 o.C. 5. Final elongation: The temperature is reduced to 4-15 o.C.

13 🕮 Applications of PCR

- Somebody needs only one cell, a drop of blood, sperm of an individual to make multiple copies for matching.
- numble copies for matching.

 It is also applied in the detection of some viral diseases, much before the symptoms.
- could appear in patient.Involved in parentage disputes.
- The forensic application is ultimate.(Ex of saliva cells from the back of stamp traced
- the culprit)

 Historians use it as an evidence in the process of evolution. (Mummies are subjected
- to DNA test).
 In discovering a drop of wine exactly from which grapes went out side the bottle.
- ार जिल्ला
- · DNA Finger Printing ·
- All living organisms show differences from each other mainly due to their base pair sequence of DNA. The comparison of DNA sequence of two individuals will reveal the
- relation or not.
- \bullet Stages in the Finger printing : -I. Isolation of DMA(from cells or organs of body ,usually from tissue or blood, hair
- or skin Z. Washing : Isolated DNA or the targeted DNA is washed with an enzyme
- proteinase (physical purification).
- -- 3.Purification : With carbon tetrachloride and phenol. -- 4.Cutting ,Sizing and sorting(Special enzymes called er
- 4.Cutting ,Sizing and sorting(Special enzymes called endo nucleases cut the fragments at desired places, Biological scissors
- SI
- 5. Staining: A stain called Ethidium bromide is added to color the fragment
- -6.Viewing: Under UV light
- 7. Transfer: To a nylon sheet on gel and soaking for over night
 8. Probing and printing: Each probe Typically sticks in only at one or two places in
- the nylon sheet and the bar code is printed
- 16 DOT Blot Techniques:
- It is a technique in molecular biology used to detect the Bio molecules.
- Traditionally the molecules are separated by chromatographic methods.
- A mixture containing bio molecule to be detected is applied on membrane as a dot.
- Northern blotting: Procedure where RNA fragments are transferred from an Agarose

gel to nitrocellulose filter where RNA is hybridized to a radio active probe.

TY Dot blot.....cont

- Southern dot blot:
- nitrocellulose filter, where the DNA is hybridized with radio active probes. • In this technique the DNA fragments are transferred from Agarose gel to
- The Northern and Southern blots are usually applied to detect nucleotide probes.
- This technique is applied to detect only molecules like antibodies or antigens. Western dot blot technique:
- The above techniques are very accurate in detecting the corresponding molecules.

18 🖾 ENZYME LINKED IMMUNO SORBENT ASSAY- ELISA

- It is useful only for the detection of antibodies or antigens from the given samples. It is a biochemical and immunological technique.
- It is a main diagnostic tool in medicine, pathology and quality control.
- In this technique either antibodies or antigens are needed for the detection.
- In this technique an unknown amount of antigen is fixed on a surface, where specific theoD..... AZIJE 1919
- antibodies are added.
- The antibodies are normally linked to an enzyme, which can produce some detectable
- Through this method the amount of antigen/ antibody is measured.
- · Earlier in this technique radio active labeling was used, which can cause health It is mostly used to detect the antibodies in the serum.
- hazards. (Health threat than diagnostic value) . Stratis Avrameas & G.P.Pierce have
- developed the modified method in which the container containing immuno sorbent---
- Porath, 1966
- * It is also called as protein engineering, Recombinant DNA technology or genetic 20 Genetic engineering
- It should not confused with traditional breeding. In this the genes are manipulated manipulation / modification(GM) or Gene splicing.
- The gens are biological soft wares and their mere presence is not enough. They indirectly.
- The genetic engineering deals with two aspects namely the molecular cloning and should be regulated by promoter, regulator and operator systems.
- 21 Tables in Genetic Engineering transformation
- Isolation of interested gene from others.
- -* DNA information can be obtained from c-DNA or DNA libraries
- -* The obtained DNA is amplified through PCR technique.
- * insertion of the eukaryotic genome DNA in to prokaryote.
- enzymes are isolated by Will Porter & John Darms 1978 (won Nobel Prize) enzyme) and ligases are useful for splitting and attaching respectively. These liposome or by directly by gene gun). Restriction enzyme (restriction endonucleases * Insertion of the desired gene in vectors such as plasmids.(usually viral vectors or
- Transformation: 22 🛅 Genetic engineering cot...
- * Once vector is obtained, it can be used to transform the targeted organism.
- Applications of genetic engineering: -* After the transformation the genetically modified organism (GMO) is isolated.

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erythropoietin in Chinese Production of substances like Insulin (Humulin), 1. It is successful in crop technology.

3. Hormones like somatotropin, Beta endorphins (opiate activity), Interferon,

somato statins and vaccines like hepatitis vaccine.

GMO may cause threat to environment (through consumption)

23 🔁 SLEW CELLS

 These cells renew themselves by mitotic cell divisions. They are found in all multi cellular organisms.

They are capable of differentiating in to many types of cells in the body.

The stem cell research has started in early 1960 by Canadian Scientists ERNEST. A

 The mammalian stem cells are of two types: .MC COULLOCH and E JAMES.

Embryonic stem cells.(found in blastocyst)

- Adult Stem cells (found in the adult tissues)

tissues (Specialized). The stem cells developing in the contributes to the development of embryonic

24 STEM CELLS Cont...

Hamster's ovarian cell.

In many adult individuals the stem cells and progenitor cells act as repair system in

• The stem cells can be grown and transformed in two specialized cells through cell body. Ex. Blood, development of tissues and skin.

embryonic cell lines, autologous embryonic stem cells. cultures, which are used in medical therapies and therapeutic cloning through

• The stem cells are highly plastic, found in the umbilical cord and bone marrow.

Self renewability and potency are the features of properties of stem cells.

25 Zem cells potency

1. Tote potency :

embryonic stem cells and extra embryonic stem cells. of zygote mostly the first few are toti potent. These are differentiated in to - Such stem cells are called as multi potent which will be for a short time. The cells

– 2. Pluerepotency :

derived from any 3 germ layers. Are the descended cells of tote potent cells. They can differentiate in to cells

Mutipotency:

cells, ex 4. Unipotency; Stem cells producing only one type of ce haemopoitic tissue (RBC, WBC, PLATELETS and IMMUNE CELLS) The stem cells of this type can produce only closely related family of cells, ex

slleo mete elosum.

Male (ESC) (ESC)

tissue of blastocyst or morula (a stage of the embryo). • These are the cell lines of embryonic stem cells, usually derived from EPIBLAST

stem cells, can give rise to all 3 germ layers in human beings. Early blastocyst (human embryo), 4-5 days old contains 50-150 cells are pleurepotent.

Most research is on ES cells of mouse or human being.(m ES cells and h ES cells

 The embryonic stem cells require different environment to maintain them as respectively)

undifferentiated condition in gelatin

• They require leukemia inhibitory factor (LIF) and human fibroblast growth

factor(HBGF) respectively.

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- they are identified. Human embryonic stem cells are featured by surface antigens, on the basis of which
- The adult stem cells have the property of dividing and the ability to create a cell more 27 🖼 Adult stem cells:
- differentiated than itself.
- The adult stem cells are of two types. The somatic stem cells and germ line stem
- cells, the later are involved in giving rise to gametes.
- The pleurepotent adult stem cells are small in number
- Most adult stem cells are lineage restricted, mostly by their tissue origin
- The adult stem cells do not pose any controversy, as they are generated in the body (mesenchymal or endothelial stem cells),
- continuously (advantage over the embrynic stem cells.)
- Bio remediation
- technology to remove the pollutants). Its applications are as follows microbial degradation, for example pollutants are removed from effluents.(Alternate - Biotechnology is committed to environmental management. It aimed to use
- Biogas: Methane and CO2 mixture is used in dry composting. Archaebacteria are
- Preservation of eutrophication (Bio remediation helps in removing nitrogen from used for this purpose.
- soil and helps in preventing eutrophication.)
- Multiple communities of micro organisms growing on soil surfaces form thin coat - Bio films:
- Remove all toxic chemicals Ex. Pseudomonas cepasia is useful to remove pollutants. called as bio film. (Gas streams coming out of water treatment plants degrade the
- chlorinated compounds.
- Inserting a foreign gene(Transgensis) in to a genetic make up of any organism by Transgensis
- In Transgensis the promoter (Gene)sequence is substituted genetic engineering is known as Transgensis.
- virus) -The most commonly used promoter gene is Ca MV35S(from Cauliflower mosaic
- encodes proteins that provide resistance to agents that are toxic to plants). A marker gene is also added to the promoter for easy identification. (Marker gene
- A marker gene is also added to the promoter for easy identification. (Marker gene
- Plants can be transformed by two methods: a) Gene gun method(Microinjection of encodes proteins that provide resistance to agents that are toxic to plants).
- Stages in transgenic animals genes in to an organism). b) Agrobacterium method(Single site insertion)
- 1) Identification and construction of foreign gene.
- 2) Microinjection of DNA to the nucleus of fertilized egg
- 3) Transplantation or implantation of these cells to the mother
- -4) Developing embryos

32 [

31

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67

87

 \div 6) Transgenic technology is the extension of ancient agricultural practice only. – 5) demonstrating that the gene is regulated well.

- -7)The first record transgenic examples are from animals- on mouse called *Super*
- mouse 8) Transgenic Ape is ANDi (Transgenic Rhesus monkey), BT Cotton contains gene
- from Bacillus thirungensis.
- 9) Super mouse– 10). Thaumatin (low calory sweetner)

33 Pros and cons of Transgensis

- \bullet The following are risks involved in Transgensis.
- L'Unpredictability of nature
 L. Bio safety (decided by ICAR)
- -3. Genetic contamination.
- -4. Green revolution leading to gene revolution.
- The following are the advantages of Transgensis:
- 1. Under the guidance of INSA, the technology is applied to edible crops. 2. Useful in developing drought resistant verities with reference to whether, disease
- and pest. 3. Marginal land utility

YAADNABSUH JAMINA IDI

animals like Cattle, poultry, pigs, camels, horses, dogs and other domestic animals. * It is the science dealing with study of breeding, care , feeding and treating diseases of

Cattle:

*There are more than 26 breeds of cattle available in India.

*Cattle now are exclusively called as Bovines featured by cud chewing habit, having 4

chambered stomach, hallow horns and even toes, with a life span of 20 yrs.

*Matured cattle will have 32 teeth. Zoologically it is called as Bos indicus (cow, humped

 Gir (Rajasthani and Gujarath cow) Sahiwal (UP cow) Malvi (Rajasthani drought cattle and the male is called as bull).

resistant variety), Ongole (Andhra pradesh) and Jersy is an imported breed.

solettua 🔄 s

- It is zoologically called as Bubalus bubalis weighing about 400-800 kg wt, with a life * About 97% of buffalos are seen in Asia.
- span of 25 yrs.
- They are mostly nocturnal and poor heat resistant animals.
- They are known to provide 300 day lactation per year.
- The dairy industry is more buffalo oriented than cows.
- They are featured by more calf mortality and are easily susceptible for Rinderpest
- infections (cattle plague).
- The buffaloes yields milk with 7% of fat
- Murrah (Punjab & Haryana), Surthi (Gujarat) Bhadwari and Mehsana (Gujarat)

3 ANIMALHUSBANDARY --- CONT

- of health and US Dept of Agriculture, known to contain about 22,000 genes and • The cattle genome or Bovine genome is worked out completely by National Institute
- almost resembling the humans by 80%.
- The breeds are designed for meat and milking.
- microbes of ruminant can synthesize amino acids for protein formation. • Cattle ruminant can convert cellulose in to glucose and volatile fatty acids. The
- Cattle emit large amounts of methane released out burping have greater role global
- warming effect.
- Due to heavy grazing of the grasses, the biodiversity is disturbed. (environmental
- 4 GOATS AND SHEEP ettect)
- Goats:
- It is regarded as poor man's cow.
- Goats are highly economical because their meat is low in fat content while its milk It is called as Capra species, weighing about 75-80 kg, with a life span of 10 yrs.
- for children has high fat content. Therefore it advisable foe consumption by adults and nutritive
- form.) Goat's milk can be digested easily in spite of heavy fat content (it exists in lyophilized
- CIRG (Central institute of Research on Goat) in UUPUPMakhdoom UP Goat's droppings provide rich form of manure containing nitrogen and phosphorous.
- 2 SHEED
- It known as Ovis aries.
- Featured by 10 15 yrs of life span
- Unlike goats, sheep provides meat, milk and wool.)
- Sheep are more temperature resistant than goats and subjected to more mountain

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 To improve sheep separe

6 MIMAL HUSBANDARY---- PIGS

- and Sow respectively.

- Pigs are known for prolific breeding and feeding.
- matter in to animal matter.
- Pigs do not have functional sweat glands as such to keep themselves cool by water
- and mud as sun cream. Severe stress in them lead to cannibalism.
- They are mainly used for travel in deserts than food animals
- India possesses 1.2 million camels.

- Lot of water is stored in the form of fat, which is stored in hump.
- On availability they drink water and store in the vesicles of stomach.

- - They are less intelligent animals.

 They are the earliest domesticated animals. The horses are hoofed ungulate mammals.

The camel produces milk, hair and meat

- with a life span up to 40 years. Each animal weighs450-500 kg, camels are slow breeders (lays a calf every 3years),
 - - - Pill Animal husbandary: Camels

 Wallgo attu all over India Clarius batrchus, All over India Mystus singhala all over India.

Catla catla

Zanskari

inuqineM •

Bhutia

inswisM •

Breeds

Kathiawari

.slemins

nids •

Fresh water fishes

All over India.

гэдэкр

Rajasthan

Distribution

 Hearing and touch senses are exceptionally well. They are employed in police, sport and transport.

Himachal Pradesh.

Bhutan & Punjab

North- eastern mountains.

Gujarat, Rajasthan

Being cognitive, having spatial distribution and quick learning they are intelligent

Due to their good built and strong sense of balance, they can escape from predators.

Labeo calbasu: Calbsu North & South India

Labeo rohita: Rohu All over India

10 📧 Animal Husbandary--Edible Fishes

earoH---- YabandauH IsminA 🕮 9

 They are featured by night vision. They have great fight and flight instinct.

8 NIMALHUSBADARY -----HORSES

- They are the fast growing animals and they are known for converting the vegetable
 - China ranks first in the world for pig production.
 - The life span of pig is about 16 yrs.
- Biologically it named as Sus. The male and female pigs are respectively called as Boar
 - The pigs are called as non ruminant animals.
 - CSBF (Central Sheep Breeding Farm).
 - To improve sheep breeds the govt has set up a research institute in Haryana, The

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- · Marine fishes:
- Harpodon, the Bombay duck coastal Maharastha
 Anguilla eel Coastal indai
- \bullet Salmon East & West coast Pomphret Indo-Pacefic.

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YOOJOTZIH TNAJ9 🖾 1

- Study of tissues is known as Histology
- Plant tissues are basically of two types
- 1. MERISTEMATIC TISSUES
- -2. PERMANENT TISSUES
- The meristematic tissue is composed of actively dividing cells, with dense
- cytoplasm, without vacuoles.
- They are mostly involved in increasing the length and thickness of plant.
- A) Apical meristems: Ex in the tips of stems and roots leading to primary growth. According to their position they are of 3 types.
- B) Lateral meristems: Cells divide only in one plane cause increase in diameter. 2 Meristematic tissues cont...
- cambium. Due to this tissue's activity secondary thickening of plant is possible. Ex. Cork
- C) Intercalary meristem: located at the base of node, internodes or leaf base.
- 3 Permanent tissues
- The cells in this tissue are specialized.
- They are all thick walled with lot of intercellular spaces and the wall is made up of
- These tissues are distributed all over the plant like in root, stem and leaves.
- Their basic function is assimilation or storage of waste products like gum, resin ect, or
- store food stuffs.
- The permanent tissues are of 3 types
- Permanent tissues ... cont
- i. Simple permanent tissue.
- Ii. Complex permanent tissues.
- iii. Epidermis.
- Simple permanent tissue is 4 types.
- 1. Collenchyma: Cells prominent in between cell spaces are filled by cellulose and
- Z.Parenchyma: These tissues are distributed all over the plant like in root, stem and pectin material. This tissue provides strength to plant.
- leaves. The basic function is storage of stuffs.
- -3. Arenchyma: In aquatic plants cells do have huge inter cellular spaces for floating s Simple permanent tissues ... cont
- 4. Schenchyma: Cell walls are thick (lignin impermeable to water), cells are dead.
- Germanent tissues.
- They are of two types; the XYLUM and PHLOEM
- Formed of bundles of pipes-plumbing like. XYLEM: It is the chief conducting tissue(water and organic solutions)
- but assisted by companion cell and sieve plates. These tube transport organic food up • PHLOEM: It carries dissolved substances, it is formed in the form of conducting tube,
- and down.
- 7 Permanent tissues
- Epidermis.
- without any intercellular spaces. It is usually the covering layer in which the cells are compactly placed
- 8 HISTOLOGY ----- ANIMAL TISSUES.
- Basing on the structure and function 4 major tissues are identified. They are as

- 1. Epithelium
- Connective tissue.
- 3. Muscular tissue and
- 4. Nervous tissue.
- The above combinations of basic tissues form different types of compound
- tissues, which in turn are involved the formation of various organs.
- 9 Histology Epithelium.
- It is in the form of sheath of cells.
 It usually forms the covering layers, internal as well external and always one cell thick
- layer, then it is called as simple otherwise stratified.
- Types of epithelium:
- I. Squamous epithelium. Thin and flat seen in alveoli, epidermis and skin.
- 2. Cuboidal epithelium. Cells are cube like seen I thyroid and ovaries
 3. Columnar epithelium. Cells column shaped, seen in intestine, stomach and
- byarynx

10 Connective tissue

- This tissue supports the body organs
- It is featured by ground substance the MATRIX containing the following cells.
- Fibroblasts produce fibers the yellow and white.– Macrophages
- Adipose cells
 The blood is also the connective tissue, whose matrix is plasma in which cells like

RBC WBC and platelets freely move.