MAMMALIA

(Endothermic terrestrial vertebrates that dominated during Coenozoic era)

- Mammals evolved during **Triassic period of Mesozoic era**
- They range in size from the smallest shrew to that of a whale that attains a length of more than 20 meters.
- The Golden age of mammals is **Coenozoic era**
- They occupy the top of evolutionary ladder due to their super organised brain.
- Mammals are defined as 'endothermic vertebrates which possess mammae and teats for suckling the young'.

CHARACTERISTIC FEATURES OF MAMMALIA:

- Endothermic or Homeothermic.
- Body is covered by epidermal hairs except in whales. However, embryos of whales have temporary hair.
- Hair is in the form of **spines** in ant eaters, hedge hogs and porcupines.
- 'Integumentary glands are **sweat** and **sebaceous** glands.
- Glands that keep skin and hair soft are **sebaceous** glands.
- Sweat or sudoriferous glands help in regulating body temperature, while sebaceous glands help in keeping the skin and hair soft.
- Modified or specialised sweat glands develop into mammary glands. This character gives the name Mammalia to the class.
- A muscular partition called **diaphragm** separates anterior thoracic cavity from the posterior abdominal cavity.
- Diaphragm helps in breathing movements.
- Skull is **dicondylic**.
- Each half of the lower jaw is composed of a single bone, the **dentary**, articulating with the **squamosal of the skull.**
- A bony **palate** separates the nasal passage from buccal cavity.
- **Secondary palate formed by the union of premaxillae, maxillae and palatine**
- Vertebrae are with flat centra (**acoelous or amphiplatyan**).
- Ribs are double headed.
- Cervical vertebrae are **seven**, except in three' toed sloth (9 vertebrae) two toed sloth and manatee (6 vertebrae).
- Dentition is **heterodont, thecodont** and **diphyodont**.
- Teeth are lodged in an alveolar socket of the jaw bone (Thecodont).
- Heterodont dentition involving 4 types teeth, **incisors** (cutting teeth), **canines** (Tearing teeth) **premolars** and **molars** (Grinders).
- Milk teeth, in the young ones are replaced by permanent teeth (Diphyodont).
- Salivary glands in the buccal cavity are 4 pairs
  i) Infra orbitals
  ii) Parotid
  iii) Sub maxillary and
  iv) Sublingual.
  In man infra orbitals are absent.
- Respiration is by lungs.
- Glottis is protected by **epiglottis**.
- Red blood corpuscles are enucleated, biconcave and circular except in camels and llamas where they are elliptical.
- Pace maker is: 1. SAN (Sinuauricular node) 2. AVN (Auriculo ventricular node) is ectopic pacemaker.
- Heart is four chambered. There is a complete double circulation.
- Only left aortic arch is present.
- Renal portal system is completely absent.
- Cerebral hemispheres are large and exhibit convolutions.
- A transverse band of nerve matter called the **corpus callossum** connects the two cerebral hemispheres.
- Optic lobes are four in number **(corpora quadrigemina)**
- Cerebellum is large and solid.
- Cranial nerves are 12 pairs.
- The eyes are provided with **Lachrymal**, **Harderian** and **Meibomian glands.** Their secretions moisten and lubricate the conjunctival surfaces of the eyeball and its lids.
- The ear is divided into three parts :
- **External ear: Pinna** is fleshy and lobe like and contains wax glands or ceruminous glands in the auditory meatus.
- External ear is absent in monotremata cetacea and sirenia.

- Middle ear has three ear ossicles extending between tympanum and internal ear.
- They are **malleus, incus** and **stapes.**
- **Stapes** is the smallest bone in mammals.
- Internal ear has three semicircular canals and a watch spring like **cochlea,** containing **organ of corti.**
- Kidneys are **metanephric.**
- Excretion is ureotelic.
- Testes remain in scrotal sacs except in whales, elephants and some insectivores.
- Eggs are microlecithal in monotremes.
- Megalecithal in prototherians.
- Cleavage is holoblastic and equal.
- Except egg laying monotremes, mammals are **viviparous.**
- Developing foetus is attached to the uterine wall of the mother by a **placenta** which helps in nutrition, respiration and excretion.
- **Chorio allantoic placenta** is present in eutherians while in some marsupials, it is chorio yolk sac placenta.
- The intrauterine period is called gestation period.

CLASSIFICATION OF MAMMALIA:

- Mammals are divided into 2 subclasses namely, Protetheria, and Theria by Vaughan et al.,

Subclass: I. Protetheria (Gr. Protos First + Therios, beast)

- (Reptile like, oviparous egg – laying mammals **with a variable temperature between 25°C to 28°C**).
- Pinnae in the external ear are absent.
- Teeth are present only in the juveniles
- **Pectoral girdle with 'T' shaped interclavicle.**
- Ribs with a single head, the tuberculum is absent.
- Pelvic girdle shows epipubic bones extending from the pelvis.
- Mammary glands are modified sweat gland and without nipples.
- **Corpus callossum is absent in the brain.**
- Cochlea is simple.
- Testes are abdominal.
- Distinct cloaca is present into which two Ureters and genital sinus open.
- Females are oviparous.
- Megalecithal eggs with Meroblastic cleavage

Order: Monotremata (Gr. Monos Single + Trema opening)

- Cloacal opening is present. These are primitive reptile like oviparous or egg laying mammals.
- **Monotremes** are confined to **Australia, Tasmania, and New Guinea.**
- **e.g. Platypus, Echidna**

Ornithorhynchus anatinus:

- **Duckbilled platypus** is found in the rivers of Australia and Tasmania.
- It is 50-60 cm long and well adapted to life in water.
- It has a thick fur and flattened tail.
- Toes are clawed and webbed.
- Upper jaw is modified as a bill with the help of which the animal probes its prey.
- Male has a spur on its heel connected with poison gland.

Tachyglossus (Echidna): **Spiny anteater** is found throughout Australia and Tasmania.

- It is terrestrial and burrowing.
- It is nocturnal and feeds on ants.
- Snout is long and tubular with a terminal mouth.
- ***Tachyglossus aculeatus*** is Short nosed echidna
- ***Zaglossus bruijini*** is long nosed echidna

Subclass: II – Theria

- Viviparous mammals included under Theria
- Mammae are provided with Nipples
- Reduced structure in pectoral girdle is Coracoid
- Ribs are double headed and cervical ribs are absent
- Cochlea is coiled

- Testes are Extra abdominal
- Gestation period is seen in Theria
- Placenta is developed in Theria

Theria is divided in to two infra classes - Metatheria & Eutheria

Infra class - Metatheria

- Marsupium or brood pouch is present in the female.
- Epipubic bones are usually present and attached with the Pubis. Mursupium is supported by the epipubic bones.
- Coracoids are reduced.
- Incisors are more than three in each half of the jaw.
- Carpus callossum is indistinct.
- Anal and Urinogenital openings are operated by a common sphincter.
- Vagina and uterus are double (Didelphic condition). In males penis is bifid.
- Viviparous and placenta is usually yolk sac placenta.
- Gestation period is very short. Young ones are born in an exceedingly immature condition, naked and blind.
- They are found mainly in Australia and neighbouring islands. Hence Australia is called "**Land of marsupials**" However opossum is found in America.
  E.g. *Didelphis, Macropus, Phascolarctos (Koala bear).*
- ***Didelphis virginiana:*** (opossum) Didelphis is a tree dwelling marsupial confined to America.
- It is nocturnal.
- There are *5* pairs of incisors in the upper jaw and 4 pairs in the lower jaw. Dental formula 5/4, 1/1, 3/3, 4/4. Last premolars are replaced in marsupials
- Tail is prehensile.
- All parts of neo pallium are connected by hippocampal and anterior commissure.
- Gestation period is the shortest among mammals, 12 to 14 days only.
- Placenta is chorio – vitelline placenta but in Perameles it is chorio allontois placenta.

Macropus rufus: It is called red kangaroo. Kangaroos are spread over Australia, Tasmania and New Guinea.

- Tail is large and thick at the base and used as a balancer during leaping. Hence, the tail is often called the fifth leg of kangaroo.
- Kangaroos are gregarious and herbivorous wild animals.

Phascolarctos cinereus (Koala bear): Koala is an Australian Teddy bear.

- It is arboreal, with a rudimentary tail.

  Being a land of Prototheareans and most of the Marsupials, Australia is called "The land of Archiac mammals".

  Zoological name of Kangaroo—Macropus

  Zoological name of marsupial bandicoot—Parameles

  Zoological name of banded ant eater—Myrmacobius

Infraclass II: Eutheria

- Higher viviparous placental mammals.
- Young are born in relatively advanced stage.
- Dentition never exceeds 3/3, 1/1, 4/4, 3/3.
- Corpus callosum is highly developed in the brain. Penis is present in front of the scrotal sacs.
- Coracoids are absent in the pectoral girdle.
- Epipubic bones are absent in the pelvic girdle.
- Anus and urinogenital apertures are independently encircled by sphincters.
- The space between anus and urinogenital aperture is **Perineum**
- Placenta is chorio allantoic placenta.
- Longest gestation period is seen in elephant (24 months)
- The general characters of Mammalia represent, typically of the infraclass Eutheria.
- The bats and whales exhibit very interesting phenomena where they emit ultra sounds to locate their way. (Echolocation).

e.g.:

Order	**Animals**

Insectivora	Hedgehog & shrews
Chiroptera	Bats
Primates	Lemur, Loris, Monkeys, Apes and man
Rodentia	Rats, squirrels, Porcupines, guinea pigs
Lagomorpha	Rabbits, hares
Cetacea	Whales and Dolphins
Carnivora	Dogs, Foxes, Cats, Leopards, tigers, lions and seals
Probascida	Elephants
Sirenia	Sea cows
Perrissodactyla	Horse, ass, Zebra, rhino, (Odd toed Ungulates belongs to this order)
Artiodactyla	Pigs, hippos, camels, cattle, sheep, deer and giraffe (Even toed Ungulates belongs to this order)

i. *Chiroptera (Bats):* ***Flying foxes*** are included in this order.
ii. Primates (Man & Apes)
iii. Rodentia (Rat)
iv. Cetacca (Whales & Dolphins)
v. Lagomorpha (Rabbit)
vi. Proboscidae (Elephants)
vii. Carnivorn (dogs, cats, tigers, lions and bears)