UNIT-V
EVOLUTION OF HORSE

Horses (**Equus**) are odd-toed hooped mammals belonging to the order **Perissodactyla.** Horse evolution is a **straight line evolution** and is a suitable example for **orthogenesis.** It started from Eocene period. The entire evolutionary sequence of horse history is recorded in North America. "

Place of Origin

The place of origin of horse is **North America.** From here, horses migrated to **Europe** and **Asia.** By the end of Pleistocene period, horses became extinct in the motherland (N. America). The horses now living in N. America are the descendants of migrants from other continents.

Time of Origin

The horse evolution started some 58 million years ago, m the beginning of **Eocene** period of **Coenozoic era.** The modem horse **Equus** originated in Pleistocene period about 2 million years ago.

Evolutionary Trends

The fossils of horses that lived in different periods, show that the body parts exhibited progressive changes towards a particular direction. These directional changes are called evolutionary trends. The evolutionary trends of horse evolution are summarized below:

1. Increase in size.
2. Increase in the length of limbs.
3. Increase in the length of the neck.

4. Increase in the length of preorbital region (face).
5. Increase in the length and size of III digit.
6. Increase in the size and complexity of brain.
7. Molarization of premolars.

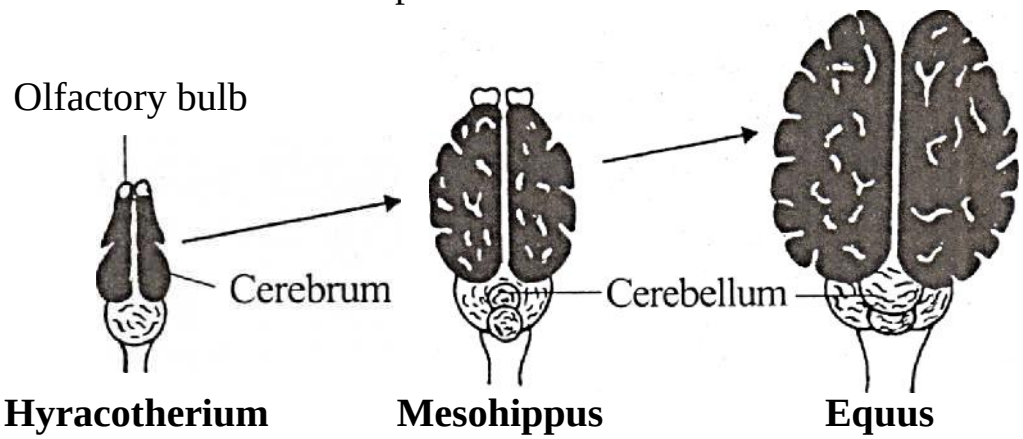


Fig.: Evolution of brain in horse.

8. Development of high crowns in premolars and molars.
9. Change of plantigrade gait to unguligrade gait.
10. Formation of diastema.
11. Disappearance of lateral digits.
12. Enlargement of hoof on the middle digit.
13. Development of springing mechanism.
14. Straightening and stiffening of back.
15. Transition from browsing habit to grazing habit.

Ancestral Stock

The modem horses are the descendents of the class Mammalia form **Tetraclaeonodon** included in the order **Condylartha.** All the mammals included in this order are Five-toed, hoofed ungulates.

Evolutionary Sequence of Horses

Horse evolution occurred in **North America.** It started 58 million years ago in the **Eocene** period of **Coenozoic era.**

The ancestor of horse was **Tetraclaeonodon**, included in the order **Condylartha** of class Mammalia. It lived in old world in the Eocene period. It was a five toed animal.

Tetraclaeonodon gave rise to *Hyracotherium (Eohippus).*

Eohippus gave rise to **Oroliippus** which in turn gave rise to **Epihippus.** All these were Eocene horses.

The **Epihippus** gave rise to **Mesohippus** which in turn gave rise to **Miohippus.** These two were Oligocene horses.

The **Miohippus** gave rise to **Parahippus** which in turn gave rise to **Merychippus.** They were Miocene horses.

The **Merychippus** gave rise to **Pliohippus** which lived in the **Pleistocene** period.

The modem horse **Equus** was descended from **pliohippus** in the Pleistocene period in **North America** about 2 million years ago.

Thus North America was the **Principal theatre** of Horse evolution. From there, they migrated to other countries. By the end of Pleistocene they became extinct from the mother land. The Modem horse in N. America are introduced by man.

Fossil Horses

The fossil record of the evolution of horse is more or less complete. The fossil horses from the first horse to the modern horses are given below:

1. Eohippus or Hyracotherium - Eocene horses
2. Mesohippus - Oligocene horses
3. Miohippus - Oligocene horses
4. Parahippus - Miocene horses
5. Merychippus - Miocene horses
6. Hipparion - Pliocene horses
7. Pliohippus - Pliocene horses
8. Equus - Modem horse

1. Eohippus or Hyracotherium

It was the first horse and hence it is called **dawn horse.** The fossils of these horses are found in abundance in North

America. It lived during Eocene of Coenozoic era. **Hyracotherium** had the following salient features:

1. It was the smallest horse with a height of only 10 inches.

It was about the size of a fox.

2. It lived in the forests and used to eat soft vegetation.

3. The fore limbs were provided with four digits, namely II, III, IV and V. The first toe was represented by **splint.** The hind limbs were provided with three digits, namely II, III and IV; the first and V digits were represented in the form of **splint.**

4. The limbs were digitigrade.
5. The springing mechanism was absent.
6. The back was arched and flexible.
7. The preorbital region was not elongated.
8. Dentition was **brachyodont** i.e. low crowned. It contained 44 teeth.
9. The cerebral hemispheres were small and smooth.

Eohippus or **Hyracotherium** gave rise to several lines during Eocene period. They were **Orohippus, Epihippus** and **Mesohippus.** All the horses, except **Mesohippus,** became extinct during early **Oligocene.**

2. Orohippus

It was an Eocene horse. It originated from **Eohippus.** It became extinct during late Eocene. It was generally called mountain horse. It was slightly taller than Eohippus. The splint bones disappeared from both limbs. It was a browser. In other aspects, it resembled Eohippus.

3. Epihippus

It was the third Eocene horse which originated from Orohippus. It became extinct by the end of Eocene.

It was a little larger than **Orohippus.** The last two premolars were molar-like. It was still a browser.

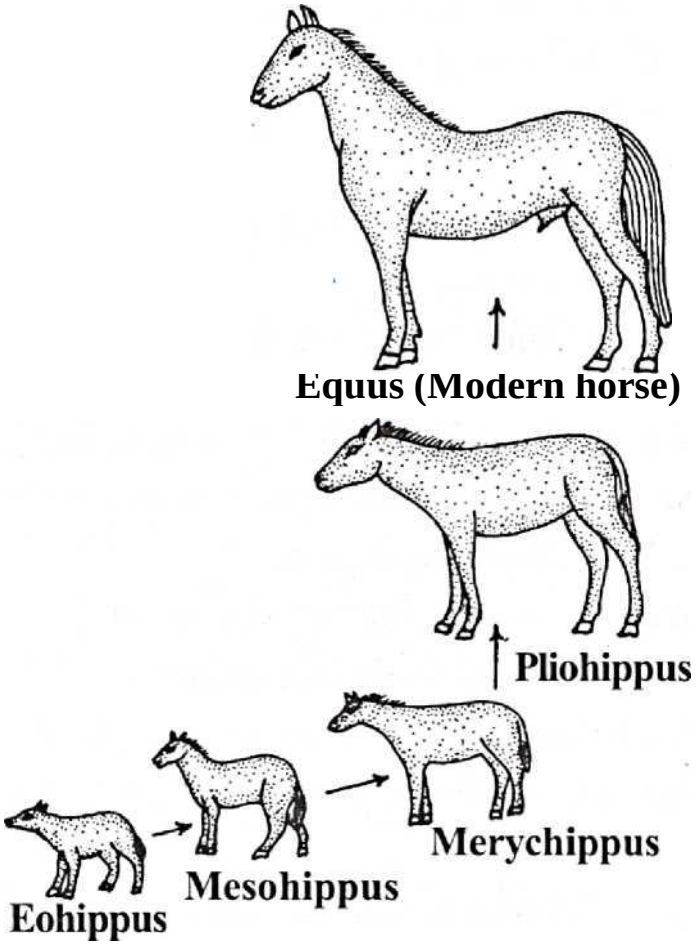


Fig.: Evolution of horse.

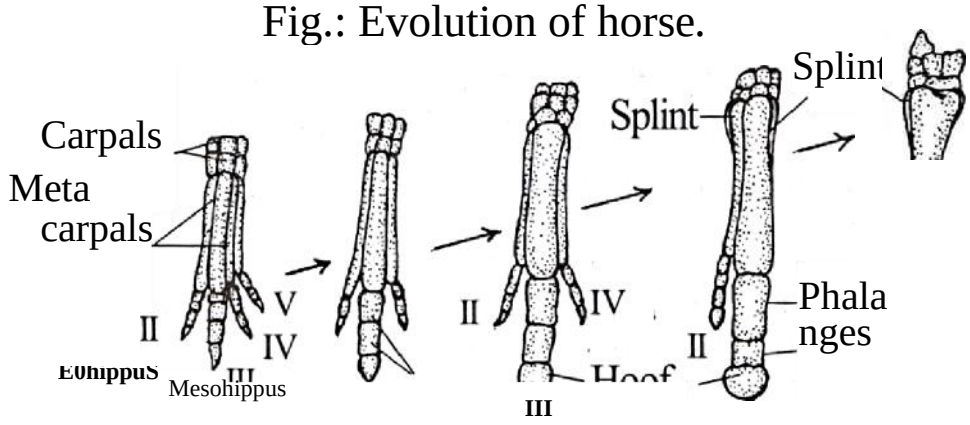


Fig.: Changes in the fore limb of horse.

4. Mesohippus

It was an Oligocene horse. It originated from Epihippus. It was on the main line of evolution, leading to the modem horses. It became extinct by the end of oligocene. The salient features of **Mesohippus** are summarized as follows:

1. It was generally called an **intermediate horse**.

2. It was about the size of a sheep. It had a height of 18 to 24 inches.

3. The back was arched.

4. All the legs were provided with only three digits. But in the fore limbs V digit was represented by a splint. The middle digit was prominent.

5. The limbs became elongated because of the lengthening of metacarpals and metatarsals.

6. The pre-orbital region was in the process of elongation.

7. The elongation of pre-orbital region led to the formation of **diastema.**

8. The last two premolars were molar-like.

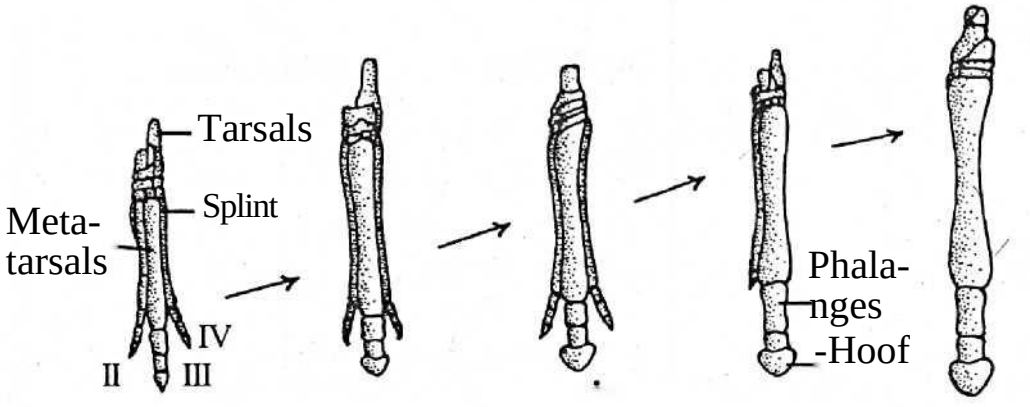
9. It was a forest dweller and browser.

10. The brain exhibited some complexity over that of **Hyracotherium.** The cerebral hemispheres were enlarged and convoluted.

5. Miohippus

It was another horse that lived at the end of Oligocene. It was more or less like the **Mesohippus.** But it was slightly larger in size. It was a forest dweller and browser.

Miohippus was the direct ancestor for modem horses and many extinct horses. It gave rise to two lines. One line led to **Parahippus** which gave rise to the modem horses. A side line gave rise to **Anchitherium.** The **Anchitherium** gave rise to **Hypohippus.** The Anchitherium became extinct by the end of Miocene and **Hypohippus** became extinct by the beginning of Pliocene.



Eohippus Mesohippus parahippus **Pliohippus** **Eques**

Fig.: Changes in the hind limb of horse.

6. Parahippus

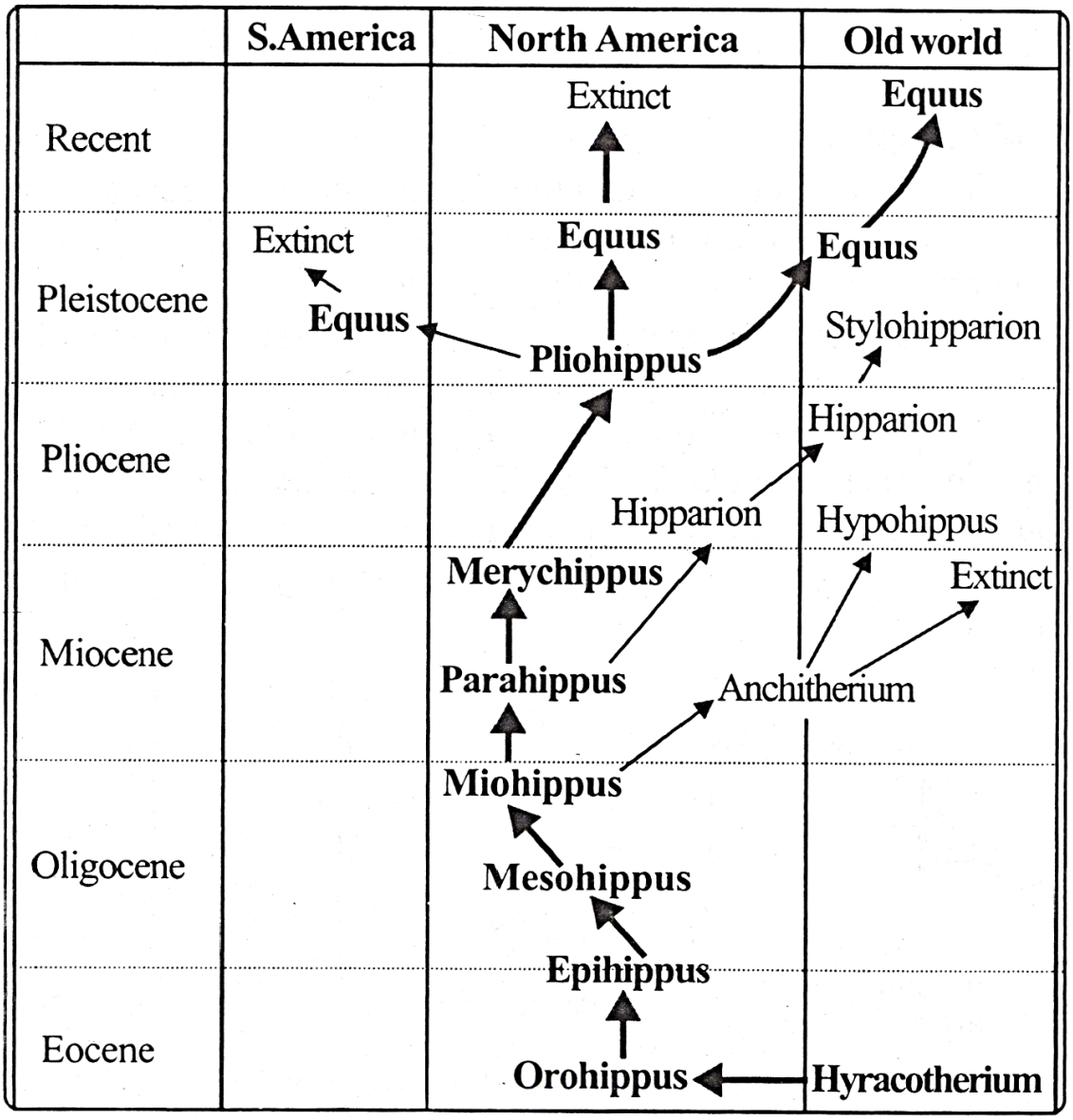
It descended from **Miohippus.** It lived during Miocene. The salient features of **Parahippus** are summarized below:

1. It was a **browser.**
2. The **preorbital** region was much elongated.
3. The **premolars** were molar-like.
4. **Dentition** was hypsodont i.e. high-crowned.
5. There were three toes in the legs. The middle toe was prominent and the side toes were slender.

7. Merychippus

It was a Miocene horse descended from **Parahippus.** It was the **first three-toed grazer.** The salient features of **Merychippus** are given below:

Table.1: Showing the evolution of horse.



1. It was adapted to live on grassland. It fed on grasses. It was the **first grazer** in horse evolution. Hence it formed the transitional stage between browsers and grazers.

2. The legs contained three toes. The middle toe alone touched the ground. The hoof was well-developed in the middle digit.

3. The muscles of the limbs formed an efficient **spring mechanism.**

4. The pre-orbital region was progressively elongated.

5. The diastema was well developed.

6. Dentition was hypsodont i.e high crowned.

7. The cerebral hemispheres were still more complex and convoluted.

8. Hipparion

It was a Pliocene horse. It was a side line from **Parahippus**. It was a three-toed grazer. It has a height of 40". It gave rise to **Stylohipparion** during the early Pleistocene and became extinct by the upper Pleistocene.

9. Pliohippus

It was a Pleistocene horse. It descended from **Merychippus** and was on the main line of evolution, leading to the modem horse. It had a height of 40". It was the **first one-toed** horse. The side toes were much reduced and were represented by splint bones. This fossil horse gave rise to the modem horse, **Equus.**

10. Equus

It is the modem horse. It descended from **Pliohippus**. It appeared in Pleistocene. The transition from **Pliohippus** to **Equus** involves the following changes:

1. The height is increased from 40" to 60".
2. The middle toe is enlarged and has a well-developed hoof.
3. The side toes (II &IV) are represented as splint bones.
4. It is well adapted for grazing.

5. The brain is enlarged and the cerebral hemispheres are much folded.

6. The main course of evolution of horse occurred in N. America. The modem horse also evolved first in N. America during Pleistocene. So N. America is the motherland of horses. But it became extinct in the motherland by the end of Pleistocene. The horses now living in N. America were introduced by man.

Orthogenesis in Horse Evolution

The evolutionary history of horse represents a very good example of orthogenesis, straight line evolution.

Eventhough most of the evolutionists believe in the straight line evolution of horse, there are also oppositions. It should be remembered that the fossil horses given above are only a few among many. The few selected fossils show the direct line of evolution. But there were many side lines which became extinct at different periods. This made **Simpson** (1953) to come to the conclusion that "orthogenesis is a product rather of the tendency of the minds of scientists to move in straight lines than of a tendency of nature to do so".