DEPARTMENT OF ZOOLOGY

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B.Sc. Zoology Part III

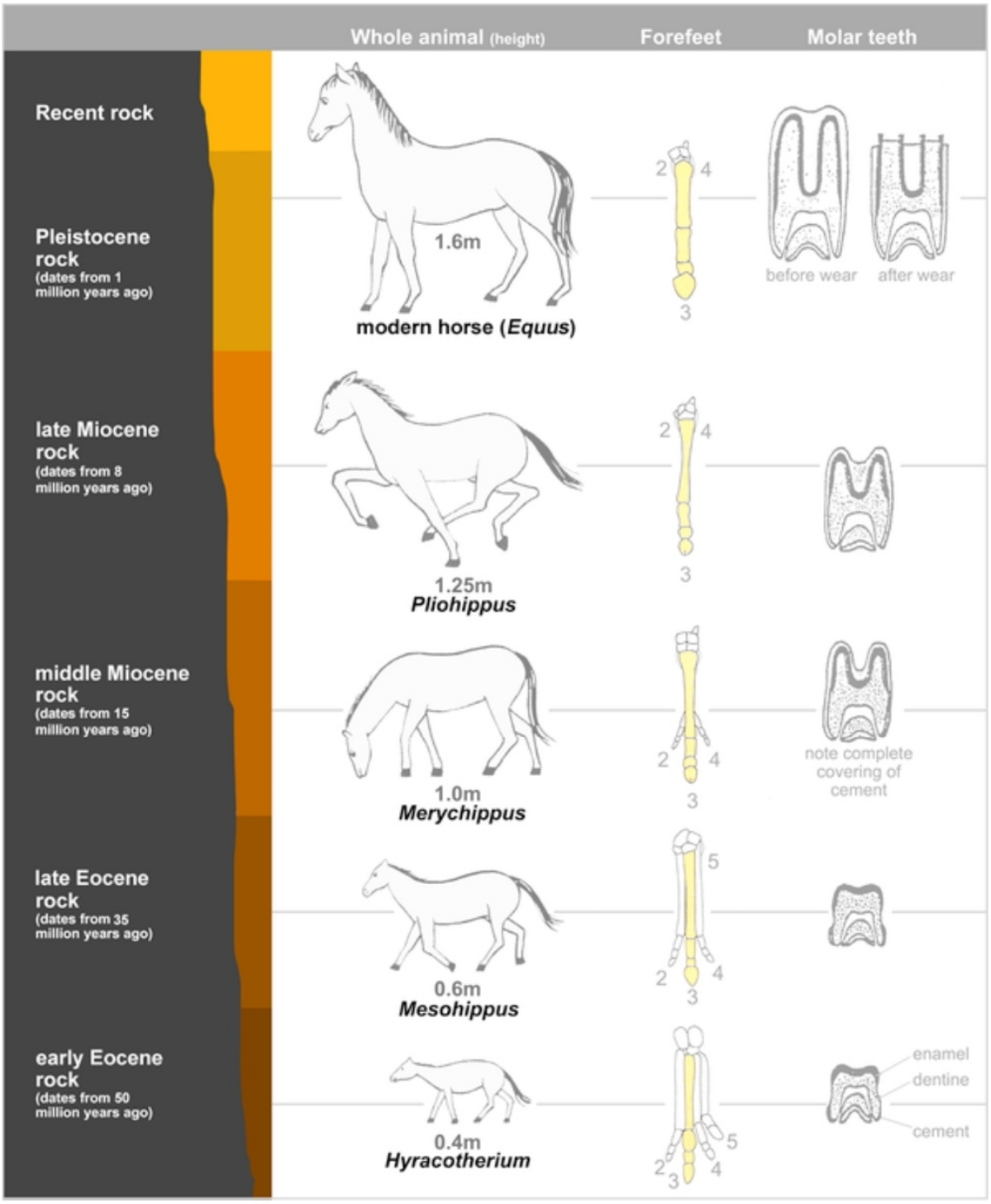
EVOLUTION OF HORSE

INTRODUCTION

- Evolution has occurred by a gradual processes of change from simple to complex structure.
- The fossil records of horse is remarkably complete in which various intermediate stages are available.
- The intermediate gradations of fossil records shows a clear gradual progression in the formation of modern horse (*Equus caballus*).
- It belongs to:-
  Order: Perissodactyla
  Sub-order: Hippomorph
  Family: Equidae
- The family Equidae is about 60 million years old.

EVOLUTIONARY CHANGES

- The ancestor of Horse were fox like creatures of browsing habit, but to change in climatic conditions, nature of food they had to modify some of the body structure accordingly.
- Such change can briefly be taken as follows:-
  i. Size increases from fox like to modern forms.
  ii. Increase in length of limbs.
  iii. Reduction in no. of toes.
  iv. Enlargement of head and neck.
  v. Change from ancient plantigrade foot to modern unguligrade foot.
  vi. Molars and pre-molars develop high crown suitable for grazing.
  vii. Increase in size and complexity of the brain.
  viii. Development of spring mechanism.



This image shows a representative sequence, but should not be construed to represent a "straight-line" evolution of the horse. Reconstruction, left forefoot skeleton (third digit emphasized yellow) and longitudinal section of molars of selected prehistoric horses

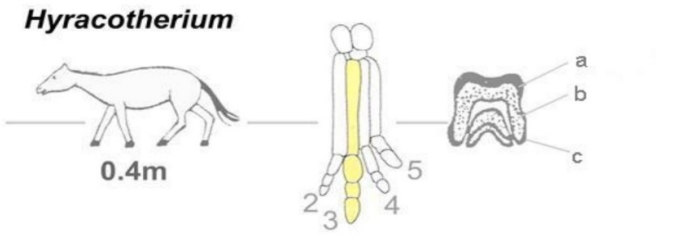
PLACE OF ORIGIN

- North America was the real place for Equine evolution from where the different genera migrated to Europe and Asia.
- The first known fossil in the phylogeny of horse was found in Europe and it was called *Hyracotherium* (dawn horse).
- According to Muon theory the known fossil found in the North America was *Eohippus.*
- Both *Eohippus* and *Hyracotherium* had great similarity, hence, there may be technically the same form.

STAGES OF HORSE EVOLUTION

(1) *Eohippus* (*Hyracatherium*)

- It was found in the beginning of Eocene about 52 million years ago.
- It was small, browsing with a size of fox about 250-450 mm, called Down Horse.
- The ulna and fibula were stout and were separate from radius and tibia respectively.
- Fore limb had four toes (II, III, IV, V) and hind limbs had three toes (II, III, IV), the 4^{th} and 5^{th} digits of hind limbs were represented by splints.
- Springing mechanism were absent.
- The total no. of teeth were 44 (less crowned molar and pre-molar)
- Diastema was beginning to appear.
- The cerebral hemisphere were small and smooth.



Eohippus, with left forefoot (third metacarpal colored) and tooth (a, enamel; b, dentin; c, cement) detailed

(2) *Orohippus*:-

- It was originated in middle Eocene approximately 50 million years ago at North America and New Mexico.
- It increased slightly in size (about 13.5 inches)
- The last premolars (IV) became molariform at it was still browser.
- The number of toes fore limb and hind limbs remains but splints of rest digits were lost.
- It was called mountain horse.

(3) *Epihippus*:-

- It was the third Eocene horse appeared in the mid-Eocene about 47 million years ago, originated from *Orohippus* but little larger.
- The last two premolars (III & IV) became molariform. It was still browser.
- There was no marked variation in the no. of toes either in forelimbs or hind limbs.
- It became extinct by the end of Eocene.

(4) *Mesohippus*:-

- It is originated from *Epihippus* in Oligocene epoch about 32-24 million years ago..
- It was nearly the size of a sheep (18-24 inches).
- Neck was short and less flexible.
- It walked on three toes on each of its front and hind feet (the first and fifth toes remained, but were small and not used in walking).
- Three pre-molars (II to IV) were molariform.
- Teeth still low crowned adapted for browsing not grazing.
- Trunk were long and slender and back somewhat more arched.
- The cerebral hemisphere were enlarged and convoluted.

(5) *Miohippus*:-

- It was found in late Oligocene, slightly larger than the *Mesohippus.*
- Limbs has 3 toes and browser.
- They became extinct in Miocene.

(6) *Parahippus*:-

- It arose in early Miocene from *Miohippus*.
- It was three toed (the middle most was prominent and the side toes were slender) and browser.
- The pre-molars were molariform.

(7) *Merychippus*:-

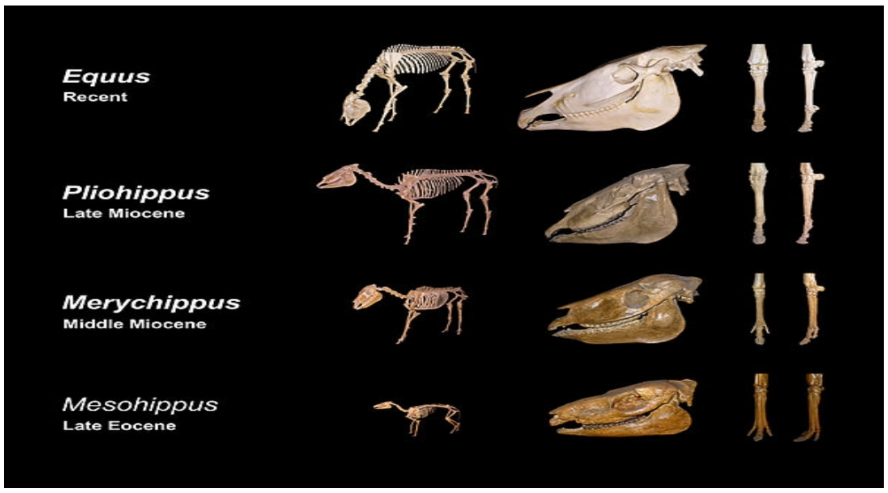
- It appeared in the middle and upper Miocene and become extinct in Pliocene.
- It was the 1st grazing horse, 40 inch in size.
- Both limbs had three toes. Central toes was hat-like but side toes (II & IV) became very thin.
- Teeth was high crowned.
- Cerebral hemisphere were large and convoluted.

(8) *Pliohippus*:-

- It originated from the *Merychippus* in middle Miocene around 12 million years ago.
- It was the 1st one toed horse.
- The height of teeth was greater than that of *Merychippus*.
- There was a pit in front of the eye orbit.

(9) *Equus*:-

- It originated from the *Pliohippus* at the end of Pliocene.
- Earliest records of *Equus* are found in North America from where it migrated to whole world.
- It is the modern horse which achieved the height of 60 inches.
- Its middle toe is enlarged and is in possession of a well-developed hoof.
- Incisors are highly crowned, canines are absent. First premolar is reduced and these exists a diastema between incisor and pre-molar.
- There are 3 pre-molars and 3 molars.
- It is well adapted for grazing.
- The brain is enlarged and complex with much folded cerebral hemisphere.



Skeletal evolution

CONCLUSION

The evolution of horse is one of progression of size in length of limbs, complexity of teeth structure, elongation of neck & head particularly in front of the eyes. Evolutionary progression has also led to adapt themselves gradually from browsing habit to grazing and running habit and reduction of toes.

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