

Phylogeny of Horse

The origin and evolution of horses signify the most speculative success of a race in course of its phylogenetic development. The records of the horses go back all the way with successive links from Eocene to the recent time and afford a sound basis of descent with modifications of the train of life.

The evolution of the horse took place mainly in North America. From there, the animals dispersed to Asia, Africa and Europe several times and twice to South America. The development of the horse is a process of trial and error. Many species arise and become extinct again and many branches run dead; only one line continues. Mindful of "survival of the fittest" horses, adapted to their environment again and again, adjusting to their surroundings. These brought changes, horses became more and more horse, more and more specialized. Eventually horses died out in America 8,000 years ago and they were reintroduced by the Spaniards in the 15th century. Indians did not have horses until then. Luckily horses still live on in the Old World.

The phylogenetic sequences of horses are mostly uni-directional with few side-lines. The evolutionary sequence of equine evolution becomes further complicated by the migratory power of the race. It is believed that the main course of the evolution of horses occurred in North America with migration at various times to the Old world and South America

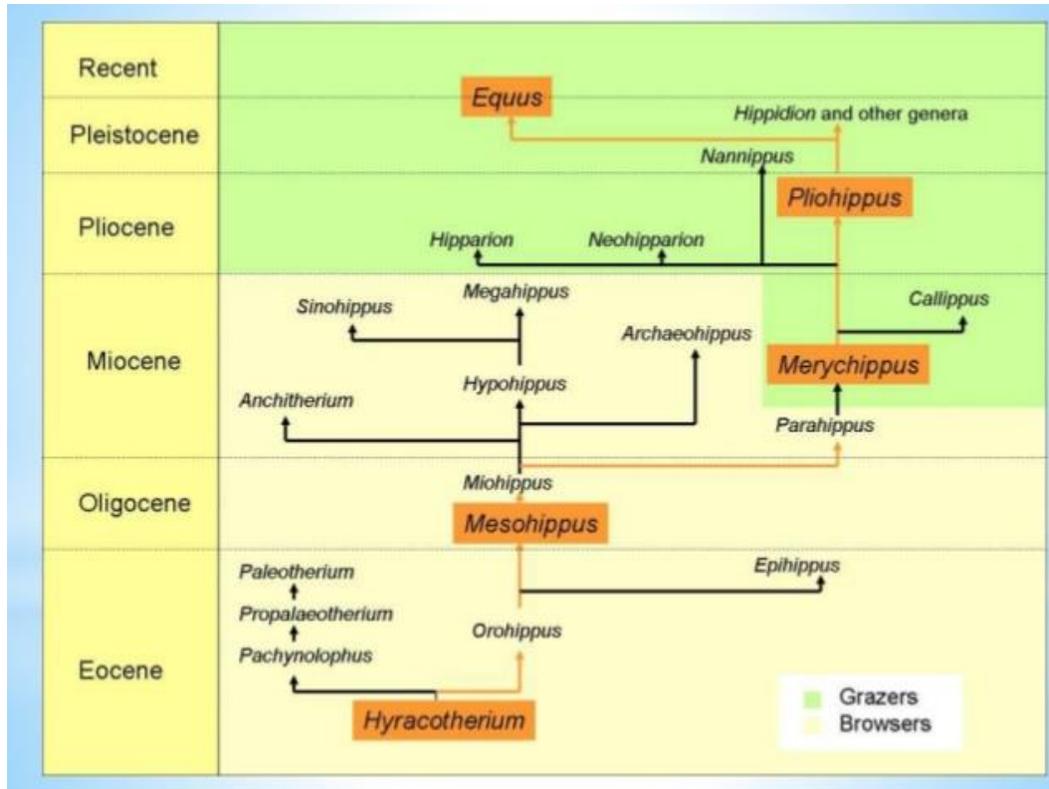


Fig: Phylogeny of Horse

Ancestors of horse:**Eocene—The epoch of four-toed horse:**

Several forms of horses have been recorded in Eocene period. Amongst the Eocene horses Eohippus is regarded as the dawn horse.

Eohippus—the lower Eocene form:

In the lower Eocene bed of North America, Eohippus was the first recorded fossil form which showed equine adaptation. It was a four-toed form. The forelimb had four complete toes and each terminates in a hoof-like nail. There was no trace of pollex. But the hind-limb had three digits with vestigial remnants of the first and fifth digits. The other forms of the horses recorded in the Eocene period are the Orohippus and the Epihippus. These two forms show little difference from the Eohippus excepting certain features in the nature of dentition.

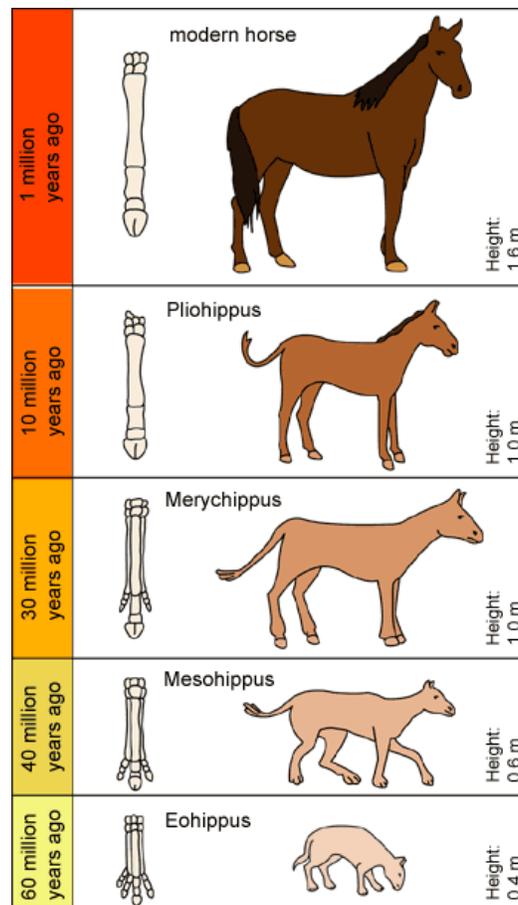


Fig: Phylogeny of horse

Orohippus—the middle Eocene form:

The next stage of the equine evolution beyond the Eohippus is the Orohippus. This form showed some advancement over the Eohippus as indicated by the loss of the splint of the fifth digit in the foot. The middle finger of the forelimb becomes slightly increased in size and the outer fingers become much shortened. The third and fourth premolars are becoming molariform.

Epihippus—the upper Eocene form:

This form is further developed than the previous forms where the third and the fourth premolars become completely molariform. According to many, Epihippus may not stand as the direct ancestor of Oligocene horses.

The outermost digits in the forelimb become much diminished and in the hindlimb the middle digit becomes dominant. The Eocene horses are small in size but they show a gradual increase in size. Distribution of Eocene horses from Europe to New Mexico reveals their power of migration.

Oligocene—the epoch of three-toed horses:

Beyond the Eocene forms, the Oligocene horses show further advancement towards equine evolution. The Oligocene horses had to confront many adverse conditions and they have given origin to some divergent forms. Two distinct forms are recognised.

Mesohippus—the lower and middle Oligocene form:

This form attains a size of about 24 inches in height and possesses three functional digits both in the fore- and hindlimbs. The middle digit becomes much elongated. The ulna and fibula are slender bones. All the premolars excepting the first one become molariform.

Miohippus—the upper Oligocene form:

This form basically resembles the Mesohippus in all respects except that the size is larger.

Miocene—the epoch of diversification:

With the advent of Miocene period there was extensive branching out of horses towards several lines. Miocene horses were of several forms and exhibit at least three adaptive lines. Of the three evolutionary lines, two overcome the evolutionary hurdles and the other line became extinct.

Parahippus—the lower Miocene horse:

This form represents the transitional stage. In this stage the valleys between the crests in the teeth started to become filled up with cement. The lateral toes are much reduced.

Merychippus—the middle Miocene horse:

This form holds the key of the direct line of equine evolution. The teeth showed a transition from the uncemented short- crowned forms to the fully cemented long- crowned forms.

Though this form is morphologically three-toed, but functionally they are one-toed. The orbit, for the first time, was almost complete. In Merychippus the milk set was uncemented and short-crowned but the permanent set was long- crowned and cemented.

Protohippus—the upper Miocene form:

This form evolved from the Merychippus but showed certain advancement in that both the milk set as well as the permanent set were long-crowned and cemented. The limbs were still three-toed. Evolutionary sidelines.

During Miocene there were two evolutionary sidelines. Hypohippus. This form had low-crowned teeth suited for browsing on succulent herbs. They were called as the browsing horses. Like all other Miocene horses the limbs were three-toed.

They attained the size of pony and were doomed to racial extinction. Hipparion. They showed certain progressive features than the previous forms. Perfection of teeth and development of special features in the skull were progressive in nature.

But they were conservative in retaining three toes in the limbs. They continued up to the Pliocene time when they became all extinct excepting few forms who struggled upto the early Pliocene period.

Pliocene—witnessed the rise of one-toed true horses:

Pliocene period was geologically of great unrest. Pliohippus originated from the Protohippus in the upper Miocene period. They were very progressive forms. The development of the skull characteristics and the perfection of the teeth were like modern horses.

They were single toed forms and there was almost no trace of the lateral toes. Plesippus. This form arose in the late Pliocene period and attained the size of the Arab horse but the limbs were much smaller. They were one-toed forms with no trace of lateral digits. The skull was Equine-

like. The dental pattern was more advanced than that of *Pliohippus* and the teeth were as in *Equus*.

During the Pliocene period another notable form was the South American form— the *Hippidion*, a derivative of the *Protohippus*. The limbs were one-Toed, but were very stout rather than slender. The *Hippidion* continued in the Pleistocene period and transformed into the *Orohippidium*.

Triumph of Modern Horses:

The modern horses belong to the genus *Equus*. Both in North and South America a large number of extinct species of *Equus* belonging to Pleistocene period were recorded. Several forms of horse-like animals are still surviving to-day in Africa and Asia. The forms present in Europe and America are either feral or domesticated. The modern forms of horses belonging to the genus *Equus* are the descendant from the *Plesippus*.

The original site of the origin and evolution of the horses is North America, where they were plenty but became extinct in Pleistocene time. At the beginning of Pleistocene time, *Equus* had migrated from the original North American home to the other continents to become world-wide. In the modern time a number of forms commonly designated as the horses, Zebras and asses are present in the old world.