Fossil Horse Lab

A fossil is any remains of a once-living thing. Fossils may be only the outline of some plant, animal, or protist that is preserved in rock. Sometimes it is possible to find entire skeletons of animals.

Fossils are often used by scientists as evidence of change. Fossils show what living things looked like millions of years ago. They also help show how these once-living things have changed over time. In families such as the horse family, so many fossils have been found that a detailed family tree can be constructed. For more information check out Fossil Horse Cyber Museum. (http://www.filmnh.ufl.edu/natsci/vertpaleo/fhc/firstCM.htm).

Goals:
In this activity you will:
1. Observe diagrams of 3 extinct (no longer in existence) and 1 extant (still in existence) horse(s) shown in their environments.
2. Measure the feet and teeth of extinct and extant.
3. Explain the changes in the horses that have taken place over time.

FIGURE 2.3
Evolution of the horse family, from the Eocene Hyracotherium (Eobippus) to the modern horse (Equus). There was an extraordinary origin, flourishing, and extinction of types of horses in the Miocene. Source: Strickberger, Monroe, W., Evolution, 1990, Jones and Bartlett, Publishers, Sudbury, MA. www.jbpub.com. Reprinted with permission.
Observe the diagrams of the horses *Hyracotherium*, *Miohippus*, *Merychippus*, and *Equus*. Below each diagram, write a brief description of the environment.

1. *Hyracotherium*
   55 million years ago

2. *Miohippus*
   30 million years ago

3. *Merychippus*
   13 million years ago

4. *Equus*
   Today
Changes in Bone Structures with Time
The changes in horses over the last 55 million years have been shown by studies of large numbers of fossils. The earliest kind of horse was small and had teeth that were adapted to browsing on young shoots of trees and shrubs. The present-day horse (*Equus*) is much larger and has larger teeth that are adapted to grazing on the tough leaves of grasses. Early horses were adapted to living in wooded, swampy areas where more toes were an advantage. The single-hoofed toe of the present-day horse allows it to travel fast in the plains.

1. Observe the diagrams below. They show fossils of the front foot bones and the teeth of horses. The foot bones at the upper right of each diagram (black) indicate the relative bone sizes of each kind of horse.

2. Look for and color the following kinds of bones for each horse: red of the toe bones (x), blue for the foot bones (y), green for the ankle bones (w), and yellow for the heel bones (z).

3. Take the data required to fill in the table. (a) count the bones (b) measure length of foot (USE BLACK SCALED DIAGRAMS) (c) measure teeth. Metric is always used in science.
Table 1. Changes in Horse’s feet and teeth

<table>
<thead>
<tr>
<th>Kind of horse</th>
<th>Hyracotherium</th>
<th>Miohippus</th>
<th>Merychippus</th>
<th>Equus</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Number of toes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) Number of toe bones</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(c) Number of foot bones</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(d) Number of ankle bones</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>(e) Number of heel bones</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Total number of bones (b→c)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length of foot (mm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BLACK INSET TO SCALE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height of teeth (mm)</td>
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</tr>
</tbody>
</table>

Analysis Questions

1. How did the environment change from 55 million years ago to today? (at least 2 sentences)

2. Carefully describe all the changes that occurred in the shape of the horse from Hyracotherium to Equus? (at least 2 sentences)

3. How did the size of the horse change from Hyracotherium to Equus? Support your answer with quantitative data.

4. Describe the overall changes in the horses over 55 million years
   (a) foot length 
   (b) number of toes 
   (c) size of the toes

5. List one way that the foot of Hyracotherium differs from that of Miohippus.

6. List one way that the foot of Miohippus differs from that of Merychippus.
7. List two ways that the foot of Merychippus differs from that of Equus.

8. As the environment changed, what happened to the foot of the horse? How do the changes in the foot reflect the horse's environment? Explain how the horse's lifestyle has changed?