

**Chapter 32 Mammals****Summary****32-1 Introduction to Mammals**

All mammals have hair and mammary glands. In females, mammary glands produce milk to nourish the young.

Mammals descended from ancient reptiles. Early mammals, which lived during the time of dinosaurs, were small and active only at night. When the dinosaurs became extinct, mammals evolved to fill many different niches.

Mammals have many different adaptations. Like birds, mammals are endotherms. Their metabolism creates their body heat. They have body fat and fur or hair to prevent heat loss. Many have sweat glands to lose heat.

Mammals must eat a lot of food to maintain their high metabolic rate. Mammals have specialized teeth, jaws, and digestive systems for eating plants or animals or both.

All mammals use lungs to breathe. Well-developed muscles in the chest, including the diaphragm, help pull air into the lungs and push air out.

Mammals have a four-chambered heart and a double-loop circulatory system. Each side of the heart has an atrium and a ventricle. Oxygen-rich blood is completely separated from oxygen-poor blood.

Highly developed kidneys help control the amount of water in the body. This enables mammals to live in many different habitats. The kidneys filter nitrogenous wastes from the blood, forming urine.

Mammalian brains consist of a cerebrum, cerebellum, and medulla oblongata. The cerebrum contains a well-developed outer layer called the cerebral cortex. It is the center of thinking and other complex behaviors.

Mammals have many different adaptations for movement. Variations in the structure of limb bones allow mammals to run, walk, climb, burrow, hop, fly, and swim.

Mammals reproduce by internal fertilization. All newborn mammals feed on their mother's milk. Most mammal parents care for their young for a certain amount of time after birth. The length of care varies among species.

**32-2 Diversity of Mammals**

The three groups of living mammals are the monotremes, marsupials, and placentals. They differ in their means of reproduction and development. Monotremes lay eggs. They also have a cloaca, similar to the cloaca of reptiles. When the soft-shelled monotreme eggs hatch, the young are nourished by their mother's milk.

Marsupials bear live young that complete their development in an external pouch. The young are born at a very early stage of development. They crawl across the mother's fur and attach to a nipple. They continue to drink milk until they are large enough to live on their own.

Placental mammals are the most familiar. Nutrients, oxygen, carbon dioxide, and wastes are passed between the embryo and mother through the placenta. After birth, most placental mammals care for their offspring.

**32-3 Primates and Human Origins**

All primates share several important adaptations. Many of these adaptations are useful for a life spent mainly in trees. These adaptations include binocular vision, a well-developed cerebrum, flexible fingers and toes, and arms that rotate in broad circles.

Very early in evolutionary history, primates split into several groups. Prosimians are small, nocturnal primates with large eyes adapted for seeing in the dark. Anthropoids include monkeys, apes, and humans.

Very early in their evolutionary history, anthropoids split into two major groups. One group evolved into the monkeys found today in Central and South America. This group is called the New World monkeys. All New World monkeys have a prehensile tail. The other group of anthropoids includes the Old World monkeys and the great apes. Old World monkeys do not have prehensile tails. Great apes, which are also called hominoids, include gorillas, chimpanzees, and humans.

The hominoid line gave rise to the branch that leads to modern humans. This group, called the hominids, evolved adaptations for upright walking, thumbs adapted for grasping, and larger brains.

Many recent fossil finds have changed the way paleontologists think about hominid evolution. Now researchers think that hominid evolution occurred in a series of complex adaptive radiations. This produced a large number of different species rather than one species that led directly to the next.

Researchers agree that our genus, *Homo*, first appeared in Africa. However, researchers do not agree when the first hominids began migrating from Africa.

They are also not sure when and where *Homo sapiens* arose. The multi-regional model suggests that modern humans evolved independently in several parts of the world. The out-of-Africa model proposes that modern humans arose in Africa and then migrated out.

About 500,000 years ago, two main groups of hominids are known to have existed. *Homo neanderthalensis* lived in Europe and western Asia. Fossil evidence suggests that they used stone tools and lived in organized groups. The other group is the first *Homo sapiens*. Researchers think that they lived side by side with Neanderthals.

Around 50,000–40,000 years ago, *H. sapiens* dramatically changed their way of life. They made more sophisticated tools. They produced cave paintings. They also began burying their dead with elaborate rituals. In other words, they began to behave more like modern humans. The Neanderthals disappeared about 30,000 years ago. It is not yet known why. Since then, *H. sapiens* has been the only hominid on Earth.