Mammals Essay, Research Paper

Mammals have existed for the past 200 million years. According to fossil evidence, they evolved from a mammal like reptile group. These reptile ancestors were small, active carnivores. They were equipped with several specialized types of teeth. Their limbs were positioned more directly under the trunk as opposed to spreading out to the sides. Both of these characteristics are prominent features of mammals. For the past 70 million years mammals have been the dominant animals in terrestrial ecosystems. Because they are warm-blooded, they have an advantage over their reptilian ancestors.

Despite their size differences, the great blue whale and the pygmy shrew have something in common: they are both members of a warm-blooded, air-breathing class of vertebrate animals known as Mammalia, or mammals. In many ways mammals are the most highly developed of all creatures. The term mammal explains one important way in which creatures in this class are set apart from other animals. It comes from the Latin mamma, which means, “breast.” Every female mammal has special glands, mammae that secrete milk. The females of all but the most primitive mammalian species are viviparous. This means they bear their young alive. The young are then fed with milk until they have grown enough to get food for themselves.

Hair is a typical mammalian feature. In many whales, however, it exists only in the fetal stages of development. Another basic trait of mammals is their highly developed brains–the most complex known. Particularly well developed is their cerebrum, the part of the brain that controls memory and learning. The mammalian brain enables the young to learn from the experience of their elders. Since the young mammal is dependent on its mother for nourishment, a period of learning is possible. This in turn has brought about a degree of behavioral adaptability unknown in any other group of organisms. Whales, seals, and dogs are among the most intelligent mammals, but monkeys, apes, and humans are the most intelligent of all.

Warm-bloodedness makes them capable of longer terms of sustained activity than cold-blooded organisms can undertake. This allows them to exploit environments that would be inhospitable to cold-blooded animals. The term warm-blooded does not mean that a mammal’s body temperature is consistently warmer than that of the environment. In the hot tropics, in fact, the opposite is true. Warm-blooded animals, or endotherms, have an inner climate-control system that is physiologically maintained. Mammals can sustain a constant body temperature that is ideal for their bodily functions under most weather conditions. This requires a high rate of metabolism, and many attributes of mammals are related to its maintenance.

A high metabolic rate requires a great deal of fuel in the form of food and oxygen. By being highly active and having strong limbs, mammals are able to generate heat and obtain large amounts of food. Their respiratory, circulatory, and digestive systems also need to be highly efficient to transform fuel into heat energy. For example, mammals have a secondary palate, which permits breathing while chewing or sucking. This feature assists in the delivery of large amounts of oxygen to the body tissues, where it is used to metabolize food.

Food must be mixed with oxygen, or oxidized, for conversion into energy. Unlike cold-blooded creatures, whose body temperatures are dependent on the weather, mammals must produce a lot of energy to heat themselves. Accordingly, they need large quantities of oxygen. Mammals have strong lungs and, unlike any other class of animals, they have a breathing muscle called the diaphragm to pump large amounts of air into the body and force out carbon dioxide wastes.

The circulatory system of mammals is also very efficient. Their red blood cells can transport more oxygen than those of any other animals, except birds. The mammalian heart is a complex four-chambered organ designed to keep unoxygenated blood and oxygenated blood from mixing. To accommodate this blood separation, mammals have a dual circulatory system. Mammals have a number of traits designed to conserve heat energy. Most mammals have body hair, which insulates by trapping air. Instead of a hairy coat, water-dwelling mammals such as dolphins and whales have a thick, insulating layer of fat.. Hair also serves a defensive and tactile role in mammals. The hair of hedgehogs has been transformed into spines, and that of armadillos has changed partly into bony plates or scales. To protect against overheating, most mammals pant, which is essentially pumping heat out of the body through the lungs. Humans and some other mammals also dissipate heat by sweating.

The more than 200 bones of the mammalian skeletal system show a number of advances over those of lower vertebrates. The mammalian lower jaw, or mandible, for example, is hinged directly to the skull, instead of through a separate bone as in all other vertebrates. Other specialized features of the mammalian skull include an expanded nasal chamber with bones that are folded in complex convolutions, providing a large surface area for the detection of odors. Nearly all mammals have seven neck bones, or vertebrae.

The skeletal system of mammals can be divided by function into the axial skeleton and the appendicular skeleton. The axial skeleton consists of the braincase (cranium), backbone, and ribs. It serves primarily to protect the central nervous system. The appendicular skeleton consists of the limbs and their girdles. In addition, mammals have skeletal elements that trace back through their ancestry to the gill arches of primitive fish and other vertebrates. These elements, collectively called the visceral skeleton, include the jaws, the hyoid apparatus that supports the tongue, and the small bones of the middle ear. The mode of bone growth is another distinguishing feature of mammals. Mammalian long bones grow from two areas–the center of the bone and the ends. In lower vertebrates, however, growth occurs only from the center of the bone.

All mammals reproduce through sexual intercourse. The female egg is fertilized internally. Mammals are divided into three subclasses according to the different ways in which the newborn develop from the fertilized egg. There are about 4,000 species of living mammals, arranged in about 120 families and 20 orders. The primitive monotremes of the subclass Prototheria reflect the reptilian origins of mammals. The duck-billed platypus and the echidna, or spiny anteater, are the only surviving species of this order. Like reptiles, they lay eggs rather than give birth to live young as is typical of all other mammals. After hatching, the young nurse on milk secreted from pores all over the mother’s nippleless chest.

Within the subclass Theria, the pouch-bearing marsupials bear living but underdeveloped young that often spend many months after birth attached to their mother’s teats. As fetuses they obtain their nourishment only from the small yolk that develops around the egg. Since this cannot sustain the fetus long, marsupials are born after a short gestation period of about six weeks. After birth they stay in their mother’s pouch for a period of about six months and feed on her milk. The marsupials include kangaroos, wallabies, wombats, koalas, Tasmanian devils, opossums, and other animals.

The fetuses of some marsupials and all of the higher mammals, subclass Eutheria, are nourished in the mother’s body through a placenta, an organ that attaches the unborn young to the uterine wall. The young of placental mammals develop completely in the uterus, the mother’s womb. They receive nutrients through the mother’s blood via the placenta. This provides the fetus with a safe and constant environment, and its food supply is not limited by what a yolk can provide. Placental mammals produce fully developed young that are suckled and protected by the mother, in the manner of all higher animals.

Artiodactyla, an order of even-toed hoofed animals, including ruminants, pigs, and deer; most are herbivorous and terrestrial. The order Artiodactyla fits into the class mammalia under the subclass Placental Mammals as seen below.

Orders of Living Mammals

MONOTREMES

Monotremata. Duck-billed platypuses and spiny anteaters.

MARSUPIALS

Marsupialia. Kangaroos, wallabies, opossums, wombats, koalas.

PLACENTAL MAMMALS

Insectivora (insect eaters). Shrews, moles, hedgehogs.

Dermoptera. Colugos, or flying lemurs.

Chiroptera. Bats.

Primates (highest order). Tree shrews, lemurs, monkeys, marmosets, great apes, humans.

Edentata. Sloths, armadillos, anteaters.

Pholidota. Pangolins, or scaly anteaters.

Lagomorpha. Hares, rabbits, pikas.

Rodentia (gnawers). Mice, rats, squirrels, porcupines, beavers.

Cetacea. Dolphins, porpoises, whales.

Carnivora (flesh eaters). Cats, dogs, bears, weasels, hyenas, raccoons, badgers.

Pinnipedia. Seals, sea lions, walruses.

Tubulidentata. Aardvarks.

Proboscidea. Elephants.

Hyracoidea. Hyraxes, or dassies.

Sirenia. Manatees, sea cows, dugongs.

Perissodactyla (odd-toed hoofed animals). Horses, asses, zebras, tapirs, rhinoceroses.

Artiodactyla (even-toed hoofed animals). Pigs, cattle, sheep, goats, antelopes, alpacas, camels, deer, giraffes, hippopotamuses.