

MAMMAL FACT SHEET

Created by the Center for Aquatic Sciences at Adventure Aquarium

What are Mammals?

- Mammals are the most familiar of all animal groups on Earth for a very good reason. You are a mammal.
- Mammals are warm-blooded, air-breathing animals usually covered in hair that nurse their young using specialized mammary glands.
- Mammals have other important evolutionary adaptations as well. Dogs, bats, horses, whales (although, not covered in hair) and humans are all examples of today's mammals.
- The first mammals appeared on Earth about 225 million years ago in the heart of the Triassic Period. These ancient mammals were small (about the size of a mouse) and evolved from a group of doglike reptiles called therapsids.
- At around the same time that the first mammals showed up, the first dinosaurs appeared, too. Unlike early mammals, dinosaurs and other terrestrial reptiles grew to large sizes allowing them to dominate the landscape. Most ecological niches for medium and large sized herbivores and carnivores were occupied by these ancient reptiles.
- The early mammals remained small. Many became successful insectivores. They avoided large carnivores by maintaining a nocturnal lifestyle and hiding in burrows and crevices during the day.
- Unfortunately, the majority of the large terrestrial animals disappeared during the Cretaceous–Paleogene extinction event, also known as the K-T event, about 65 million years ago. Mammals on the other hand, possibly because of their subterranean habits or unique adaptations, survived the extinction event. As a result, surviving mammals quickly diversified into many new and unique species.

- Today, there are over 5600 living species of mammals that crawl, fly, burrow and swim on planet Earth. This includes the largest animal that has ever lived, the blue whale.

Do mammals have a special way to feed their young?

- Mammals get their name from the unique presence of mammary glands that produce milk to nourish offspring. Only mammalian females possess functional mammary glands and they are always found in pairs.
- The number of mammary glands that a mammal has reflects the typical number of offspring the animal produces. Whales, primates and some bats, who usually produce only one or two offspring at a time, only have one pair of mammary glands. On the other hand, more prolific mammals like rats can have six pairs of mammary glands.
- Young marsupial and placental mammals suck milk from the mammary glands by latching onto their mother's nipples. In contrast, the peculiar monotremes produce milk that exudes directly from the mammary gland onto the mother's body. The young must lick the milk directly from the parent's fur.
- The only other exception as to how baby mammals access their mother's milk is with whales and other cetaceans. Female whales can forcibly eject the milk from the nipple into the mouth of the young. This adaptation is essential as baby whales do not have lips needed for suckling.
- Milk is the sole food for newly born mammals and contains lactose, albumin, butterfat and water as its main components. The proportions of these components vary however based on the species.
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- Albumin accelerates growth. Guinea pig milk is high in albumin allowing baby guinea pigs to double their weight in just a few days. Humans, on the other hand, have a lower amount of albumin in their milk, resulting in a slower growth rate. Marine mammals, which rely on body fat to keep them warm in the water, have milk with as much as 50% butterfat to quickly increase the young's weight.

Why do mammals have hair?

- With the exception of mammary glands, the presence of hair or fur is the most representative adaptation for mammals.
- Mammals developed hair primarily as insulation to keep warm. Their warm-blooded lifestyle allowed early mammals to thrive in colder habitats and be active at night where the warming benefit of the sun does no good.
- Hair evolved as a way to keep their body heat from escaping into their often cooler environment. As mammals diversified into different forms, some families reduced their dependence on hair as an insulator.
- Humans are sometimes referred to as hairless apes because we have significantly less body hair than other primates.
- The most extreme examples are whales and dolphins, which have completely lost body hair to develop a more streamlined body. Despite this, whales and dolphins are still mammals as their immediate ancestors had hair. In fact, some whales still have a few non-functional hairs on their heads or around their mouth.
- While body hair first evolved as form of insulation, it has other functions or special uses as well. A porcupine's defensive quills are actually just large, stiffened hairs. Whiskers are attached to important sensory receptors giving some animals like a walrus or a cat an extra sense of touch. The use of whiskers is very important for burrowing mammals that have reduced eyesight.

What else is hair used for?

- Hair and fur can also act as camouflage or serve in communication. The white tail deer uses the bright underside of its tail as a warning flag to other deer that danger may be near. A polar bear is white to blend into its snowy habitat while a black bear's coloration helps it camouflage within its forested range.
- Of special note regarding mammalian hair is piloerection. Each hair follicle is connected to tiny muscles that can make the hair stand erect. This is useful in two different ways.
- When mammals have a need for extra warmth, the movement of the hair can trap additional air between the hairs to give extra insulation. When a mammal is scared, the hair standing strait can give the appearance of being larger than the mammal actually is. Think about a cat puffing up when it encounters a dog. The cat is trying to look more threatening as a defense against the dog.
- Despite human's reduction on body hair, we still have this classic response to chills and fear. When was the last time you had goose bumps?

Why do some mammals have different teeth?

- Clearly mammals are not the only type of animal that has teeth. However, mammals have evolved a differentiation of teeth, meaning that not all of the teeth are the same or do the same job.
- Mammals, including humans, have a variety of different types of teeth. Front teeth, known as incisors, are useful for cutting, grasping and gnawing. The number of incisors varies between species and most herbivores have highly developed incisors. Rodents for example, rely on their incisors so much that their teeth are continually being worn down. For this reason, rodent's incisors continually grow throughout their life.

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- Canine teeth are sometimes large and pointed and most highly developed in mammals that are carnivores. They serve principally for the capturing and killing of prey and for tearing flesh. Canine teeth are completely lacking on rodents, rabbits and some other herbivores. Other mammals have greatly enlarged canine teeth that form tusks. The upper canines of the walrus are used to dislodge shellfish and to aid in hauling out on pack ice.
- The teeth located furthest back on the mammalian jaw are the premolars and molars and they exhibit the greatest diversity. Carnivorous mammals, like wolves, have sharp, blade-like cutting edges on the premolars and molars. Grazers, like cows, have large, flat grinding molars. Mammals that have a more omnivorous diet have molars that can be used for cutting as well as grinding.
- Mammals are the only animals with specialized teeth.

Is hair the only thing that keeps mammals warm in the winter?

- Mammals, along with birds, are the only living animal groups that are considered warm-blooded.
- A warm-blooded metabolism enables an animal to maintain a constant body temperature, unlike cold-blooded animals whose body temperature changes with their surroundings. A warm-blooded metabolism allows birds and mammals to be more active than most other terrestrial vertebrates. A self-warming body also allowed mammals and birds to expand their ranges to colder environments as well as to better survive historical ice ages.
- Mammals and birds had to develop a body covering that functions as insulation allowing them to maintain their body temperature.

- All mammals breathe air by using lungs. Mammals do not have gills. A muscular diaphragm flexes inflating the lungs with breathable air then relaxes allowing the lungs to exhale.
- Some marine mammals can hold their breath for exceptional amounts of time, however even these species must eventually come to the surface to breathe.

Are all mammals more or less the same?

- By far the most common group is the placental mammals, which include almost every native mammal in Europe, Asia, Africa and the Americas.
- Placental mammals give birth to live, well developed young. This group gets its name due to their development of a placenta, which is an organ that connects the developing embryo and the mother. The placenta allows for the exchange of oxygen and nutrients while the young remains inside the mother's uterus. This enables the embryo to continue to develop within the safety of the mother's body.
- The placenta is expelled from the mother's body during the young's birth. The belly button is the scar that remains on placental mammals from where the umbilical cord that connects the placenta to the embryo.

Why do some animals have pouches?

- The second largest group of living mammals only accounts for about 330 species and 70% of them live in Australia, known as marsupials. Probably the most familiar marsupial to Americans is the kangaroo.
- The kangaroo's most unusual feature, the pouch, is what makes marsupials unique. Instead of giving birth to a relatively well developed offspring, marsupial babies are born extremely

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underdeveloped. This is where the pouch comes in.

- After birth, the tiny offspring climbs from the birth canal into the mother's pouch where the mammary glands are located. The young then latches onto a nipple and continues to develop within the safety of the mother's pouch.
- All of Australia's native mammals, with the exception of bats and rodents, are marsupials, not just kangaroos.
- Other famous Australian mammals like the koala, wombat, bandicoot and even the Tasmanian devil have pouches, just like kangaroos.
- Other placental mammals, like dingoes and camels were introduced to Australia by man. The remaining 30% of the world's marsupials live in South and Central America. North America's lone marsupial is the opossum.
- The final group is also the most peculiar, the monotremes. There are only five living species, the platypus and four species of echindas and all live in Australia and New Guinea. The monotremes give birth by laying eggs. Other peculiar traits include a lack of teeth in adults and milk produced by pores in the skin rather than from nipples.

Are dolphins and whales considered mammals or fish?

- One of the most specialized groups of mammals is collectively known as marine mammals. Marine mammals are those mammals that have adapted to life in the ocean and spend the majority, if not all of their lives in the sea.
- Marine mammals include cetaceans (whales and dolphins), pinnipeds (Seals, sea lions & walrus), Sirens (Manatees & Dugongs) and sea otters.
- While these groups are not closely related, they all share some characteristics to enable them to thrive in a marine environment.

- All marine mammals developed a streamlined body with appendages designed for swimming rather than running.
- They also have an increased capacity to utilize and store oxygen enabling marine mammals to spend longer amounts of time submerged between breaths.
- The most important adaptation for warm blooded mammals living in the cold seas is insulation. Most marine mammals have developed thick layers of fat, called blubber, in order to maintain a warm core temperature. Sea otters, on the other hand, have developed one of the densest coats of fur in the animal kingdom to keep them warm.
- The U.S. Marine Mammal Protection Act (MMPA) of 1972 protects all marine mammals in US waters from harassment and hunting (apart from native subsistence hunting), as do laws of many other nations.

Who is at Adventure Aquarium?

- You might not guess it due to their immense size, but Nile hippos are actually herbivores, meaning they prefer a diet of grains, Timothy hay, fruits, vegetables and leafy greens. They eat 70,000 calories a day, which comes out to 35-40 pounds of food a day. You and I would have to eat about 115 Philly Cheesesteaks to eat that many calories!
- The quills of the Cape porcupine are covered in tiny barbs, or hooks, so if a quill sticks into a predator's skin, it won't come back out very easily. They don't shoot their quills but once the quills are stuck into their enemy, the porcupine can release the quills and escape. The porcupine will then grow new quills to replace the lost ones.
- Be sure to visit <http://www.adventureaquarium.com/Wh-at-to-do/Aquarium-animals.aspx> for more about the animals you will see when you visit Adventure Aquarium.

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