ThoughtCo.

The Eight Main Mammal Characteristics

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01 of 09 What Makes Mammals Different From Other Vertebrate Animals?

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Mammals are amazingly diverse animals: they live in nearly every available habitat on earth (including deep seas, deserts, tropical rain forests, and deserts), and they range in size from one-ounce shrews to 200-ton whales. But what exactly is it that makes a mammal a mammal, and not a reptile, a bird or a fish? On the following slides, you'll learn about the eight main mammal characteristics, ranging from hair to four-chambered hearts.

02 of 09 Hair and Fur

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All mammals have hair growing from some parts of their bodies during at least some stages of their life cycles. Mammalian hair can take on several different forms, including thick fur, long whiskers, defensive quills and even horns. Hair serves a variety of functions: insulation against the cold, protection for delicate skin, camouflage against predators (as in zebras and giraffes), and sensory feedback (as witness the sensitive whiskers of your everyday house cat). Generally speaking, the presence of hair goes hand-in-hand with a warm-blooded metabolism.

What about mammals that don't have any visible body hair, like whales or Olympic swimmers? In the case of whales and dolphins, many species have sparse amounts of hair during the earliest stages of their development, while others retain wispy patches of hair on their chins or upper lips. And, of course, even completely hairless-looking humans still retain the hair follicles in their skin!

03 of 09 Mammary Glands

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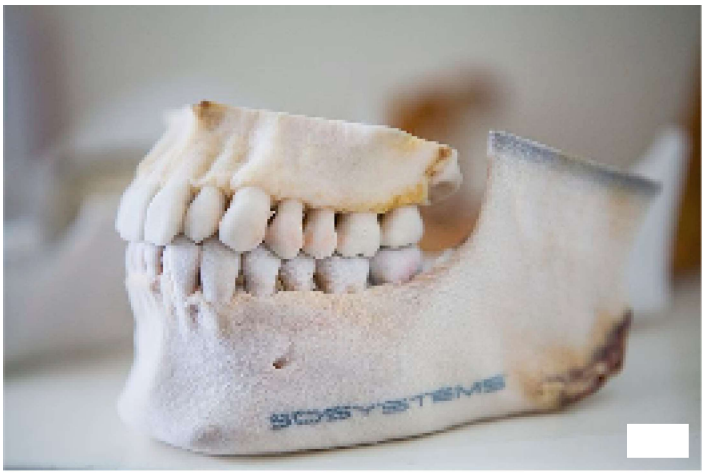
Unlike other vertebrates, mammals nurse their young with milk produced by mammary glands. Though they're present in both males and females, in most mammal species mammary glands only fully develop in the females, hence the presence of smaller nipples on males (including male humans). The exception to this rule is the male Dayak fruit bat, which nature has endowed (for better or worse) with the task of breast feeding.

Mammary glands are modified and enlarged sweat glands consisting of ducts and glandular tissues that secrete milk through nipples; the milk provides young with much needed proteins, sugars, fats, vitamins and salts. However, not all mammals have nipples: monotremes like the platypus, which diverged from other mammals early in evolutionary history, instead secrete the milk produced by their mammary glands via ducts located in their abdomens.

04 of 09 Single-Boned Lower Jaws



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The lower jawbone of mammals is composed of a single piece that attaches directly to the skull. This bone is called the dentary, because it holds the teeth of the lower jaw.; in other vertebrates, the dentary is only one of several bones in the lower jaw, and does not attach directly to the skull. So what's the big deal? Well, this single-pieced lower jaw and the muscles controlling it endows mammals with a powerful bite, and also allows them to use their teeth to either cut and chew their prey (like wolves and lions), or grind down tough vegetable matter (like elephants and gazelles).

05 of 09 One-Time Tooth Replacement

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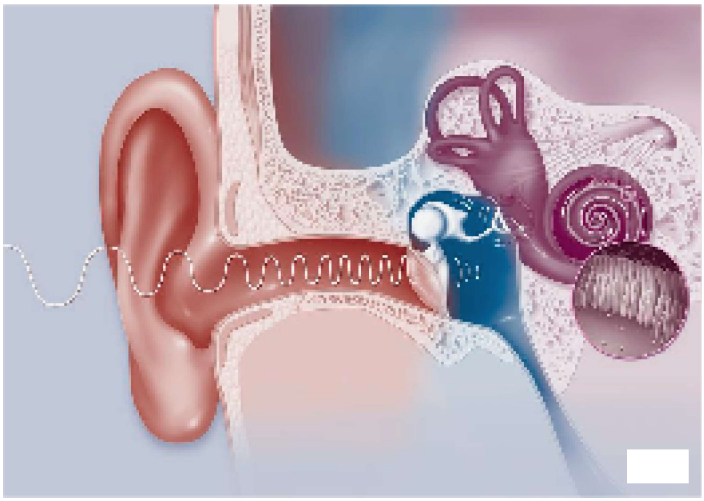
Diphyodonty is a pattern, not unique to mammals, in which teeth are replaced only once throughout a vertebrate's lifetime. The teeth of newborn and young mammals are smaller and weaker than those of adults; this first set, known as deciduous teeth, fall out before adulthood and are gradually replaced by a set of larger, permanent teeth. (This fact will be self-evident to any first- or second-graders reading this article!) By the way, animals that replace their teeth continuously throughout their lifetimes--like sharks--are known as polyphodonts.

06 of 09 Three Bones in the Middle Ear



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The three inner ear bones—the incus, the malleus and the stapes, commonly referred to as the hammer, the anvil and the stirrup—are unique to mammals. These tiny bones transmit sound vibrations from the tympanic membrane, or eardrum, to the inner ear, and transforms these vibrations into neural impulses that are then processed by the brain. Interestingly, the malleus and incus of modern mammals evolved from the lower jaw bone of the immediate predecessors of mammals, the "mammal-like reptiles" of the Paleozoic Era technically known as therapsids.

07 of 09 Warm-Blooded Metabolisms

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Mammals aren't the only vertebrates to have endothermic (warm-blooded) metabolisms; this is a trait shared by modern birds and their ancestors, the theropod (meat-eating) dinosaurs of the Mesozoic Era. However, one can argue that mammals have made better use of their endothermic physiologies than any other vertebrate order: it's the reason cheetahs can run so fast, goats can climb the sides of mountains, and humans can write books. (As a rule, cold-blooded animals like reptiles have much more sluggish metabolisms, since they must rely on external weather conditions to maintain their internal body temperatures.)

08 of 09 Diaphragms

As with some of the other traits on this list, mammals aren't the only vertebrates to possess a diaphragm, the muscle in the chest that expands and contracts the lungs. However, the diaphragms of mammals are arguably more advanced than those of birds, and definitely more advanced than those of reptiles. What this means is that mammals can breathe and utilize oxygen more efficiently than these other vertebrate orders, which, combined with their warm-blooded metabolisms (see previous slide), allows for a wider range of activity and the fuller exploitation of available ecosystems.

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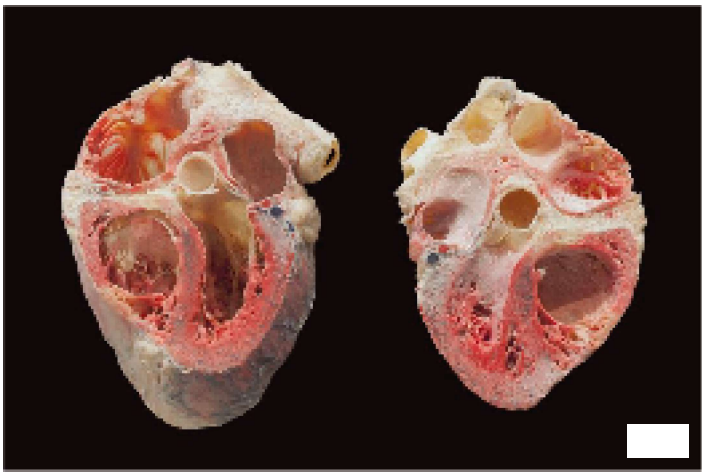
09 of 09 Four-Chambered Hearts



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Like all vertebrates, mammals have muscular hearts that contract repeatedly to pump blood, which delivers oxygen and nutrients throughout the body and removes waste products like carbon dioxide. However, only mammals and birds possess four-chambered hearts, which are more efficient than the two-chambered hearts of fish and the three-chambered hearts of amphibians and reptiles. A four-chambered heart separates oxygenated blood, which comes from the lungs, from the partially deoxygenated blood that circulates to the lungs to be re-oxygenated. This insures that mammalian tissues only receive oxygen-rich blood, allowing for more sustained physical activity with fewer intervals of rest.