

HORNS AND ANTLERS

Horns were a familiar sight in prehistoric landscapes, 100 million years before they became common in mammals. *Triceratops* had three horns: one nasal horn and two above the eyes. It also had a horny shield along the posterior margin of the head. *Styracosaurus* had a 0.7 m nasal spike. These early reptilian horns probably provided a very effective defense against fierce prehistoric carnivores and may have been used in intraspecific encounters.

Mammalian horns are a carryover from their reptilian heritage. They are most common in a group of hoofed mammals, the artiodactyls (e.g., cattle, sheep, and goats). A horn is a spike of bone that arises from the frontal bone of the skull and is covered with the protein keratin (figure 1a). This bony spike, the “os cornu,” grows slowly from youth to adulthood, and its marrow core is highly vascularized. Filaments of keratin arise from follicle-like structures in the skin. Keratin filaments are cemented together and completely cover the os cornu. The outer horn layers have no blood supply.

Horns are defensive structures. They exist in symmetrical pairs and are present in both sexes. As any farmer or rancher knows, horns do not regenerate if cut off. Horns are usually not shed. One exception is the pronghorn antelope (*Antilocapra americana*). Every year, a new horn grows on the os cornu beneath the old horn, and the latter is eventually pushed off.

Another kind of head ornamentation, the antler, is common in deer, elk, moose, and caribou. Antlers are highly branched structures made of bone, but are not covered by keratin. Unlike horns, they are usually present only in males and are shed and reformed every year (figure 1b). Caribou are an exception because antlers are present in both sexes. Antlers are more recently evolved than horns; the earliest records of antlered animals are from the Miocene epoch (mid-Tertiary period), and by the Pleistocene epoch, they had become common.

Seasonal changes in the level of the male hormone testosterone regulate antler development. Antlers of male elk begin to form in April as skin-covered buds from the frontal bone. The primordial cells that initiate antler growth are left behind from the

previous year when the antlers were lost. Antlers begin to branch after only 2 weeks. By May, they are well formed, and by August, they are mature. Each year, antlers become more complexly branched. Throughout the spring and summer, they are covered with delicate, vascular tissue called velvet. In August, the bone at the base of the antler becomes progressively more dense and cuts off blood flow to the center of the antler. Later, blood flow to the velvet is cut off, and the velvet begins to dry. It is shed in strips as the antlers are rubbed against the ground or tree branches. Breeding activities commence after the velvet is shed, and the antlers are used in jousting matches as rival males compete for groups of females. (Rarely do these jousting matches lead to severe injury.) Females tend to select males with large antlers, which may explain why antlers can get so large in some species. (Although now extinct, the Giant Stag, *Cervis megaceros*, had antlers with a 3 m spread and a mass of 70 kg.) Later in the fall, or in early winter, the base of the antler weakens as bone is reabsorbed at the pedicels of the frontal bone. Antlers are painlessly cast off when they strike a tree branch or other object.

Other hornlike structures are present in some mammals. Rhinos are the only perissodactyls (e.g., horses, rhinos, and tapirs) to have hornlike structures. Their “horns” consist of filamentous secretions of keratin cemented together and mounted to the skin of the head. There is no bony core, and thus, they are not true horns. Rhino “horns” are prized in Asian countries for their presumed aphrodisiac and medicinal properties and as dagger handles in certain mideastern cultures. These demands have led to serious over-hunting of rhinos; in many regions, they are almost extinct.

The horns of giraffes are skin-covered bony knobs. Zoologists do not understand their function.

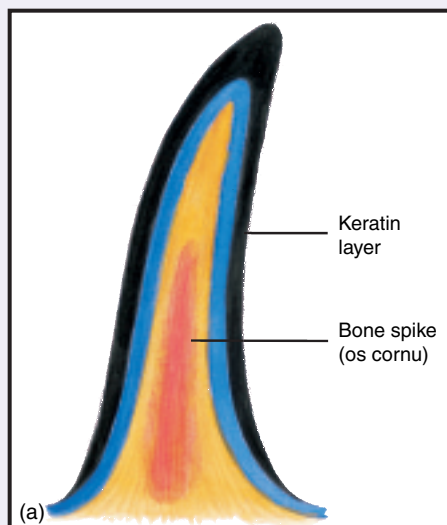


FIGURE 1
Horns and Antlers. (a) The structure of a horn. (b) Development of deer antlers. (Miller/Harley: *Zoology*, 5th ed. © The McGraw-Hill Companies.)