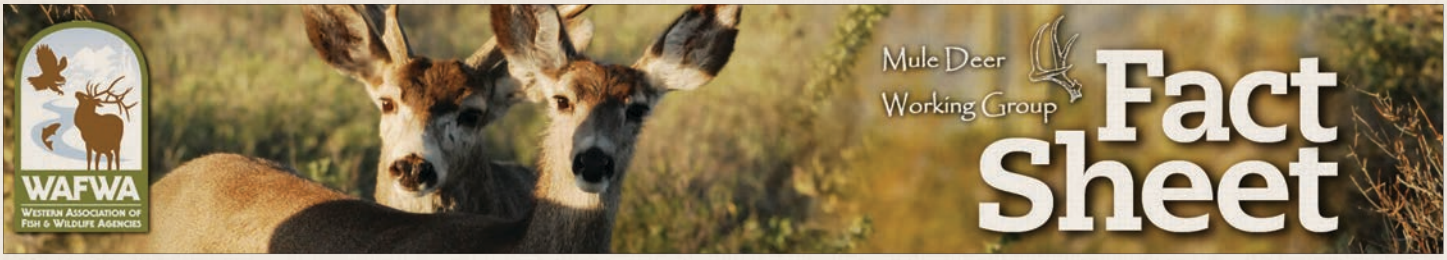


MULE DEER ANTLER DEVELOPMENT
Fact Sheet #27

OVERVIEW
Throughout history antlers have been valuable for functional and ceremonial use because of their durable nature and mysterious death and rebirth cycles. The more we learned about antler development, the more complicated the whole process appeared. As we started to scientifically investigate the growth of antlers we put more pieces of the puzzle together and began to form a more complete picture of this complex process.

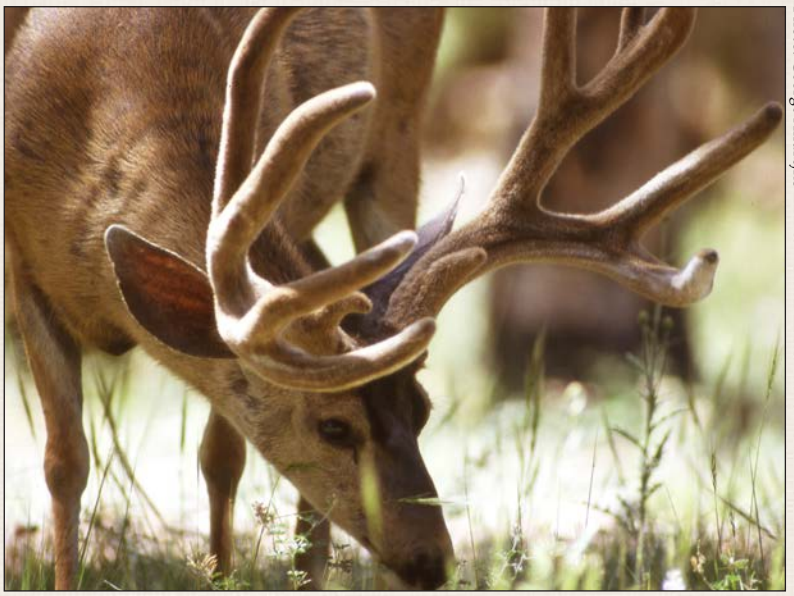


Photo: George Andrejko

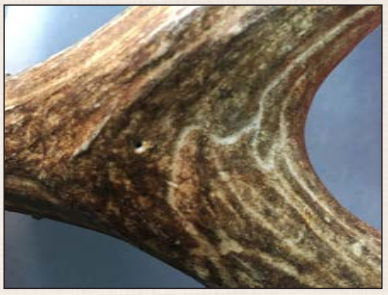
THE EXTERNAL BONES
Antlers are actually bones that exist outside of the body and are supplied with nutrients via blood flow while growing. They eventually die, drop off, and immediately begin growing again. These external boney appendages on the heads of members of the deer family start to develop on males after their first few months. Underneath a buck fawn's forehead skin is a region of thickened tissue, essential for the growth of antlers. Researchers have shown this tissue can be transplanted on to boney places elsewhere on the body and produce antlers at that new site. Growing antlers are basically cartilage made up primarily of protein. However, this is no ordinary cartilage because it is full of blood vessels needed for rapid antler growth. During growth, this cartilage is spongy in appearance and even rubbery to the touch. As growth continues, the cartilage is gradually replaced with bone material. The mineral content of antlers is about the same as true bones: mostly calcium and phosphorus.

HORMONES
Testosterone is at low levels during antler growth. In the autumn, testosterone levels rise and other hormone levels fluctuate, causing rapid final mineralization of the antlers into bone and then drying of the velvet-like outer skin. After the breeding season, more hormonal changes, primarily declining testosterone levels, trigger a weakening of bone at the junction of the antler and base and the antlers fall off. After only a few weeks of scab formation and tissue recovery the next cycle of antler growth begins. If a buck fawn is castrated before his boney bases develop, he will never grow antlers. If a buck with hardened antlers is castrated his testosterone rapidly drops and he will soon shed his antlers. Bucks lacking normal testosterone levels for any reason will grow antlers but stay in velvet permanently because of the lack of the autumn spike in testosterone. Fluctuations in hormone levels throughout the year are regulated by changes in the amount of daylight each day. The eyes detect periods of light and dark to trigger the brain to meter out correct levels of hormones. To show the regulating effect of changing day length on antler development, researchers have artificially changed the periods of daylight and dark indoors so that bucks grew two or more complete sets of antlers the same year. They also caused bucks to grow a set of antlers at exactly the opposite time of the year than normal.

VELVET SKIN

In buck fawns, antler velvet appears among the small swirls of hair on the frontal bone of the skull. This dark, velvet-like skin is full of blood vessels and is unlike any other in the animal kingdom and is remarkably similar to fetal tissue because of its rapid growth rate, rapid wound healing, and production of new hair follicles. After dropping the previous year's antlers, the resulting wound does not form scar tissue like normal skin, but rather scabs over until the new antler growth again generates healthy, productive, and regenerative velvet skin. When velvet tissue is shed, it starts to loosen from the antler aided by the buck rubbing his antlers on a sapling or bush. Shedding velvet occurs rapidly once it's started, usually within 24-48 hours. When velvet comes off, most antlers are very white, but stained by blood. A brown compound in tree bark called tannin, along with residual blood, stain antlers with their familiar brown color.

BLOOD FLOW



Growing antlers are warm to the touch because of the abundant blood flow in the velvet. Blood carries nutrients and various compounds to the growing antlers, which promote cell division and tissue growth. Arteries feed the growing tips where the blood flows through the active growth zone and returns down the center of the antler. Arteries in the velvet share a unique quality with umbilical cord arteries; they both have the ability to constrict very quickly when severed to stop the loss of blood. The grooves and texture of antler bases and mainbeams are mostly from where major blood vessels in the velvet left impressions in the hardened antlers.

NERVES AND ANTLERS

Velvet contains a large number of nerves which make them sensitive to the touch. Even tame captive bucks rarely tolerate touching their velvet antlers. This sensitivity allows the buck to learn the size and shape of his antlers as they grow, which is important so bucks can avoid hitting their soft antlers on brush, trees, and hard objects that might damage them. Knowing the shape and size of the antlers also comes in handy during sparring matches and fights. These nerves are also involved in guiding the shape of antlers as they grow. One experiment applied a low electrical current to growing velvet antlers and it disrupted the nerve impulses enough to create badly misshapen antlers. The nerves are the reason damage to velvet often causes deformed antlers that year. Damage to the bases can also cause nontypical growth in future years.

Photo: Levi Heffelfinger

THE MULEY ANTLER

Antler size is a function of age, nutrition and genetics. Species generally have unique antler configurations and the mule deer version is not shared by any other living deer. Mule deer antlers fork once 6-10 inches from the base and then each branch forks again in the classic mature form. Even on mature bucks, browtines between the base and first fork are small or absent. This configuration results in the iconic “4x4” antlers so revered among western hunters.

More information on mule deer can be found at www.muledeerworkinggroup.com

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