

CACTUS BUCKS



Photo: doylemsphotography.com

By Jim Heffelfinger

British philosopher, Bertland Russell, once said: "What science cannot tell us, mankind cannot know." Despite our valiant attempts to unlock their mysteries, antlers are a reminder that we cannot know everything. The field of antler research has told us much about the physical and physiological process of antler development, but there remains many things for which we simply have no explanation.

We do know that antlers grow as a protein-rich cartilage which is then mineralized and changed to bone as mostly calcium and phosphorus are transported by blood flow and deposited into the hardening antler. This growth and

mineralization is orchestrated by a complicated system of hormonal fluctuations increasing and decreasing at various times throughout the year.

Photo: Colorado Parks and Wildlife



Cactus bucks are so named because their uncontrolled antler growth with many irregular points look cactus-like.

The timing of most of these fluctuations is driven by the seasonal changes in the relative length of day and night cycles. Like everything in nature, things occasionally go wrong and in some cases they go very wrong.

One of the most remarkable ways that antlers go "wrong" is when an individual retains the velvet on his antlers into the fall and sometimes carries a badly deformed mass of velvet antler material. The worse ones have a multitude of small burrs or projections sticking out in all directions along the length of the antler beam and tines. These bucks are frequently referred to as "Cactus Bucks" because it looks like a cactus on top of their head. This condition has been reported



This buck was over 12 years old and consequently experienced a deterioration of his normal hormone cycle causing classic "cactus buck" antler growth.

for centuries in many different deer species around the world. Except for a few local clusters, it is uncommon, showing up here and there in individual deer.

Remarkably, we still know very little about the causes of cactus bucks in the wild. One thing we know is that it is mostly associated with things that interrupt the hormone cycle or possibly the ability of antlers to detect the hormones in the bloodstream. Hormone levels, endocrine disruptors, genetics, age, injury, disease, deformed reproductive tissues, and antlered does are all potential causes for abnormal velvet antlers. One or several of these acting together can cause the occurrence of what we call cactus bucks.

HORMONES

Abnormal or improperly-timed fluctuations of hormones can cause irregular antler cycles or abnormal antler conditions. Young fawns that are castrated before three to four months never develop pedicles (bases) because they never produce the necessary testosterone levels required for this first step in antler development. Later injections of testosterone will initiate the production of a bony pedicle. A buck that is castrated while in velvet will never lose the velvet from his antlers because he lacks the rapid rise in testosterone that occurs prior to rut. Without the sub-

sequent decrease in testosterone after rut, a castrated buck does not drop his velvet antlers. The buck then continues to grow more antler material in the next antler cycle, never shedding his antlers until he finally carries a grotesque mass of velvet antlers.

Antler growth is still possible without testes because high levels of testosterone are not needed to grow antlers. Low levels of male hormones are produced by other structures such as the adrenal gland near the kidneys and that may be enough to grow antler material, but not enough to stimulate the closure of blood vessels that causes the velvet to dry up.

Bucks that are castrated while carrying hardened antlers will drop their antlers within a few weeks because of the sharply falling testosterone level. Bucks castrated after they drop their hardened antlers, will grow new antlers the next year, but they will never be polished or shed because of the lack of sufficient testosterone levels. In the 1840s, naturalist John J. Audubon described two castrated bucks he observed: *"Their horns continued to grow for several years; the antlers were of enormous length and very irregularly branched, but the velvet was retained on them....they had become very large and when first seen at a distance we supposed them to be elks."*

GENETICS

Many odd points and abnormalities are the result of the animal's genetic blueprint. Antler characteristics are inherited from the buck's parents so a nontypical buck will produce a disproportionate number of offspring with nontypical points. Genetically-programmed antler abnormalities can be seen year after year in each new set of antlers an individual grows. Although many abnormal antler conditions are genetically-based, the grotesque antlers of cactus bucks are probably not genetic in most cases. The exception to this may be cases where a genetic mutation affects the production, transport, or reception (in the velvet antlers) of a hormone. This facet of the cactus buck mystery has never been investigated.



When the velvet is removed from cactus bucks, the full extent of the uncontrolled antler growth is revealed. The "Barnacle Buck" is a white-tailed deer cactus buck that has been on display for many decades in the Buckhorn Bar and Saloon in San Antonio, Texas.

AGE

Age is a contributing factor in the production of cactus bucks only as it relates to the maintenance of adequate hormone levels. When a buck becomes very old, the complicated cycle of hormones sometimes begins to break down. Antlers will not grow normally without some hormones at correct levels. With the loss of an adequate spike in pre-rut testosterone, the antlers will stay in velvet and not be shed. This is obviously a hormone issue, but caused by the advanced age of the buck.

INJURY

Obviously castration in the wild is an injury that would clearly produce a cactus buck. Many times people explain cactus bucks by saying they must have been castrated while jumping over a barbed wire fence. This may seem like an obvious explanation (especially for those of us who cross barbed wire fences!), but I have to believe that bucks are more careful with such an important package.

Nicks and cuts in the velvet antlers can produce odd points, and an injury to a leg bone often causes a misshapen antler the next year. Extensive trauma to the pedicle (base) before growth begins or soon after is the source for many large freakish racks. However, these bucks will lose their velvet as rut approaches, differentiating them from cactus bucks.



There are many different potential causes of the condition we refer to as "Cactus Bucks" but only a thorough inspection of the deer inside and out can diagnose the root cause in any particular buck.

DISEASE

Tumors can affect hormone levels and cause antler oddities such as antlered does or cactus bucks. There are cases of antlered females having a cyst or tumor on their ovary or their adrenal gland. Tumors like these can disrupt the normal balance of hormones and may provide enough male-type hormones to initiate antler growth.

Hemorrhagic diseases can cause hemorrhaging in the testes which leads to the destruction of cells that produce testosterone and subsequently reduces the circulation of male hormones. The result of this damage to the testes is an incomplete hardening of the antlers whereby they become very brittle under a dead velvet covering. Epizootic hemorrhagic disease and bluetongue are specific hemorrhagic diseases that commonly strike deer in late July-August, which corresponds to the last stages of antler growth. Recently, a cluster of cactus bucks observed near Delta County, Colorado was investigated and most likely caused by epizootic hemorrhagic disease.

ENDOCRINE DISRUPTORS

There are many different compounds called "endocrine disruptors" that can interrupt the hormone cycle either by reducing the production of hormones or by interfering with the binding of those hormones at receptor sites in the velvet antlers. These can produce symptoms similar to castration. Endocrine disruptors can come from naturally occurring plants, herbicides, pesticides, and other chemicals.

One class of hormone-like compounds that have received a lot of attention are phytoestrogens. These are naturally occurring compounds found in plants that are very similar to estrogen. They are a defense mechanism produced by the plant to reduce browsing by herbivores like deer. Unfortunately we do not know enough about what natural deer foods have high concentrations or under what conditions phytoestrogen levels are higher than normal. It is interesting that cases of cactus bucks frequently occur in association with certain soils, or after fires or unusual weather patterns (like drought). Other types of endocrine disruptors are compounds such as Zearalenone which are produced by mold. This is a naturally-occurring compound with estrogen-like activity that has been shown to reduce testicle size and interfere with hormones. Problems with Zearalenone are probably most common with supplemental feeding programs, where storage of feed creates an environment for mold growth.

CRYPTORCHID BUCKS

Cryptorchid males are bucks with testes that never descended into the scrotum. They remain inside the body cavity encased in fatty tissue. It is difficult to find the testes in this case because they are not in the normal location and are hidden in other tissue. The name "cryptorchid" literally means "hard-to-find testes." Sometimes only one testicle descends (unilateral cryptorchid) or both may fail to descend (bilateral cryptorchid). Because the scrotum is empty and barely noticeable on bilateral cryptorchids, these animals are sometimes described as antlered does. These bucks may have polished antlers in the fall if their internal testes are developed enough to produce the needed hormones like testosterone.

HYPOGONADAL BUCKS

These poor souls simply have testes that descended into the scrotum, but never developed larger than a pea. "Hypogonadal" means "small gonads" (I'm sure you can find a use for that word in deer camp this year!). Because the testes are underdeveloped, the testosterone and other hormones are not high enough to



The lack of normal testosterone fluctuations in cactus bucks results in incomplete hardening of the antlers and the retention of velvet.

mineralize antlers so these bucks will always be in velvet, won't shed their antlers, and will be sterile.

HERMAPHRODITES

These are deer that possess both male and female sex organs. They usually have an ovary on one side and an internal testicle on the other (lateral hermaphrodites). These animals are not capable of reproducing, but because of the presence of testosterone, they usually carry out a normal antler cycle. Hermaphrodites might have polished antlers during the fall, but the presence of the ovary can produce enough estrogen to offset the effects of the testosterone and cause the antlers to stay in velvet.

PSEUDOHERMAPHRODITES

Pseudohermaphrodites do not have any real female reproductive parts (no ovary), but externally they may look very female. These bucks lacked the proper levels of male hormones during early development, causing a lot of confusion in the formation of their reproductive organs. These animals can look almost entirely male or almost all female depending on their hormones during development. This class of cactus bucks is difficult to diagnose since the sex organs may look like a female from the outside. In some cases the penis is inside the body and the buck urinates through an opening that looks somewhat like a female deer. It is highly unlikely that these animals would have hardened antlers because if male hormone levels were too low to form male reproductive tissues, they will not be high enough to mineralize antlers and shed velvet.



Antlered does like this one harvested by Alan Woodward (Three Rivers, TX) remain in velvet like cactus bucks and do not shed their antlers.

TRUE ANTLERED DOES

Most true antlered does have fully functional female reproductive tracts. These does can breed, become pregnant, and successfully raise fawns. These antlered does remain in velvet and are subsequently reported as cactus bucks. What actually initiates the antler development in these does is still somewhat of a mystery. Because of the lack of increasing testosterone levels at the end of summer, true antlered does in the wild do not have polished antlers. They never lose their velvet and the antlers are often deformed, lack a basal burr, and are never shed.

CLUSTERS OF CACTUS BUCKS

In the late 1950s and early 1960s, biologists in the Central Mineral Region of Texas discovered an incredibly high number of cactus bucks. During that time about 3-9% of the deer were affected. These cactus bucks all suffered from deformed genitalia and "hypogonadism." It appeared in this case that the testes developed normally and later shrunk to less than a quarter their normal size. The bucks were sterile and were also observed to have the lowest placement in the dominance pecking order. Even does dominated them with aggressive behavior.

This concentration of cactus bucks offered an opportunity to find an

underlying cause. Biologists investigated every potential reason they could think of, but were never able to explain this cluster of cactus bucks. They ruled out exposure to the most common diseases and since there was no inflammation of any tissues it did not appear to be disease caused. The locals had observed this condition in previous years, but felt the incidence had increased following years of drought. This hinted that maybe it was because the deer were in poor condition, but the fat reserves of these cactus bucks were higher than their fully endowed brethren. It was apparently not simply due to a dietary deficiency, but did seem to correspond with a Granite-Gravel soil type so it may have been related to a specific plant that grew there after several dry years.

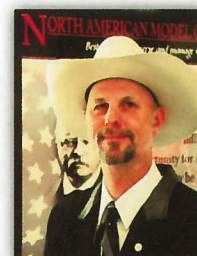
More recently, a related situation surfaced far away in Sitka black-tailed deer on Kodiak Island, Alaska. Starting in the 1990s local deer enthusiast and hunting guide, Dr. Jake Jacobson, noticed an increasing trend in abnormal antlers on one part of Kodiak Island. These deer had incomplete and atypical antler growth, incomplete mineralization, stayed in velvet, and some antlers were dropping off above the normal antler base. Jacobson teamed up with leading antler researchers and reproductive physiologists to find the cause. When they examined some of the bucks more

closely, they discovered that the bucks with abnormal antlers were cryptorchid males with testicles inside the body cavity. They examined 94 deer on Aliulik Peninsula where this condition is most prevalent and found 65% had abnormal testicles on both sides and 70% of those had abnormal antlers. They collected samples of blood, muscle tissue, testicles, and detailed sets of photographs from these bucks. Analysis of the blood showed that testosterone levels were an average of 10 times higher in normal bucks than in the cactus bucks. They were not able to determine the cause of the abnormalities, but thought it was related to the exposure of pregnant females to estrogen-like compounds in the environment that interfered with the normal development of testicles and fetal antler buds.

UNSOLVED MYSTERIES

It is somewhat unsatisfying that we know so much about the antler cycle and still are not able to solve the mystery of the wild cactus buck. The most promising area of research will be on environmental toxins and compounds, both natural and those of human origin. A different assemblage of annual plants appears each year depending on the variation of spring temperature and rainfall. Herein lies the difficulty of diagnosing a dietary cause of cactus bucks. A photograph of a cactus buck is interesting, but to unravel what caused it takes a detailed examination of reproductive organs, hormone levels, and possibly vegetation.

With the myriad of potential causes of cactus bucks we may, in the end, have to begrudgingly admit that Bertrand Russell was right.



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For more information on deer and to order an autographed copy of Jim's book "Deer of the Southwest" visit www.deernut.com.