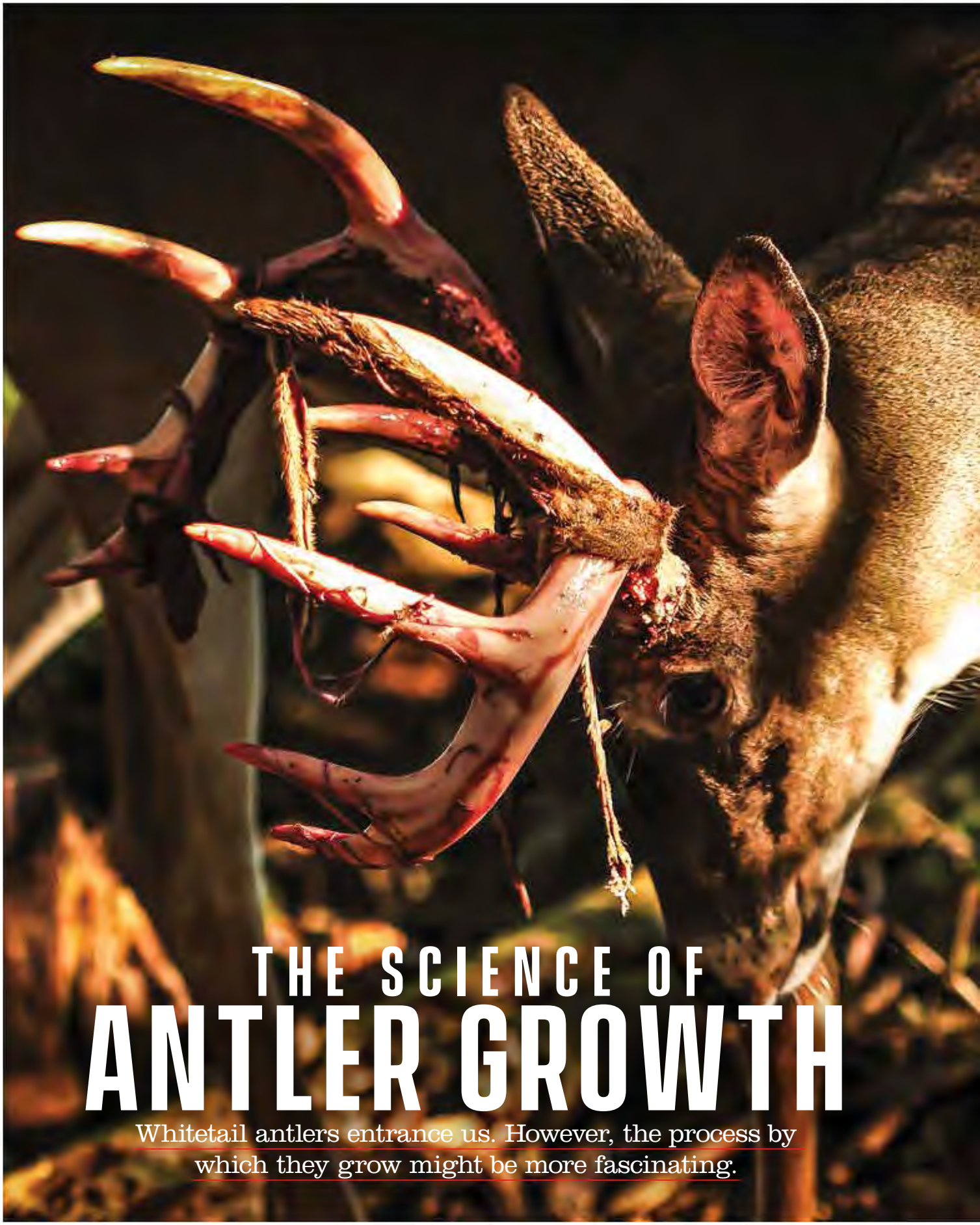

THE SCIENCE OF ANTLER GROWTH

Whitetail antlers entrance us. However, the process by which they grow might be more fascinating.

by *Matt Harper*

Certain things have an uncanny ability to reach our psyche and produce an infatuation that's mesmerizing and fixating.

For some, it's the open ocean, a world where the water and sky meet. For others, it's the majesty of a towering mountain that fills the spirit yet makes you feel very small. Then, of course, there are antlers.

Some of you might think I've missed the mark by comparing oceans and mountains to antlers. But I have not, unless it's because antlers grip the mind even more. Think about your reaction when a huge-antlered buck steps from the edge of a food plot or emerges from a brushy draw. Your heart and breathing rate soar, and your blood pressure spikes. You immediately throw up the binoculars to look, and if you're not careful, the rack entrances you so much you forget the years of training and experience and collapse into a pile of antler-crazed mush. I have many stories of dropped gloves, fumbled bow releases and internal shakes so severe they register on the Richter scale. And it's not just me. Watch any hunting show and you will see "professionals" fall to pieces when antlers appear. Sometimes, manly men break down in tears when they grasp the antlers. That's happened to me, too. Some might call this buck fever, but I call it antler neurosis. I don't know where it comes from or the mode of action, but it's real.

Aside from their psychological effects, antlers are scientifically fascinating. Their fundamental purpose is as a weapon for the battle of procreating the owner's genetics. Antlers are also a good indicator of the health and nutritional plane of specific bucks and the herd in general. However, I think the most interesting aspect of antlers is the mechanism by which they grow.

HORMONES AND ANTLER GROWTH

The antler growing cycle is controlled by the endocrine system via varying hormonal levels that occur during various times of year. Deer are known as short-day breeders, which means does will cycle and the rut will commence during the time of year with fewer daylight hours. With decreased daylight comes an increase in melatonin production, which triggers responses that eventually result in increased testosterone production. That drives bucks to start searching for, chasing and breeding does. But testosterone plays far more roles than simply breeding. If you follow the testosterone levels in a buck's system throughout the year, you will see a slight bump around early spring, which is the catalyst for regenerative cells in the pedicle to begin antler growth. Testosterone levels then decrease slightly but begin to slowly increase in late summer and early fall. Testosterone levels reach a point in early fall that will cause velvet to be shed, revealing the hardened antler. Then those levels peak during the rut and begin to decline. When levels decrease enough, bucks shed their antlers, and then the process restarts. You have probably heard of cactus bucks or bucks that never shed their velvet and continue to grow antlers, albeit abnormal in appearance. Those bucks start antler growth, but then something, such as injury to the testes, does not allow testosterone levels to increase high enough for velvet to shed. Also, research has shown that if deer are artificially enhanced with testosterone, they won't shed hardened antlers until the testosterone treatments are discontinued.

THE PHYSIOLOGY OF ANTLER GROWTH

Most people think of antlers in their hardened state, but during most of the antler growing cycle, antlers are growing, living things. When testosterone triggers antler growth to restart, antlers begin as a bump or bulge on the pedicle. For a few weeks, it appears that not much is happening, but the regenerative pedicle cells are laying the early antler foundation. The outside of the young growing antler is covered with a skin-like tissue called velvet, which is comprised largely of blood vessels that feed nutrients to the growing antler underneath. In fact, there is so much blood flow that velvet can actually feel hot. Velvet is also extremely sensitive, causing bucks to treat growing antlers quite gingerly. That helps prevent the velvet from being injured during the growing cycle, which would negatively affect antler growth for that cycle.

As the antler begins to extend and grow, a structure begins to form under the velvet that constitutes the framework of the antler. This is a protein matrix comprised primarily of collagen and gives the antler its basic shape. In the early growing stages, antlers are mostly protein — about 80 percent. As the collagen matrix grows, minerals are deposited within the matrix as the first steps of mineralization. The mineralization, or hardening process, speeds up in late summer, with more mineral deposited on the internal protein framework. As mentioned, mineral is transported to the growing antler via the blood flowing through the velvet. You might think this mineral comes directly from the deer's diet, but it actually comes from the skeletal system. Minerals — such as calcium, phosphorus and magnesium — are taken from the skeletal system and transported to the antler in similar fashion as mineral transport for lactation. Antler growth is secondary to skeletal health, and a buck's body will not compromise skeletal health for bigger antlers. When velvet is shed in early fall, it reveals an antler structure that is about 55 percent mineral and hardened to the consistency of dry bone. The comparison to bone is appropriate, because antlers are essentially bone — an external extension of the skeletal system.

FACTORS AFFECTING ANTLER GROWTH

Antler growth is affected by many factors, but the three main players are genetics, nutrition and age.

Genetics has been a hot topic among deer hunters for years, and it undoubtedly affects the ultimate potential of antlers. After all, deer breeders use genetic selection to grow antlers larger than anyone thought possible. When trying to manage genetics in a wild deer herd, however, there are multiple problems. First, you can't control which bucks breed. You can try to remove what you perceive as bad genetics, but you will likely not remove all of them. Also, the perception of bad genetics might not necessarily be reality. You might see a spike yearling and think, "Cull him." However, it might be a late-born fawn, or the doe had subpar milk production. Possibly, there was a drought that year, and the nutritional plane was deficient. Those bucks might have good genetics but don't display them phenotypically because of outside influences. Of course, there's the obvious issue of only being able to manage half the equation. Theoretically, does should supply half the genetics, and there's no way to determine in a wild herd if a doe has good or bad genetics when it comes to antler growth. I'm not saying there isn't merit in culling mature bucks that are obviously inferior, but simply trying to rely on that tactic will likely lead to disappointment.

– MATT HARPER'S MONSTER BUCK
The author shows how proper nutrition and allowing the deer to reach an older age class can produce trophy bucks. This heavy-horned stud is one of Harper's best deer.

Age is another critical factor and one you must try to manage if you want to maximize antler growth. You will have no idea about the potential antler size of a buck until he reaches maturity. From birth until about 3 years old, bucks grow their skeletal and muscular system. That growth takes precedence over secondary functions, such as antler growth, so nutrients are directed first toward body growth. At 3, bucks reach skeletal maturity, and at 4, they reach muscular structure maturity. You often see a sizable jump in antler size between ages 2 and 3 and then again from 3 to 4 because more nutrients can be directed toward antler growth.

At 5, bucks have reached full maturity and have had an entire antler growing cycle during which nutrients can be directed in larger quantities toward antler growth as opposed to body growth, which is why you typically see the largest antler size at 5 and 6.

Biologically, a buck simply cannot reach full antler growth potential until they have reached body growth maturity. Think of it this way: Like many teenage boys, I could eat about anything and never add to my waistline because I was growing muscle and bone. Then at some cruel point, I hit my growth maturity, and that half a large pizza went straight

to my gut. If waist measurement were the equivalent of Boone and Crocket antler scoring, I didn't reach trophy class until I matured. At least that's what I tell my wife.

Genetics and age are fixed antler growing factors, and nothing can be done to change a buck's genetics or speed up maturity. The variable factor we can influence is nutrition. Look at it from the perspective of building a house. Genetics are the blueprint for the house and cannot be altered, as you can't make the house bigger with the designs you're given. Age is the time it takes to build the house, and if you stop building — that is, kill a buck —too early, you will never complete the house. Nutrition equates to the materials used to build the house. To build the house to its full potential, you must have all the materials. If you are short on lumber, shingles and flooring, you will never achieve what the blueprint could have produced.

In most cases, nutritional management will show dramatic increases in antler growth because nutrition is a limiting factor, even in agricultural regions. For example, Iowa has abundant corn and bean fields, but those are not present year round, and there might be mineral limitations in the soil. Regardless of your location, nutrition is limited if you're trying to maximize antler growth.

The critical consideration involves maximizing antler growth. Deer can survive without nutritional management, but will they reach their genetic potential? In almost all cases, they will not without supplemented nutrition, which is why nutritional food plots and mineral supplements produce positive results regardless of the region. Nutrition is the broader terminology for all nutrients a deer consumes. Although all nutrient categories are important for antler growth, protein and mineral are often the focus because they tend to be the most limiting naturally in the diet during the antler growing phase, and both are prominent players in antler growth.

But it's important to understand that nutrition is a year-round management consideration. Just because we hang up the bow and oil the gun for winter storage doesn't mean deer quit eating. Health and body condition also take priority over antler growth, so a buck must be in top physical condition to have the chance of maximizing antler growth. Nutritional deficiencies change based on seasonal nutritional needs and nutrition availability, so year-round nutritional management practices for optimal antler growth are best.

CONCLUSION

Antlers have a mysterious quality for most deer hunters. Maybe they symbolize hunting prowess or represent the unique grandeur of the deer. Or perhaps it's just cool to have a big set of antlers. Either way, it's real. But when you look at the science of how and why antlers grow, you realize an even deeper respect for them and what they represent.