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DEER ASSOCIATES eNEWS
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Spinoffs from Deer Research at the CKWRI

by David G. Hewitt and Randy DeYoung

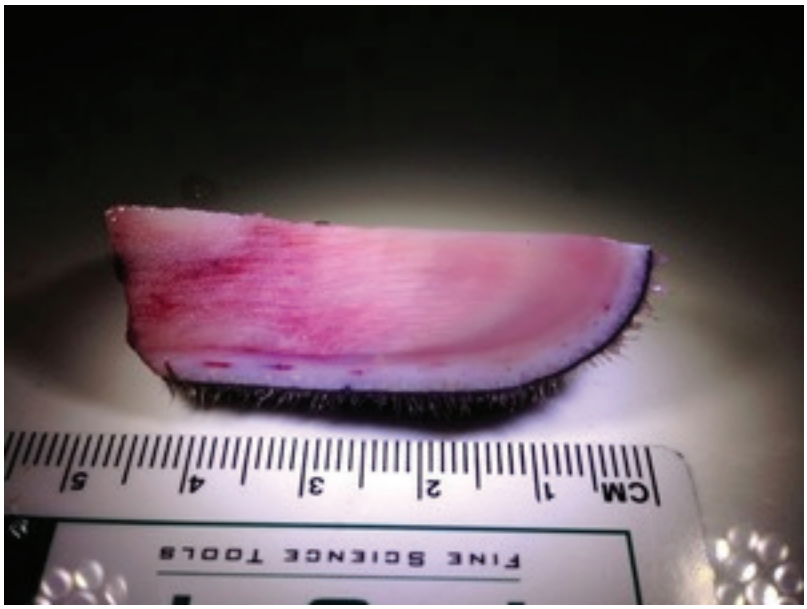
Antlers are unique in the animal kingdom. These bony appendages are found only on members of the Cervidae, the family composed of deer species. In North America, representatives of the Cervidae are white-tailed and mule deer, elk, moose, caribou, and brocket deer. Some species that are not deer, like sheep and goats, also have growths on their heads, but these are horns, not antlers. Only antlers are composed of bone, have branching, and are regrown annually. The headgear most like an antler on a non-deer species is sported by the North American pronghorn. The pronghorn's horn has a tine, or a prong, and the outer sheath is shed and regrown annually and composed of keratin, or modified hair, similar to horns of other species.

Archeological evidence suggests antlers have been important to people for tens of thousands of years for utilitarian, religious, aesthetic, sporting, and medicinal purposes. Societal changes have reduced the value of antlers as tools and in religious ceremonies, but the aesthetic and recreational appeal of antlers remains strong.

The medicinal use of antler products is usually associated with traditional Asian medicine, although athletes in the United States sometimes use antler preparations in an effort to improve their performance. Whereas the value of consuming antlers as a medicine remains unproven, antlers may be able to improve human health in other ways. In the 1980s, Bob Brown at the CKWRI used antlers as a model of bone growth. His studies with deer antlers provided insight into hormone and mineral metabolism in bone. Other scientists around the world have also used deer antlers to increase understanding of bone physiology and disease in people.

Since these early studies, the field of molecular biology has blossomed, providing new and exciting opportunities to use antlers to improve human health. A challenge to using antlers as a model of human bone growth and disease is linking the medical researchers, who have the technical and physiological expertise, with the wildlife biologists who can provide tissue and ecological insight into patterns of antler growth. Berdon Lawrence, a CKWRI advisory board member, was uniquely positioned to overcome this challenge. In addition to his association with the CKWRI, Berdon also works closely with Dr. Brendan Lee, a physician and scientist who specializes in bone disease at the Baylor College of Medicine.

In early 2013, with the vision necessary to make great leaps in science, Berdon organized a meeting between Brendan and scientists at the CKWRI. Since that time, David Hewitt and Randy DeYoung have sent several sets of antler and other tissue to Dr. Lee's lab in Houston. Working with Kim Worley in Baylor's Department of Molecular and Human Genetics, the team has been sequencing the white-tailed deer's genome, identifying genes expressed in various tissues including growing antler, and laying the foundation to investigate specific genetic differences between deer with different antler characteristics. The research group has also had discussions with Texas Parks and Wildlife biologists at the Kerr Wildlife Management Area. Another potentially fruitful collaboration will be to use genetic samples from the Kerr WMA's pedigreed deer herd to study genetic influences on antler size.



The primary goal of this research is to use an understanding of antler growth to improve therapies for human bone disease and fractures. Interestingly, the benefits of this research collaboration not only flow to human medicine, but also flow back to wildlife ecology and management. Greater understanding of the genetic basis of antler growth will provide insight into the vast amount of variation in antler traits among deer species, different deer within a species, and within an individual deer from one year to the next. A buck's genetic make-up probably interacts with environmental influences such as nutrition, temperature, social stress, disease, and injury to determine antler traits. These interactions are recognized but poorly understood. Finally, sequencing the white-tailed deer genome will help ecologists better understand the evolutionary relationships among all the deer species in North America and throughout the world.

This collaborative research program between the Baylor College of Medicine and the CKWRI is a great example of the unforeseen benefits of investing in vigorous research programs. That investment, coupled with visionary people who can see the potential of unconventional research collaborations, broaden our understanding of both people and wildlife.

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