



Deer Associates eNews

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Maternal Effects and Tarnishing of the Silver Spoon

By Randy DeYoung

Despite the title, this article has nothing to do with flatware. The terms “maternal effects” and “silver spoon” both refer to conditions experienced early in life. Maternal effects are specific to the mother, usually her level of nutrition during pregnancy and while supporting the offspring. Maternal effects are considered a form of environmental variation, but may be difficult to influence through management due to their highly individualized nature. The concept of the silver spoon is a metaphor for the nutritional and environmental conditions experienced early in life. Individuals born in a good year may experience faster growth, reach adult size quicker, and amass greater nutrient reserves. The end result is greater survival, better physical development, and higher reproduction.

Background

Most biologists agree that antler growth in deer is influenced by age, nutrition, and genetics. Age can be managed through careful application (or restriction) of high-velocity lead and nutrition through habitat improvements or supplemental feed. In some cases, genetic characters of a deer population can be influenced through management, though this is one of the most difficult aspects to measure or quantify.

To complicate a manager’s job, nutritional and genetic factors may interact in complex ways. For example, anecdotal reports suggest delayed effects of intensive management, especially feeding. It appears the full benefits of an intensive feeding program on deer body and antler size do not appear until the program has been in place for at least 5-7 years. In other words, the effects of enhanced nutrition appear generational. Why might this be so?

Research

A recent study in South Dakota may hold the key to understanding the generational effects of nutrition on deer body and antler development. Kevin Monteith and colleagues took wild deer from eastern and western portions of the state and brought them into captivity. Eastern South Dakota is mostly prairie and farmlands and is good quality deer habitat; habitat in the southwestern portion of the state is poor-moderate

quality for deer. Adult does from eastern South Dakota average 50 lbs heavier than their western counterparts, and bucks are likewise heavier with better antler development in the east.

In captivity, first-generation fawns were bottle-raised and fed a high-quality diet. Despite the same nutrition and living conditions, descendants of western deer stopped growing 41 days earlier than their eastern counterparts and as a result had smaller body and antler size at maturity. Surprisingly, second-generation fawns from the west caught up to their eastern brethren in early growth and mature size.

The exact mechanism for delayed growth is uncertain- maternal effect plus a healthy dose of the silver spoon, and perhaps even the sort of epigenetic “programming” only recently appreciated in studies of human genetics. Nevertheless, the South Dakota results implicate a delayed maternal effect on fawn growth that lasted for at least one generation.

Management Implications

The significance of these findings to understanding how management may influence deer populations is huge. Deer condition and development are a product of not only current conditions, but past conditions for one or more generations. The potential for time lags in population response to management are real and emphasize the importance of diligence and consistency of your management program. Finally, this study may provide clues for understanding regional trends in deer antler and body size, which tend to follow patterns of soil quality.

About the Author: Randy DeYoung is a Research Scientist and Assistant Professor at the Caesar Kleberg Wildlife Research Institute/Texas A&M University-Kingsville. His work focuses on the molecular ecology of wildlife.

Further Reading

For more information, see the following article that appeared in the Journal of Mammalogy in 2009, vol 90: pages 651–660.

Growth of Male White-Tailed Deer: Consequences of Maternal Effects

By K. L. Monteith, L. E. Schmitz, J. A. Jenks, J. A. Delger, and R. T. Bowyer

Abstract: Identifying maternal effects on offspring is critical to interpreting population dynamics, but the duration of maternal effects and which life-history traits they influence is not well understood. We quantified growth and development of male white-tailed deer (*Odocoileus virginianus*) originating from the Black Hills in southwestern South Dakota and from eastern South Dakota in a controlled environment with high-quality nutrition. Despite being in good nutritional condition, males from the Black Hills ceased rapid growth 41 days earlier, were 29% smaller at asymptotic body mass, and grew

significantly smaller antlers than males from eastern South Dakota. Females from eastern South Dakota were 14.9 kg larger than females from the Black Hills, yet birth mass of male offspring was similar for females from the 2 regions. Male offspring of 1st-generation deer from the Black Hills attained a 30% larger asymptotic body mass and grew significantly larger antlers than their sires. Body mass and antler size of 2nd-generation males of Black Hills origin approached that of 1st-generation males from eastern South Dakota at maturity. Suppression in growth of 1st-generation males of the Black Hills and increased growth by their offspring supported an influence of maternal and grandmaternal condition during gestation on subsequent growth of offspring and highlighted the significance of nutrition during gestation. These intergenerational effects indicate that measures of animal condition and population performance might reflect past rather than current conditions, and illustrate the potential for time lags in responses of populations to improved environmental conditions.