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Do drastic weather effects on diet influence changes in chemical composition, mechanical properties and structure in deer antlers?

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Source

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Abstract

We attempted to determine why after an exceptionally hard winter deer antlers fractured more often than usual. We assessed mechanical properties, structural variables and mineral composition of deer antlers grown in a game estate (LM) after freezing temperatures (late winter frosts, LWF), which resulted in high incidence of antler fractures despite being grown later in the year, and those grown after a standard winter (SW). Within each year, specimens from broken and intact antlers were assessed. LWF was associated with reduced impact energy (U) and somewhat reduced work to peak force (W), Young's modulus (E) and physical density, as well as cortical thickness. LWF was associated with considerably increased Si and reduced Na. In each year, broken antlers had lower Mn, P and physical density, and they had more Na and B than unbroken antlers. Because no such effect was found in farmed deer fed whole meal, and because freezing in plants usually produces an increase in Si content, which in turn reduces Mn, it is likely that LWF produced a diet rich in Si and low in Mn. Because antlers are grown transferring calcium phosphate from the own skeleton and Ca/P levels were slightly reduced, it seems likely that Mn reduction may have increased antler fractures. A comparison between farm deer and those in another game estate (LI) also shows a link between lower Mn content and lower W. Thus, small changes in minor bone minerals, probably induced by diet, may have marked effects in mechanical properties of bone.

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