

Comparative studies of cranial periosteum in red deer (*Cervus elaphus*), reindeer (*Rangifer t. tarandus*) and Chinese water deer (*Hydropotes inermis*)

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Deer pedicles and antlers develop from antlerogenic periosteum located on the frontal lateral crest. The cellular layer of the periosteum provides the stem cells for pedicle and antler formation. Pedicles and antlers grow in male red deer (*Cervus elaphus*), in both sexes in reindeer (*Rangifer t. tarandus*) and in neither sex in Chinese water deer (*Hydropotes inermis*) (CWD). The aim of the study was to investigate whether the antlerogenic tissues of these three deer species have a different histological structure.

Antlerogenic and facial periosteum together with a layer of underlying bone were taken from red deer calves, reindeer calves and CWD calves. All tissue samples were processed for histology. Cellular layer thickness and cell density were measured. The data were analyzed using ANOVA. The coronal sutures in the antlerogenic region of a red deer stag calf, and a CWD stag calf, were studied macroscopically.

The antlerogenic periosteum of red deer and reindeer had cancellous underlying bone. The bone

was covered with active osteoblasts. The antlerogenic periosteum of CWD and facial periosteum from red deer, reindeer and CWD had compact underlying bone. The bone was devoid of osteoblasts. Comparisons of layer thickness and cell density of the periosteum are shown in Table 1. Glycogen granules were located in the antlerogenic periosteum of red deer and reindeer, but not in CWD. For the coronal suture in the antlerogenic region in red deer, frontal bone overlaps parietal bone; in CWD, parietal bone overlaps frontal bone.

Cellular layer thickness of antlerogenic periosteum may affect the antlerogenic potential of different deer species. Glycogen might serve as an energy source for pedicle initiation. The formation of bevelled coronal sutures in the antlerogenic region are probably due to the posterior migration of cells responsible for pedicle formation. Histologically reindeer are ready to develop pedicles at birth, red deer are ready by 4 months of age and CWD never reach this stage.

Table 1. Thickness and cell density in the cellular layer of antlerogenic periosteum in red deer, reindeer and Chinese water deer

	Red deer		Reindeer	CWD	s.e.d.
	Male	Female			
n	9	5	4	5	
Thickness (μm)	147.5	107.3	182.5	57.2	13.51***
Cell density (cell/mm^2)	6.76	6.12	8.76	6.45	0.493***

*** $P < 0.001$