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Biological properties of epididymal spermatozoa subjected to different technological procedures and the antioxidant status of testes and epididymis of European red deer (*Cervus elaphus elaphus*)

ABSTRACT

The aim of this study was to evaluate the biological properties of European red deer (*Cervus elaphus elaphus*) epididymal spermatozoa stored in a liquid state and in the epididymis at 5°C for up to 6 days. Furthermore, the antioxidant status of testicular and epididymal tissues collected during the rut season (September–October) and the non-rut season (December–February) was assessed.

The material for the study consisted of testicles and epididymis collected *post mortem* from stags shot during hunting. Spermatozoa were obtained from the cauda epididymis. The analysis of the biological properties of spermatozoa included the assessment of motility and movement parameters, the integrity of plasma and acrosomal membranes, mitochondrial activity, DNA integrity, and apoptotic changes. In addition, spermatozoa morphology, the activity of antioxidant enzymes: superoxide dismutase – SOD, glutathione peroxidase – GPx, and catalase – CAT, and lipid peroxidation intensity (malondialdehyde – MDA) were evaluated. The assessment of the antioxidant status of testicular and epididymal tissues included analysis of SOD, GPx, and CAT activity and their gene expression.

The analysis of results showed that storage time and method had a significant impact on the biological properties of epididymal spermatozoa. Storage in the epididymis resulted in an earlier lowered in most of the studied variables compared to storage in the liquid state. Significant differences ($p \leq 0.05$) between storage variants were observed from 48 h of storage in the characteristics of spermatozoa motility, and after 144 h of storage, they were also found for other tested variables and in the antioxidant status. Analysis of the antioxidant status of testicular and epididymal tissues showed significant differences in SOD, CAT, and GPx activity and their gene expression, which depended on the tissue type and season.

The study indicates that European red deer spermatozoa can be stored in the epididymis at 5°C for up to 96 hours, but their biological properties are better preserved during storage in the liquid state. The antioxidant status of the testicles and epididymis varies depending on tissue type and season, providing the reproductive system with optimal protection against oxidative stress.

Key words: European red deer, epididymal spermatozoa, conservation, antioxidant status, reproductive tissues