

# 17 Increased inbreeding levels negatively affect sperm kinetics and motility in Purebred Spanish horses

Y. Piroberto <sup>A</sup>, A. Molina <sup>B</sup>, M. Valera <sup>C</sup>, J. Dorado <sup>D</sup>, E. Terán <sup>A</sup>, F. Azcona <sup>A</sup> and D. P. Sebastian <sup>A B</sup>  
+ Author Affiliations

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## Abstract

Reproductive performance is one of the key factors in livestock production. It is well known that reproductive traits are influenced by several genetic factors, such as the increase of individual inbreeding levels, which are associated with changes in sperm motility and shape in several species. In horses, the increase in inbreeding is a common problem because of the reduction in effective population size and the increase in selection intensity observed in several breeds. However, studies assessing the effect of high levels of inbreeding on the sperm quality of stallions are scarce. In the present study, we aimed to determine the effect of increased inbreeding levels and age on the sperm motility patterns of Purebred Spanish horses (PRE). We performed kinetic characterisation of 557 sperm samples of 82 PRE stallions aged between 3 and 16 years, using computer-assisted sperm analysis (Androvision™, Minitube). We evaluated 5 parameters in 6 different fields per sample: curved line velocity (VCL,  $\mu\text{m/s}$ ), velocity average path (VAP,  $\mu\text{m/s}$ ), velocity straight line (VSL,  $\mu\text{m/s}$ ), amplitude of lateral head displacement (ALH,  $\mu\text{m}$ ), and beat-cross frequency (BCF, Hz). We determined the pedigree-based inbreeding coefficient ( $F_{\text{ped}}$ ) based on ~300,000 PRE pedigree records to evaluate the inbreeding effect. Individuals were separated into 2 groups: highly inbred ( $n = 339$ ) and lowly inbred ( $n = 218$ ) according to an  $F$  value of 12.5%. Differences between groups were analysed using a generalized linear model. The analysis did not show significant differences ( $P > 0.05$ ) in the variables analysed with respect to the age of stallions. However, VAP, VCL, and AHL were lower in highly inbred than in lowly inbred animals ( $P < 0.05$ ), suggesting less velocity and amplitude of head displacement. In the case of BCF, no significant differences ( $P > 0.05$ ) were observed between the two study groups. In conclusion, age did not affect sperm quality parameters in the age group of stallions analysed. In addition, we demonstrated that high inbreeding coefficient reduced the mean velocity and trajectory pattern of spermatozoa in PRE.