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Genetic characteristics for a breed standard definition of the Maltese Hunting Dog (Kelb tal-Kacca ta' Malta)

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The Maltese Hunting Dog (Kelb tal-Kacca ta' Malta, KTKM) is deeply rooted within the Maltese historical and cultural landscape. This breed can be traced back to the 16th century with the edict of Grand Master Ximenes in 1773 referencing the use of a "braque"-type dog, underlining the significant role of hunting dogs in Maltese rural life. Despite its presence and historical importance, the KTKM population is not well studied, nor is it officially recognised as a breed. To define the genetic structure of the KTKM and determine its genetic uniqueness and phylogenetic relationships, genomic data of 24 KTKM were compared with 46 dog breeds, comprising hunting dogs (spaniels, hounds, and pointers), Italian (Cirneco dell'Etna) and Maltese primitive dogs (Kelb tal Fenek, also known as Pharaoh Hound), as well as terriers, herding and guardian shepherd breeds included to exclude possible introgressions. Multidimensional scaling analysis placed the KTKM within the hunting pointing dog cluster, aligning with its phenotypic and functional characteristics, but closer to Kelb tal Fenek than the rest of the group. A phylogenetic tree constructed using Reynolds distances grouped the KTKM with Italian and Maltese breeds, positioned in between the hounds and pointing dogs, whereas the identity-by-state analysis confirmed that the closest association of the KTKM is with the pointing breeds, further highlighting its intermediate genetic position. The treemix analysis identified migration events from the spaniel lineage to the KTKM and from the KTKM to the Cirneco dell'Etna and Kelb tal Fenek, suggesting possible historical genetic exchanges between these groups. In the admixture analysis, the KTKM have a high degree of uniformity and originality, with a unique genetic identity already evident before K=8. Haplotype sharing analysis revealed modest levels of sharing but identified specific connections of the KTKM with the Kelb tal Fenek and some pointer breeds. In conclusion, the KTKM appears to be a distinct and genetically uniform population, closely aligned with the functional group of pointing dogs to which it belongs. Remarkably, this goes along with encouraging results related to inbreeding, with this breed presenting moderate levels of inbreeding and heterozygosity, despite its small size and geographic isolation. This study highlights the importance of conservation efforts to safeguard the KTKM's gene pool and its place in Maltese cultural heritage.