Extended vs. new imputation systems for supporting transfer to SNP-based parentage control in horses of different breeds

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When the demand for riding horses for young people and children increased in the 1970s in European countries, the German riding pony (GRP) was established originating primarily from crosses of English riding ponies with Arabian and English thoroughbreds. The breeding regulations still allow crosses with a wider range of horse breeds including Warmblood riding horses which has facilitated breeding progress in dressage- and jumping-related traits. With the growing genomic toolset for horses, the studbooks' motivation to replace traditional laboratory analyses of microsatellite markers (MS) for parentage testing by routine genome-wide single nucleotide polymorphism (SNP) genotyping. For efficient transfer to this new system, SNP-based MS imputing has been implemented for German Warmblood horses (GWH) already in 2021, but not yet for pony breeds. Depending on similarity and genetic exchange between breeds, MS allele frequencies can differ significantly, and breed-specific alleles can occur. Accordingly, collection of reference data for imputation development for ponies was required, resulting in N=2,118 GRP with available SNP (medium density array, 80k+) and MS data by the end of 2023. Aim of this study was evaluating best use of this data, so three test scenarios of SNP-based MS imputing differing in composition of the reference population were run: GRP only (A), GWH only (N=12,417; B), and GRP and GWH (C). Average MS imputation accuracies for the target population were lowest in B ranging between 0.89-0.98 for 13 MS markers. Corresponding accuracies in A were higher (0.97-0.99) and very similar to those in C (0.98-0.99). No detrimental effects on MS imputation accuracies for GWH were seen in C. These results allowed the decision to integrate the GRP reference data into a joint reference population with GWH through which full coverage of all occurring MS alleles is ensured. The extended system for SNP-based MS imputing is now the basis of routine parentage control in GWH and GRP in Germany facilitating pony breeding to benefit from genomic developments.

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