

High Prevalence of Triploidy and Aneuploidy in Spontaneous Pregnancy Loss in Horses

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Structural and numerical chromosomal aberrations are frequently identified as a leading cause of pregnancy loss in women from around 7 weeks of gestation but are seldomly reported in other mammalian species. We used Chromosomal Microarray Analysis (CMA) and Short Tandem Repeat (STR) testing to investigate the prevalence of chromosome aberrations in products of conceptus (POC) from equine early pregnancy loss (EPL; ≤ 70 gestation day) and mid to late term pregnancy loss (MLPL; 71 gestation day–24h post parturition). Among 110 EPLs (mean gestational day = 45), CMA revealed 42 (38.2%) of POC were triploid, 18 (18.2%) were aneuploid, and 48 (44.5%) were diploid. Consistent CMA results in both the fetal and placental compartments were observed in 25/25 cases assessed. STR testing identified tri-allelic genotypes in 39/44 EPL POC, corresponding to 33 triploid, 4 trisomic and 2 diploid POC. Morphological and DiceCT examinations of a subset of triploid fetuses revealed structural anomalies in the brain and heart (9/9). Neither mare age nor stallion age correlated with chromosomal aberrations. For 165 MLPL POC (mean gestational day = 222), CMA demonstrated segmental aneuploidy in two (1.2%) cases, 162 (98.2%) were diploid, and one (0.6%) POC failed QC. STR testing of 81 MLPL cases confirmed the findings of CMA (79 diploid cases and 2 segmental trisomy). Nextera whole genome sequencing of a subset of samples confirmed trisomies and monosomies. This is the first report of triploidy in pregnancy loss outside of humans and now represents the most significant cause of EPL reported in the mare to date. Whole chromosomal aberrations were confined to the first 10 weeks aligning with Embryonic Carnegie Stages 7-23.