Animal Reproduction

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Blood plasma biochemical parameters in fully-grown pigs derived from assisted reproductive technologies

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Emerging evidence indicates a long-lasting effect of assisted reproductive technologies (ART) on molecular physiology and metabolic function. Previous studies have reported variations in the metabolic profiles in piglets and growing pigs born from artificial insemination (AI) and born after transfer of in vitro produced embryo (IVP) (París-Oller et al., Res Vet Sci,142:43, 2021) but it is unknown whether these differences persist into adulthood. The aim of this work was to study baseline values of plasma biochemical parameters in ART-derived pigs and to gain insight into the evolution of metabolic profile across their life [young age (45 days), adulthood (365 days), and old age (1250 days)]. Pigs born through AI and IVP [n= 16 and 29 (45 days), 13 and 21 (365 days), and 9 and 13 (1250 days), respectively], produced in a previous study (París-Oller et al., J Anim Sci Biotechnol 12:32, 2021), were kept under same housing, managing and feeding conditions. Plasma was obtained through the centrifugation (1200 *g*, 20 min, 4 ºC, Eppendorf 5810 R) of blood collected in lithium heparin tubes and stored (-80ºC) to determine the biochemical parameters total protein (TP), albumin (ALB), globulin (GLOB), creatinine (CREA), urea (URE), glucose (GLUC), cholesterol (CHOL), triglycerides (TRIG), amylase (AMIL), lipase (LIP), creatinine kinase (CK), alkaline phosphatase (ALP), gamma-glutamyl transpeptidase (GGT), aspartate aminotransferase (AST), alanine aminotransferase (ALT), and total bilirubin (TB) using an automated clinical chemistry analyzer (Olympus AU400, Japan). Inter- and intraassay coefficient of variation were below 15%. Data were analyzed by a mixed ANOVA and Student's t-test for multiple comparisons. In the absence of homoscedasticity, a Student's t-test with Welch's correction was used, and in case of non-normality the Wilcoxon rank-sum test was performed. A P value < 0.05 was considered significant. The analyses of the metabolites showed higher CREA in old-IVP than old-AI (2.32±0.07 vs. 1.925±0.07 mg/dL); higher GLUC in young-IVP than young-AI (107.77±6.10 vs. 83.77±5.41 mg/dl); lower LIP in young-IVP than young-AI (16.74±1.29 vs. 22.91±2.11 IU/L); and lower AMIL, GGT and AST in IVP than AI at all ages. The other metabolites were similar between AI and IVP animals but increased (PT, ALB, GLOB, URE, TBIL), decreased (CHOL, ALP, ALT) or fluctuated up and down (TRIG) with age. The enzyme CK, related to muscle integrity, was the only parameter that was not affected by the group or age of pigs. Reference values for plasma biochemical values provide valuable information for investigators and will help in valid interpretation for health status and for those who use IVP pigs as a research model. In conclusion, these physiological data are useful for veterinarians and livestock producers and show slight persisting differences in some metabolites in pigs naturally and artificially conceived during life although the clinical relevance of such differences is unnoticeable.

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