In ruminants, the trophoblastic placental layer secretes pregnancy-associated glycoproteins (PAG), a family of aspartic proteinases, also referred to as pregnancy specific protein B (PSPB). Pregnancy-associated glycoproteins are detectable in maternal circulation after placental attachment. Since PAGs are secreted specifically by placental binucleate cells, they may be used to assess fetal-placental unit viability. However, variability of PAG profiles amongst sheep breeds warrants establishment of standard breed profiles prior to relying on a particular PAG assay for pregnancy diagnosis. This study aimed to assess serum PAGs, their correlation to progesterone (P4), and persistence in newborns and postpartum ewes in a crossbred sheep. Two groups of Polypay X Dorsett sheep, housed at Michigan State University Sheep Research Farm were used to study early to mid-pregnancy (Study 1) and late pregnancy to postpartum (Study 2) hormonal and PAG dynamics. In Study 1, maternal serum samples were collected from seven females every two weeks from gestational day (GD) 30 to GD120 and assayed using two ELISAs for PAG-1 (IDEXX; Westbrook ME) and PSPB (BioPRYN, BioTracking, Moscow ID). Progesterone was assessed at GD45, GD75, and GD105. In Study 2, maternal serum samples were collected from 12 females weekly starting at GD120 until 11 weeks postpartum. Serum samples from newborns were collected at birth and every three days until day 12 after birth. All samples were assayed for PAG1. The following statistical analyses were conducted: one-way repeated measures analysis of variance, Pearson and Spearman’s correlations, linear regression, and independent T-test. Significance was defined as P < 0.05. Circulating PAG1 levels steadily increased from GD30 until GD120 while PSPB exhibited a bimodal pattern of secretion. A strong positive correlation was observed between P4 and PAG1 ($r^2 = 0.779$, $P < 0.0001$), but not between PSPB and P4. Maternal PAG1 concentrations declined until 10 weeks after parturition ($P < 0.05$). Pregnancy-associated glycoprotein1 concentrations were lower before and after parturition in singleton compared to twin pregnancies ($P < 0.05$). Pregnancy-associated glycoprotein1 levels continuously declined in singleton and twin newborns ($P < 0.05$) and cleared from newborns by 12 days after birth. Therefore, PAG1 can be used to distinguish singleton from multiple pregnancies in sheep. Our findings demonstrate for the first time how different PAG assays provide unique gestational profiles. Also, because the placenta is the main source of P4 in sheep beyond GD50, the strong correlation between PAG1 and P4 through mid-gestation demonstrates that PAG1, but not PSPB can be effectively used as a marker of placental endocrine function.

Keywords: Pregnancy-associated glycoproteins, gestation, postpartum, sheep

Reference