Alpha-fetoprotein as a marker for equine neonatal disease
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Most equine neonatal losses have been associated with intrauterine infections such as placentitis. Alpha-fetoprotein (AFP), a protein produced by the fetal liver, was recently shown to be increased in the plasma of mares with ascending placentitis. While AFP is present in high amounts in both allantoic and amniotic fluids, and in fetal plasma, AFP profiles in healthy and sick newborn foals are not well defined. Theriogenologists/equine practitioners working in broodmare farms frequently face the challenge to determine whether a foal is ill and requires tertiary care. We hypothesize that AFP is present in high concentrations in the fetus and it will also be increased in plasma of foals suffering neonatal disease. Therefore, it may be a useful diagnostic and prognostic marker for neonatal disease. The objectives of this study were to (i) describe AFP concentrations in healthy newborn foals during the first week of life, (ii) compare AFP concentrations in healthy foals to septic foals. In study I, sixteen clinically healthy newborn Standardbred foals had blood samples collected daily for seven days, at 24 hour intervals. Plasma was harvested and stored at -80°C until further analyses. Concentrations of AFP were determined using a heterologous commercial chemiluminescence assay previously validated for use in the horse. In study II, fifty newborn Thoroughbred and Standardbred having normal deliveries had complete blood count (CBC), fibrinogen (Fb) concentration, determination of IgG concentration, and blood collected for determination of AFP concentration by 12 to 24 hours after delivery. All foals were thoroughly examined by well-experienced equine veterinarians during routine normal mare/new foal check. Based on physical examination, CBC, and Fb results, foals were grouped as healthy (white blood cell <12,000, Fb <400mg/dl) or clinically septic (white blood cell count >12,000 and Fb >400). Statistical analyses were performed with a commercial software (JMP-Pro12, SAS Institute, Cary, NC). Data on both studies were analyzed by mixed models, and expressed as means ± SEM, with foal accounted as random variable. Significance was set as p<0.05. There was an effect of time for AFP during the first week of life (p=0.003). There was a significant reduction in AFP concentration from day 1 (1118 ± 118 ng/ml) of birth to day 7 (538 ± 58 ng/ml). Although it was outside the scope of this study, it remains to be determined when AFP concentrations are negligible in plasma of newborn foals. For study II, nine foals met the criteria of clinically septic and 41 were clinically healthy. Concentrations of AFP were different between clinically healthy foals (1148 ± 147 ng/ml) and clinically septic foals for AFP concentrations (1430 ± 205 ng/ml) (p=0.03). Our findings suggest that AFP may serve as a useful marker that can be used to assess neonatal health under field conditions. Its uniqueness for being present in high concentration both in the fetus and newborn foal may open a new field of investigation in understanding neonatal losses in horses.

Keywords: Foal, sepsis, diagnostic marker