

equine herpesvirus 1/4, botulism, rotavirus, plus or minus autogenous *Salmonella typhimurium* and *Clostridium perfringens* in the last 6 weeks of pregnancy, were enrolled. All foals were determined healthy and had adequate postnursing IgG. None received hyperimmunized plasma. Blood was drawn monthly and submitted to Kansas State University rabies laboratory to quantify antirabies neutralizing antibody via the rapid fluorescent focus inhibition test. Foals were allocated with a generalized, randomized block design, based on rabies titer at 1 month of age. Foals received a commercial combination EEE, WEE, WNV, tetanus, rabies vaccine beginning at either 4 or 6 months of age. Foals received a booster 30 days after their initial injection. Rabies antibody concentrations were analyzed to establish the rate of decline prior to and after vaccination immune responses. Prior to vaccination, geometric mean rabies titers were 3.5, 1.1, 0.6, and 0.4 IU/ml at 1, 2, 3, and 4 months of age, respectively. Through the first 4 months of life, antibody titer decline was 90%. At 4 months of age, 33/49 (67%) foals had rabies titer \leq 0.5 IU/ml. The geometric mean postvaccination rabies titers were 0.8 and 1.0 IU/ml in foals that began initial vaccination series at 4 and 6 months of age, respectively. Postvaccination, 20/25 (80%) foals in the 4-months age group and 20/24 (83%) foals in the 6-months age group had rabies titer \geq 0.5 IU/ml. In our study, the rate of rabies antibody declined over the first 4 months of life, indicating that most foals are expected to have a titer below 0.5 IU/ml prior to 4 months of age. The immune response to vaccination was similar between foals that started their immunization series at 4 months of age compared to those started at 6 months of age. future is unknown.

Keywords: Rabies, vaccination, titers, immunization, immunity

Prospective ultrasonographic evaluation of caudal placenta and cervix in pregnant mares in relationship to foaling outcomes and placental abnormalities

Kristina Lu,^a Karen Von Dollen,^a Karen Wolfsdorf,^a Samantha Levkulic,^a Barry Ball^b

^aHagyard Equine Medical Institute, Lexington, KY; ^bGluck Equine Research Center, University of Kentucky, Lexington, KY

Clinical diagnostic procedures to evaluate the late pregnant mare are largely limited to physical examination and ultrasonographic evaluation of the fetus as well as the combined thickness of the uterus and placenta (CTUP). The cervix of a pregnant mare is a key physical and immune barrier to contamination of the pregnant uterus from the vagina yet there is limited research that evaluated changes in the cervix, which might be indicative of potential problems during equine pregnancy. Objective was to evaluate changes in CTUP and mean cervical diameter (CX) determined by transrectal ultrasonography (Sonoscape S9 with 9.5-15 MHz linear probe; Seattle, WA), and the relationship of these parameters to subsequent foaling outcomes and placental abnormalities. The study was conducted in Thoroughbred mares in central Kentucky during 2017 (n = 112 mares), 2018 (n = 109

mares), and 2019 (n = 139 mares). Mares were examined by 1 of 2 examiners on a monthly basis from 4 months gestational age (GA) until term (total examinations; n = 1810). At term, outcomes were classified as normal or abnormal foal and normal or abnormal placenta (based on observation of a fetal membranes inspection at the farm). Data were analyzed by a random-effects mixed model including mare as the random effect, gestational age as a covariate and foaling outcome, placenta as well as examiner as a fixed-effects (JMP ver 14.0). Correlations were evaluated by a Pearson's coefficient. The CTUP was higher (p = 0.001) in mares with abnormal placenta at term but was not related (p = 0.3) to foal outcome. The CTUP increased (p < 0.001) with GA and was affected (p < 0.001) by examiner. The CX increased (p = 0.05) in mares with abnormal foaling outcome but was not related (p = 0.2) to abnormal placenta at term. Again, CX increased (p < 0.001) with GA and varied (p < 0.001) with examiner. As noted, CX and CTUP increased with GA and were positively correlated (r = 0.26; p < 0.01). Our findings suggested that measurement of CX and CTUP in mares are related to foaling outcome and placental abnormalities at term, respectively. Future studies should examine the predictability of foaling outcomes in mares based upon prospective evaluation of these parameters.

Keywords: Mare, pregnancy, placenta, cervix, ultrasonography

Funding: Theriogenology Foundation and the Albert G. Clay endowment of the University of Kentucky

Oocyte collection rate and in vitro embryonic development with low dose deslorelin in mares

Jennifer Hatzel,^a Delfina Rodriguez,^b Christian Bisiau,^a Julhiano Rossini,^c JoAnne Stokes^a

^aCollege of Veterinary Medicine and Biomedical Sciences, Colorado State University, Fort Collins, CO; ^bLa Adela Equine Reproduction Center, Chascomus, Buenos Aires, Argentina, ^cJBR – Assisted Equine Reproduction, Matão, SP, Brazil

Equine assisted reproductive technologies have become increasingly popular throughout the past 20 years, especially ovum pick up (OPU) and intracytoplasmic sperm injection (ICSI). Successful production of in vitro embryos through OPU/ICSI often relates to the number of oocytes, but limited research has been devoted towards ovarian super stimulation for this purpose. This study aimed to determine if low doses of the gonadotropin releasing hormone agonist, deslorelin, (LDD) would increase number of follicles, increase number of oocytes collected or affect oocyte quality. Mares (n = 11, 5 - 13 years) were assigned for this study. Each mare served as her own control in a cross over design. All estrous cycles were monitored through routine transrectal ultrasonography and all visible follicles recorded. Routine transrectal vaginal aspiration was performed on mares in both groups at ~ 20 hours after ovulation induction treatment. For treated estrous cycles, when at least

1 follicle measured ≥ 15 mm in diameter, 50 μ g deslorelin in aqueous solution (Precision Pharmacy, Bakersfield, CA) was given intramuscularly every 12 hours until at least 1 follicle reached 32 mm in diameter with uterine edema. Subsequently, the LDD protocol was discontinued, allowing for 24 hours without hormone treatment. After collection, oocytes deemed mature (expanded cumulus) or immature (compact cumulus) were handled accordingly, prior to ICSI with frozen semen from a single ejaculate. Presumptive zygotes were evaluated at 24 hours for evidence of cleavage and again at 4, 6, and 8 days. Comparisons were made utilizing a Student's and Welch's *t*-tests with significance established at $p \leq 0.05$ and reported as the mean \pm standard deviation. In total, 41 estrous cycles were included (24 control and 17 treated). On average, 7.41 ± 2.3 injections of LDD were given during treated estrous cycles. Average number of follicles observed or number of follicles > 25 mm in diameter at OPU did not differ between groups ($p = 0.13$ and $p = 0.46$, respectively). Average number of follicles aspirated in the treated group (2.1 ± 1.9) tended to be higher ($p = 0.09$) than control (1.9 ± 1.4); however, the number of oocytes collected in treated cycles (1.2 ± 1.4) compared to control (0.75 ± 1.0) did not differ ($p = 0.28$). A total of 36 oocytes were subjected to ICSI from the treated and 38 from control estrous cycles. The cleavage rate was similar ($p = 0.89$) for treated (56%; 20/36) compared to control (61%; 23/38). Finally, the blastocyst rate for treated was similar ($p = 0.66$) (19%; 7/36) compared to control (24%; 9/38). In conclusion, the utilization of a low dose deslorelin protocol did not affect the number of follicles or oocytes collected within estrous cycles for OPU/ICSI. Additionally, cleavage and blastocyst rates were similar between the 2 groups indicating that this protocol did not affect the quality of oocytes. More research is necessary to identify an ovarian superstimulation protocol effective for OPU/ICSI.

Keywords: Mare, oocytes, follicles, deslorelin

Pregnancy rates and ovarian activity after uterotubal infusion of n-butyl cyanoacrylate via a hysteroscopic approach in mares: a pilot study

Yuji Inoue,^a Irwin Liu,^b J. Vazquez,^c J. Nieto,^d Claire Card^e

^aInoue Equine Clinic, Shin-Hidaka, Hokkaido, Japan; ^bDepartment of Population Health and Reproduction; ^cDepartment of Radiology and Surgical Sciences, University of California Davis, Davis, CA; ^dHospital Veterinario LaSilla, Monterrey, Mexico; ^eDepartment of Large Animal Clinical Science, Western College of Veterinary Medicine, University of Saskatchewan, Saskatoon, SK, Canada

Sterilization of mares requires surgical removal of ovaries or ligation of uterine tubes and is performed for behavioral reasons, treatment of ovarian pathology, and preparation of tease or mount mares. However, it is invasive, costly, and may be associated with adverse outcomes. Objective was to determine the effect of bilateral uterine tube infusion with n-butyl

cyanoacrylate on fertility and estrous cycle activity of mares. We hypothesized that bilateral infusion of n-butyl cyanoacrylate in the uterine tubes causes infertility but does not affect mare's estrous cycle activity. Light horse mares ($n = 8$) ranging in age from 5 - 23 years, were selected for potential fertility using transrectal ultrasonography examination, uterine culture and cytology. A proven fertile Thoroughbred stallion that successfully bred mares in 2015 was used. Mares were sedated, perineum cleansed, and the uterine tubes of treated mares ($n = 6$) were infused with 0.5 ml n-butyl cyanoacrylate, and control mares ($n = 2$) were infused with 10 ml saline, using the endoscopic hydrotubation method.¹ Treated mares were hand mated through 2 or 3 breeding seasons ($n = 78$ estrous cycles), and control mares were hand mated through 1 breeding season ($n = 4$ estrous cycles). Biweekly blood samples were obtained from mares during the breeding season for progesterone (P_4) concentrations by RIA. Per cycle pregnancy rate, established by transrectal ultrasonography of the uterus and interestrus intervals, were recorded. Stallion's seasonal pregnancy rate (SPR) in 2015 ($n = 24$ mares) was compared to the SPR of treated ($n = 6$) and control mares ($n = 2$) for years 2016 - 2018. Data were evaluated using Fisher's Exact test at $p < 0.05$. Per cycle pregnancy rates of treated (0/78) and control mares (1/4) were different ($p = 0.048$). SPR for the stallion in 2015 prestudy breeding season (20/24 mares pregnant) was different ($p < 0.001$) than the SPR of treated mares, wherein 0/6 became pregnant in each year. Interestrus intervals of 6 treated mares averaged 20 days (range 18 - 22 days), and serum P_4 profiles were consistent with estrous cycle activity. The n-butyl cyanoacrylate may function to physically obstruct sperm, oocyte and embryo movement in the uterotubal junction or uterine tube, disturb the milieu required for sperm capacitation, oocyte fertilization, and embryonic development, or a combination of these. Uterotubal infusion of n-butyl cyanoacrylate via a hysteroscopic approach may serve as an effective management strategy for induced infertility in mares of at least 3 years duration and may cause permanent sterilization.

Keywords: Mare, infertility, n-butyl cyanoacrylate, uterine tube, progesterone, estrous cycle

Reference

1. Inoue Y, Sekiguchi M: Clinical application of hysteroscopic hydrotubation for unexplained infertility in the mare. *Equine Vet J* 2018;50:470-473.

Daily sperm output, spermatogenic efficiency, and sexual behavior of donkey jacks mounting jennies in estrus

Humberto Magalhaes, Lucas Canuto, Igor Canisso

Department of Veterinary Clinical Medicine, University of Illinois, Urbana, IL

Assessment of daily sperm output (DSO) and spermatogenic efficiency are critical components of breeding soundness evaluation