Faculty Mentor: Jason Bruemmer

Title: Single Dose Equine Contraceptive

Justification:

The purpose of the proposed work is to perform a pilot study focused on the efficacy of using AdjuVac alone or AdjuVac loaded in liposomes, both with the combination of GDF9 and BMP15 peptides as an immunocontraceptive in mares. Our previous work has demonstrated that mares vaccinated with a mild adjuvant and 3 subsequent boosters provided a measurable antibody response for approximately 24 weeks. This antibody response was sufficient to result in suppression of follicular growth and ovulation in 90% of treated animals for a period of at least a two-years; suggesting successful contraception. We propose to determine whether the use of AdjuVac alone or in combination with liposomes in a single administration of the same peptides could provide a similar antibody response and provide similar contraceptive capabilities.

Ten mature reproductively sound mares will be acquired and treated with the combination of BMP-15 and GDF-9 peptides conjugated to keyhole limpet hemocyanin (KLH) in AdjuVac adjuvant alone (n=5) or with AdjuVac in combination with liposomes. BMP-15 peptide consists of a 24 amino acid sequence (QAGSMGSEVLGPSREREGPESNQC) of the mature protein and the GDF-9 peptide is a 14 amino acid sequence (SEYFKQFLFPQNEC) of the mature protein [Life Technologies Corporation, Carlsbad, CA]. Vaccines will be prepared in 2 mL volumes.

Horses will be housed at the Equine Reproduction Laboratory at Colorado State University. They will have free-choice access to grass hay, fresh water and minerals.

Mares will be treated via intramuscular injection in the hip, in an attempt to emulate the proposed target of remote dart delivery. Each horse will receive one single dose in the first week of December 2019.

Reproductive status, specifically ovarian activity, will be monitored via transrectal ultrasonography. Examinations will occur 3 times per week during the physiologic breeding season. The exams will commence in the first week of March and end the middle of September. Mares will be individually restrained in palpation stocks for the duration of the examination.
Blood samples will be collected from each mare via jugular venipuncture at the time of treatment and thereafter every week, before, during and following the equine mating season (through September 2020). Aliquots of serum will be stored and used for analysis of both antibody response and progesterone concentration. Progesterone concentration will be used to confirm the presence or absence of a functioning corpus luteum, which indicates reproductive cycle status.

Tasks:

- Mare handling for 3X weekly ultrasound exams
- Blood collection weekly
- Serum processing for hormone assay
- Serum sampling antibody titer assay

Skills:

- Horse handling
- Reading/evaluation ultrasound imaging
- Blood collection
- Serum sample handling

Training to onboard:

- ACUC (Animal Care and Use Committee) training / certification

Direct working relationship:

- Dr. Bruemmer
- Equine theriogenology resident

Meetings:

- Weekly lab meetings

Mentorship:

- Continual interaction –
  - Initial meeting and tour of facilities
  - 3 X weekly data collection
  - Weekly lab meetings