Experimental validation of anti-Mullerian hormonae as a quantitative marker of ovarian follicular reserve using unilateral ovariectomy in mares
Renata C. Uliani,a Alan J. Conley,b Cynthia J. Corbin,b Aimé M. Friso,a Luciana F. S. Maciel,a Marco A. Alvarenga a
aDepartment of Animal Reproduction, FMVZ - Univ Estadual Paulista, Botucatu - São Paulo, Brazil; bDepartment of Population Health and Reproduction, School of Veterinary Medicine, University of California Davis, Davis, CA

Estimates of ovarian reserve have long been sought as predictors of likely fertility. Ovarian follicular hormones are obvious candidates, but most are under feedback regulatory control and normalize despite declines in ovarian follicle numbers under the influence of positive gonadotropic support. However, anti-Mullerian hormone (AMH) is regulated by gonadotropic feedback and has been used as a marker of ovarian follicular reserve in women. To our knowledge, ovarian follicular reserve has not been manipulated experimentally to investigate effects on AMH concentrations, certainly not in horses. Therefore, hemi-ovariectomy was utilized to halve ovarian follicular reserve and AMH concentrations were monitored before and for two weeks after surgery. Fourteen mares of various breeds were hemi-ovariectomized during breeding season under local anesthesia via flank laparotomy. Young (n=6; mean 6.0±0.9yrs) and old (n=8; 18.4±0.7yrs) mares comprised different age groups. The incision was closed in two layers using a continuous suture line incorporating the abdominal muscular layers followed by approximation of the subcutaneous tissue and suturing of the skin. Serum was collected from all mares on the day prior to surgery and daily thereafter for 15 days. Anti-Mullerian hormone was measured using a commercial ELISA kit according to the manufacturer (Equine AMH ELISA, Ansh Labs, Webster, TX). The mean value of AMH before surgery was 1.0±0.1ng/mL and did not differ by age (1.0±0.1 and 1.0±0.2ng/mL, in young and old mares, respectively. Anti-Mullerian hormone concentrations declined progressively thereafter, reaching 0.4±0.1ng/mL 5 days after surgery, 54.5% of pre-surgical concentrations and remained constant thereafter. These data demonstrate that despite the inevitable, progressive loss of ovarian follicular reserve with aging between 6 and 18 years of age, it is not reflected in a significant decline in serum AMH concentrations. However, acute halving of ovarian follicular reserve by surgical hemi-ovariectomy was followed by a decline in AMH to half of pre-surgical concentrations. We conclude that AMH is an acute quantitative, indicator of ovarian follicular reserve after hemi-ovariectomy. However, with the slow progressive decline in primordial follicle populations that inevitably accompanies aging, ovarian compensation and continual replenishment of antral follicle populations obscures this decline in mares up to nearly 20 years of age. Therefore, caution should be exercised in the interpretation of AMH concentrations as a marker of fertility in mares less than 20 years of age.

Figure: Daily serum AMH after unilateral ovariectomy surgery.

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