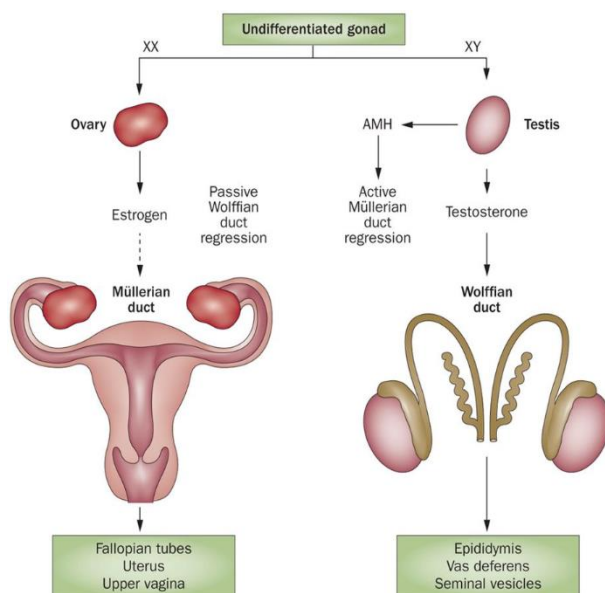


Equine Anti-Müllerian Hormone

Introduction

Anti-Müllerian hormone (AMH) is a glycoprotein, important in the development of the reproductive tract in mammals including horses. Sertoli cells of the fetal testes produce AMH results in regression of the Müllerian ducts and development of Wolffian duct. Fetal ovaries do not produce AMH results in the development of Müllerian duct and regression of Wolffian duct. AMH concentration decreases in stallions after puberty. AMH plays an active role in folliculogenesis in mares after birth.



Clinical Applications

Cryptorchidism

Cryptorchidism is a condition in which one or both testes are retained within the inguinal canal and/or abdominal cavity. The circulating concentration of AMH in the cryptorchid stallion without scrotal testes is higher than intact stallion. But the levels of testosterone and estrogen are significantly low or not different between intact and cryptorchid stallions. Testicles are the only source of AMH, whereas testosterone secretes from testicular and adrenal glands.

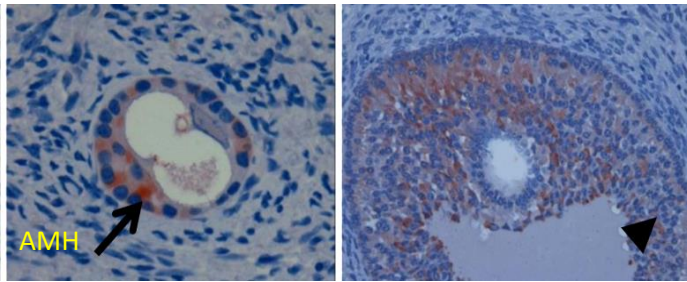
Testicular Tissue, Function and Tumor

AMH is the biomarker to detect the retained testicular tissue in horses of all ages but testosterone is not useful in horses younger than 18 month of age, estrogen sulfate is less informative before 3 years of age. AMH concentration is higher in stallions during breeding season than non-breeding season. Compared to testosterone, serum AMH displays less diurnal variation making the measurement of AMH better for reproducibility. Measurement of serum AMH or immunohistochemistry can differentiate Sertoli cell tumors with other tumor types.

Ovarian Reserve and Function

AMH is synthesized from granulosa cells of the ovarian follicles in adult mares. Circulating concentration of AMH is used to differentiate ovariectomized and intact mares. The expression of AMH is strong in the small Antral follicles (15-20 mm) and faint signal in dominant and preovulatory follicles. AMH concentration varies between young, middle aged and old age mares. AMH is highly correlated to antral follicle count and the concentration is relatively stable during and between different estrous cycles therefore

valuable in assessing the reproductive lifespan of mares.



Growing follicle

Dominant follicle

Granulosa Cell Tumor

The equine granulosa cell tumor (GCT), is the most common tumor of the equine ovary. In contrast with hemorrhagic anovulatory follicle or ovarian hematoma, the equine GCT is hormonally active. Inhibin and testosterone concentrations are increased in nearly 80% and 48% of GCT mares respectively. But their concentrations are also increased during pregnancy, and slightly increased testosterone concentrations in non-pregnant mares could be attributed to increased adrenal gland activity. Mares with a GCT have higher circulating AMH concentrations than non-pregnant and pregnant mares without a GCT indicating that AMH can serve as an endocrine marker for equine GCTs.

AMH turns out to be the most important endocrine marker to identify mares with a GCT because it has a higher sensitivity (98%) than inhibin and testosterone.

Biomarker for Fertility in Mares

AMH and / or AFC has been associated with fertility in both assisted reproduction settings as well as natural fertility. Concentrations of AMH have been shown related to assisted reproduction parameters such as oocyte quality, response to ovarian stimulation protocols, embryo production and implantation in cattle. Studies have shown that in growing equine follicles, low AFC was associated with reduced

expression of AMH, AMHRII, ESR2 and FSHR in granulosa cells compared to growing follicles from mares with high AFC. The AMH concentrations were higher in pregnant than in open mares based upon pregnancy outcome at Days 13-18.

Pregnancy outcome by age and AMH quartiles				
Age Quartile	Quartile	Open	Pregnant	total
	Young	17(17%)	83(83%)	100
	Middle	85 (39.25%)	132(60.8%)	217
AMH quartile	Aged	42(41.2%)	60(58.8%)	102
	Lower	43 (43%)	57(57%)	100
	Middle	68 (31.5%)	148 (68.5%)	216
	Upper	33 (32%)	70 (68%)	103

Serum AMH concentration were positively correlated with the daily increase in ovarian follicle diameter as well with mares with higher conception rates. It was also negatively correlated with anovulation and number of mating per conception. In summary, a strong relationship was found between peripheral AMH concentrations and fertility performance in mares.

Table 2. Correlation of Anti-Müllerian Hormone values with age of the mares and reproductive outcomes

Reproductive Outcomes	Anti-Müllerian Hormone	
	r	P
Age of mares	-0.243	0.153
Daily increase in follicle diameter	+0.463	0.013
Ovulated follicular diameter	-0.104	0.564
Multiple ovulation	-0.047	0.787
Anovulation	-0.440	0.007
Conception	+0.608	0.000
Number of mating per conceptions	-0.562	0.001
Embryonic death	-0.072	0.675

From Ansh Labs:

Equine AMH ELISA, AL-115