QFA's

Questions Frequently Asked

Reproductive Endocrine Normal Levels

Progesterone:		
	Estrus/Anestrus:	less than 1 ng/ml
	Pregnancy/Diestrus:	greater than 5ng/ml
	Male:	less than 0.2 ng/ml
Estradiol:		
	Anestrus/Diestrus:	less than 20 pg/ml
	Pregnancy >100 days:	50 - 400 pg/ml
	Stallions:	20 - 60 pg/ml
Testosterone:		
	Stallions:	
	Breeding season:	1 - 4 ng/ml
	Non-Breeding season:	less than 1 ng/ml
	Geldings:	less than 0.2 ng/ml
	Mares:	less than 0.1 ng/ml
Estrone Sulfate:		
	Pregnant >90 days:	greater than 20 ng/ml
	Non-Pregnant:	less than 5 ng/ml
	Gelding's:	less than 5 ng ml
	Stallions/Cryptorchids:	greater than 20 ng/ml
T3:		0.3 - 0.9 ng/ml
T4:		1.5 - 4.5 ug/dl
Free T4:		1.2 - 1.8 ng/dl
Insulin:		10 - 30 uIU/ml
Cortisol:		2.0 - 6.0 ug/dl
ACTH:		8 - 35 pg/ml

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Reproductive Hormones

Hypothalamus
The hypothalamus is part of the brain structure that serves to activate, control, and integrate th peripheral autonomic mechanisms, endocrine activities and many somatic functions

Prostaglandin:
Normally administered to engage the reproductive cycle, "prostin" as it is referred to in the field is given >6 and <8 days post the most recent ovulation as viewed by an ultrasound evaluation of the ovaries. The main purpose of Prostaglandin is to break down the corpus luteum, which forms on the ovary at the site of the previous ovulation. The CL as it is referred to in the field acts as a "Band Aid repairing the damage caused by the rupturing follicle upon the release of the egg into the fallopian tube. In simple terms can be considered a patch of scar tissue of which is broken down by the histaminic release of the prostaglandin.

Estrogen
Estrogen is the hormone produced by the follicle growing on the ovary that is responsible for the secondary sex characteristics in the female:

- absence of muscle development
- development of mammary glands
- development of reproductive systems and external genitalia
- fat deposition on hips and stomach (source of energy)
- triggering of estrous cycle at puberty
- triggering of heat
- depresses FSH production when follicle is mature

Follicle:
Sac like or pouch like depression or cavity that retains the ovum.

Progesterone:
Progesterone, a naturally occurring hormone in both Stallions and Mares, is essential for many vital functions in the body. The ovaries produce the majority of progesterone, but only if ovulation occurs. As broodmares approach menopause, less progesterone is produced; progesterone also balances the effects of estrogen.
Progesterone is also produced by the adrenal glands and, in smaller amounts, in the testes and the adrenal glands in stallions. One of its most important functions is in the female reproductive cycle. Progesterone prepares the lining of the uterus for implantation of a fertilized egg, and then helps to maintain it during pregnancy. If pregnancy does not occur, it signals the uterus to shed this lining thus causing her to begin her cycle all over again.

Altrenogest

Veterinarians are often asked to suppress transitional estrus and to hasten onset of ovulation in transitional mares. The oral progestogen altrenogest (Regumate) is marketed partly for this purpose. Progestogens inhibit LH release during prolonged administration. Following their withdrawal there is a rebound LH surge which theoretically drives ovulation. Administration of Regumate at the recommended dose (0.044 mg/kg per os SID) effectively suppresses behavioral estrus. To hasten ovulation, the recommended course of 10-15 days is effective only in late transition (when the mare might be about to ovulate anyway). A large follicle (>35mm) should therefore be present on the ovary to achieve hastened ovulation. Progesterone in oil (150 mg IM daily) is a cheaper but less convenient alternative. Response is variable, but on the average mares come into heat in 3-6 days and ovulate in 10-12 days following withdrawal.

h.C.G. Human Chorionic Gonadotropin

Human Chorionic Gonadotropin, or hCG as it is referred to in the field, will, if given at the appropriate time induce the maturation of an ovum and/or egg. The best time to administer hCG is when the uterus in full of edemia and looks like a tomato slice or wagon wheel. This hormone will take a minimum of 24 hours with the usual period of 36 hours in order to function as projected if given at the most opportune time.

Also, Human Chorionic Gonadotropin, or hCG, production begins approximately 16-18 days after conception when the embryo starts to burrow itself into the lining of the uterus. This hormone is measured by early pregnancy tests and if present, will return a positive result.

GnRH

Cycling can be induced by GnRH administration. However, single injections are ineffective; GnRH must be delivered in a pulsatile fashion or by sustained release. Pulsatile release of GnRH by osmotic pumps is effective to induce ovulation, but the approach is costly and complicated. Silastic implants containing potent GnRH agonists such as Buserelin, Goserelin or Deslorelin are partially effective at inducing ovulation in acyclic mares. The GnRH agonist "ovuplant" is currently available.

Deslorelin

Injectable Deslorelin has become a useful tool in equine reproduction, even though it still requires a 24 to 36 hour lead time prior to ovulation. As with hCG, the best time to identify this, is when the uterus in full of edemia and looks like a tomato slice or wagon wheel. Deslorelin is extremely predictable and that is why it is quickly overtaking hCG as the ovulation drug of choice.

F.S.H. Follicle Stimulating Hormone

The follicle stimulating hormone is produced by the anterior pituitary and causes ovarian follicles to grow and to produce increasing amounts of estrogenic substances. As its name implies, FSH stimulates the maturation of ovarian follicles. Administration of FSH to humans and animals induces "superovulation", or development of more than the usual number of mature follicles and hence, an increased number of mature gametes. FSH is also critical for sperm production. It supports the function of Sertoli cells, which in turn support many aspects of sperm cell maturation.

LH Luteinizing Hormone

In both sexes, LH stimulates secretion of sex steroids from the gonads. In the testes, LH binds to receptors on Leydig cells, stimulating synthesis and secretion of testosterone. These cells in the ovary respond to LH stimulation by secretion of testosterone, which is converted into estrogen by adjacent granulosa cells.

In females, ovulation of mature follicles on the ovary is induced by a large burst of LH secretion known as the preovulatory LH surge. Residual cells within ovulated follicles proliferate to form corpora lutea, which secrete the steroid hormones progesterone and estradiol. Progesterone is necessary for maintenance of pregnancy, and, in most mammals, LH is required for continued development and function of corpora lutea. The name luteinizing hormone derives from this effect of inducing luteinization of ovarian follicles.

CL Corpus Luteum

Let's take a good look at the hormonal sequences that drive the estrous cycle and how specific management can optimize the breeding effort. The diestrous phase is marked by a corpus luteum (a CL, the remnant of an ovulated follicle) which is actively secreting progesterone. The uterus allows 12 -14 days to pass during which it awaits a signal from the embryo that a pregnancy is present. If a pregnancy is present (and the mare's uterus is responding properly), the CL will be maintained and will continue to secrete progesterone until the 37th day, when endometrial cups are formed in the lining of the uterus which then continue to support the pregnancy with progesterone. Mares who fail to produce sufficient levels of progesterone may be supported with Regumate, a synthetic progesterone administered orally, which often makes the essential difference between losing or maintaining a pregnancy. If no embryo is present at 14 days, the uterine endometrium will secrete the hormone prostaglandin that destroys the CL. At times the uterus fails to respond in this manner and instead retains the CL. In these cases, injectable Prostaglandin is used to "short cycle" the mare, or to squelch a retained CL that is preventing her from coming back into heat. The resulting drop in progesterone levels signals the release of Follicle Stimulating Hormone (FSH) and Luteinizing Hormone (LH), initiating the next sequence of events that lead to the mare's next ovulation.
It is helpful to look at the next phase of the estrous cycle, where our management may further determine the outcome of the breeding effort. To continue on toward the mare's next estrus, FSH acts on the ovaries to stimulate follicular development. Follicles produce the hormone estrogen that acts on the brain center and causes estrous behavior. FSH acts further by affecting the softening of the cervix; it also stimulates the smooth muscles within the mare's reproductive tract to facilitate the movement of egg and sperm; and finally, it inspires the release of LH. LH facilitates the final maturation and ovulation of the egg-bearing follicle. This delicate process is responsive to human manipulation by the use of HCG (Human Choriono Gonadotropin) and Deslorelin (Ovuplant). HCG must be administered when a follicle is greater than 35mm to effectively hasten ovulation, usually within 24-48 hours of administration. Deslorelin also acts to reliably close the window of ovulation within a 36-hour time frame. We use these agents to optimize the management of breeding the mare with cooled or frozen semen.

Oxytocin

Uterine defenses require that intraluminal fluid be removed, and that the walls of the uterus be brought into close apposition. Oxytocin achieves this without invading the uterus. Repeated dosage is easy and safe. 10 IU IV or 20 IU IM is a common dose. Ultrasonographic monitoring post breeding allows one to judge the need for oxytocin or lavage on a mare by mare basis.