

Category	Chemical or Generic Name	Abbrev.	Source	Target Organ, Cell Type, and Receptor type	Endocrine Function	Pharmaceutical use
Luteolytic	Prostaglandin F2 Alpha	PGF _{2α}	<p>Physiological source:</p> <p>Uterus, endometrium cells will spontaneously begin to produce PGF_{2α} around 16 to 20 days post estrus. PGF_{2α} is actually a physiologically active lipid. It is an inflammatory mediator belonging to the broad prostanoid family.</p> <p>Like all prostaglandins it is synthesized from a fatty acid (arachidonic acid). Cyclooxygenase 2 is the initial catalyst for this synthesis. It has hormone like activity on distant cells (CL cells)</p> <p>Pharmaceutical brands:</p>	<p>Ovary / corpus luteum cells,</p> <p>Trans-membrane G protein-coupled receptor,</p> <p>The initial release of uterine PGF_{2α}, or an injection of PGF_{2α} will affect a mature CL by causing cessation of progesterone production and stimulation of oxytocin production.</p> <p>Oxytocin from the CL stimulates endometrial cells to produce additional surges of PGF_{2α}.</p> <p>The PGF_{2α} / oxytocin cascade causes regression of the corpus luteum and stops the production of progesterone</p>	<p>PGF_{2α} causes luteolysis or regression of the Corpus Luteum.</p> <p>Loss of the CL results in cessation of progesterone production.</p> <p>Endometrial production of PGF_{2α} will occur late in diestrus unless there is a healthy embryo present in the uterus producing "Maternal Recognition of Pregnancy" (MRP) factor(s).</p> <p>MRP factors will suppress uterine PGF_{2α} production, sparing the CL and allowing progesterone production to continue supporting embryonic development.</p> <p>Diestrus is the luteal phase of the estrus cycle. In a non-pregnant cow or mare diestrus will end at 16 to 20 days post-estrus. Proestrus begins as progesterone declines to baseline levels. After luteolysis the circulating progesterone level will drop to a baseline level of less than 1ng/ml in serum. Low progesterone will allow the animal to return to estrus and for the elevation (surge) of LH at the beginning of true estrus, and for the final maturation and ovulation of the ovarian follicles(s) that cause estrus.</p>	<p>PGF_{2α} is available as a pharmaceutical in the US and elsewhere in the world.</p> <p>Pharmaceutical PGF_{2α} is injected IM as a single injection. It is effective in inducing luteolysis in a horse or ruminant during diestrus when the animal has a mature CL producing progesterone.</p> <p>There is a 5 day refractory period after ovulation, where PGF_{2α} has no effect and will not cause luteolysis on an immature CL.</p> <p>It is also important to note that an animal must be cycling and have a mature corpus luteum for an injection of prostaglandin to have a luteolytic effect.</p> <p>Prostaglandin can be used to loosely "synchronize" the onset of estrus in ruminants and equines that are cycling.</p> <p>Prostaglandin can also be used to prevent pregnancy or cause abortion of a pregnancy an animal that has been mis-mated. Feeder heifers for instance are often treated with prostaglandin to prevent pregnancy in a feedlot.</p>
	Pharmaceutical in US		<p>Lutalyse, Dinoprost 5mg/ml, (5ml IM Bovine, 2ml IM - Equine) Estrumate, Cloprostenol 250mcg/ml (2ml Bovine only)</p>			

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Releasing Hormone	Gonadotropin Releasing Hormone Pharmaceutical in US	GnRH	<p>A small polypeptide that is released from the end of axons of specialized hypothalamic neurons.</p> <p>The hypothalamus lies adjacent to and above the pituitary gland and brain stem.</p> <p>GnRH is a neuroendocrine hormone similar to a neurotransmitter. It is the communication interface between between the CNS and the reproductive system.</p> <p>GnRH is released from the neuronal axon into the portal circulation between the hypothalamus and the anterior pituitary gland.</p>	<p>The target cells are gonadotrope cells in the anterior pituitary gland. Gonadotrope cells produce FSH and LH, the 2 pituitary gonadotropins. When the receptors on gonadotrope cells bind the GnRH; they will then release LH primarily, but some FSH is also released. LH requires GnRH for its release. FSH <u>does not</u> require GnRH for its release from the pituitary gland.</p> <p>The receptor is a Trans-membrane G protein-coupled receptor.</p>	<p>Synchronize the follicular cycle in cattle. Is part of the endocrine d cause ovulation of a dominant follicle.</p> <p>Causes the release of Luteinizing Hormone (LH) from the anterior pituitary gland. A single injection 100 micrograms will result in a surge of LH to be released, similar in magnitude to a natural pre-ovulatory LH surge.</p> <p>An injection or Subcutaneous implant of GnRH or a pharmaceutical analog of GnRH can result in ovulation if it is administered during estrus.</p> <p>An injection of GnRH during diestrus (the luteal phase) will also result in ovulation or luteinization; if a dominant, LH receptive follicle is present on the ovaries. This can be used to synchronize the follicular cycle in cattle to assist in estrus and ovulation synchronization.</p> <p>In cattle, when a dominant follicle ovulates or luteinizes it will allow a new follicular cycle (or wave) to begin.</p>	<p>GnRH is available as a pharmaceutical in the US and elsewhere in the world.</p> <p>Cystorelin, Fertagyl, Factrel, Ovacyst and maybe others all contain Gonadorelin diacetate tetrahydrates, 50 micrograms per ml of sterile solution for IM or IV injection.</p> <p>The usual dose in cattle is 100mcg (2ml) as a single injection.</p> <p>Ovuplant™ - Deslorelin Acetate subcutaneous implant for use in horses. Each implant contains 2.1 milligrams deslorelin acetate. For inducing ovulation within 48 hours in estrous mares with an ovarian follicle greater than 30 millimeters in diameter. Follicular size should be determined by rectal palpation and/or ultrasonography prior to treatment.</p>
Gonadotropins	Follicle Stimulating Hormone Pharmaceutical in US	FSH	<p>From anterior pituitary</p> <p>GnRH is able to stimulate an increased release of FSH from the anterior pituitary gland. But GnRH is not required for FSH release.</p> <p>Estrogen stimulates GnRH release and will increase FSH release</p> <p>Inhibin directly suppresses FSH release</p>	<p>Ovarian follicle granulosa and cumulus cells, (the nurse cells for oocytes within ovarian follicles),</p> <p>Testicle / sertoli cells, (the nurse cells for spermatocyte, spermatids, and spermatozoa)</p> <p>Trans-membrane G protein-coupled receptor,</p>	<p>Used to superovulate embryo donor animals. Causes multiple ovulations instead of the usual single ovulation.</p> <p>In the female FSH will: stimulate follicular growth, induce LH receptors in preovulatory follicular cells</p> <p>In males FSH Stimulates spermatogenesis</p>	<p>Used to superovulate embryo donor animals. Causes multiple ovulations instead of the usual single ovulation.</p> <p>FSH supplementation will counteract the suppression of pituitary FSH production by inhibin.</p>
	Luteinizing Hormone <u>not available in US</u>	LH	<p>From anterior pituitary</p> <p>GnRH is the stimulus for release of LH from the anterior pituitary gland</p>	<p>Ovarian Fol. - granulosa, cumulus and thecal cells, testicular leydig cells</p> <p>Trans-membrane G protein-coupled receptor,</p> <p>Initiates ovulation</p> <p>Initiates resumption of meiosis in oocytes</p> <p>Production of progesterone in thecal cells and leydig cells</p>	<p>Used to induce ovulation of dominant LH receptive follicles.</p>	

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Placental Gonadotropins	Human Chorionic Gonadotropin Pharmaceutical in US	HCG	From primate embryonic & fetal chorionic cell and trophoblast cells of the placenta	See LH Luteotropic - MRP signal in primates	See LH	Induce ovulation of a dominant LH responsive follicle. HCG is the primary drug used in mares for inducing ovulation.
	Equine Chorionic Gonadotropin also called: Pregnant Mare Serum Gonadotropin	ECG or PMSG	From equine fetal chorionic cells. These cells are the outermost cell layer of the embryonic or fetal placenta. After implantation at around 40 days of gestation; chorionic cells implanted in the maternal endometrium form structures called "Endometrial Cups", which produce ECG.	Ovarian follicles See FSH and LH for details and perspective.	ECG has FSH like activity causing accessory follicles to develop during pregnancy. ECG has LH activity which causing the follicles to ovulate. Accessory CLs produce additional progesterone to assist in maintenance of pregnancy.	Can be used to superovulate donor cows but it is not available as a pharmaceutical in US .
Steroidal Hormones	Progesterone Pharmaceutical in US	P4	Corpus luteum of the ovary Chorionic cells of the placenta Leydig cells of the testicles Adrenal gland Adrenal gland	Steroid hormones have intracellular nuclear receptors which bind to DNA and regulate transcription There are also other transmembrane and intracellular receptors Uterus, Anterior Pituitary gland, Hypothalamus, other CNS areas, many body tissues	Maintenance of pregnancy Precursor for corticosterone Precursor for testosterone Other Important Activity Suppresses hypothalamic production of GnRH; and thus, pituitary production of LH. Lack of LH suppresses the final maturation of dominant follicles and the follicles production of testosterone and estrogen. Lack of LH and estrogen will prevent expression of estrus and prevent ovulation during diestrus. Does not seem to suppress FSH production from the pituitary gland	Pharmaceutical in US Used for suppression estrus and suppression of ovulation in animals EAZI-BREED™ CIDR® vaginal insert for Cattle. For synchronization of estrus in suckled beef cows and replacement beef and dairy heifers. EAZI-BREED™ CIDR® vaginal insert for Sheep. For induction of estrus in ewes (sheep) during seasonal anestrus. Regu-Mate® Altrenogest , oral progestin. For suppression of estrus (and ovulation) in mares Regu-Mate® Used for suppression estrus and ovulation in mares and swine Regu-Mate® Has been used for the synchronization of estrus and to assist in the maintenance of pregnancy in mares Matrix® Altrenogest, oral progestin. For synchronization of estrus in sexually mature gilts that have had at least one estrous cycle.

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Steroidal Hormones	Testosterone	T	Leydig cells of the testicles Thecal cells of ovarian follicles	Sexual behavior, secondary sex characteristics Precursor for estradiol	Not legal for any pharmaceutical use in food animals.	No animal pharmaceutical use approved in the U.S
	Estradiol	E2	Ovarian follicles pre-ovulatory granulosa cells	Uterus, Anterior Pituitary gland, Hypothalamus, other CNS areas, many body tissues Causes receptivity in an animal that is in heat Elevated proestrus levels of estradiol initiate the GnRH release from the hypothalamus This increase in GnRH will lead to an LH surge from the anterior pituitary Follicular origin estradiol is indirectly responsible for the sequence that ends in it's own ovulation.	Not legal for any reproductive pharmaceutical use in food animals. Extra-label use in mares during pregnancy.	No animal reproductive pharmaceutical available in the U.S
TGF-β protein superfamily	Inhibin		Maturing ovarian follicles that are LH responsive (or in other words; have LH receptors expressed on the follicular cell surface), require only LH to finish maturation and achieve the ability to ovulate. These LH responsive follicles will begin to produce Inhibin.	In monotoxic animals inhibin will suppress Pituitary FSH production. By suppressing FSH Inhibin will cause smaller subordinate follicles that are not yet LH responsive to regress and die. This allows many species to limit the number of offspring to one or sometimes two.	Direct Suppression of FSH production by the Pituitary Gland Activin, inhibin and a number of other structurally related proteins such as anti-Müllerian hormone, bone morphogenetic protein, and growth differentiation factor belong to the TGF-β protein superfamily.	None currently. An Anti-Inhibin antibody has been proposed as a superovulation possibility.
	Anti-Mullerian Hormone		Testicles and ovaries	More to come		
posterior pituitary neuroendocrine hormones	Oxtocin Vassopressin		P. Pituitary gland & Corpus Luteum P. Pituitary gland	More to come		
				More to come		