

Veterinary / Management and Nutrition / Management of Reproduction: Horses

Reproductive Cycle in Horses

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Anestrus ovaries, mare

Courtesy of Dr. Patricia Sertich.



Transitional ovaries, mare

Courtesy of Dr. Patricia Sertich.

Nearly all mares are seasonally polyestrous and cycle when the length of daylight is long. Anestrus is seen during the winter when daylight length is short. During anestrus, the uterus is flaccid, and the ovaries are inactive with no significant follicles or corpora lutea. The cervix may be closed but not firm and tight, or it may be thin, short, and dilated. As the length of daylight increases, mares undergo a vernal transition and the ovaries become active, with numerous large (>25 mm) follicles. The cervix and uterus have minimal tone. Mares have three or four prolonged intervals of estrus (periods of sexual receptivity to the stallion) during the vernal transition, but ovulation does not occur. The end of vernal transition is marked by a surge of luteinizing hormone and subsequent ovulation. After this ovulation, the first 21-day interovulatory period of that breeding season occurs and a regular estrous cycle is established.

Although the mare continues to ovulate regularly every 21 days throughout the breeding season, the length of estrus varies, ranging from 2–8 days, and the length of diestrus varies accordingly to maintain a 21-day interval. Early in the breeding season, estrus tends to be longer, whereas around the summer solstice the mare may be sexually receptive for only 2–3 days.



Sonogram of edematous endometrial folds, mare

Courtesy of Dr. Patricia Sertich.



Sonogram of a dominant follicle, mare

Courtesy of Dr. Patricia Sertich.



Sonogram of corpus luteum and follicles, mare

Courtesy of Dr. Patricia Sertich.

Mares have two follicular waves each cycle. The first wave of follicular development occurs during diestrus, and these follicles become atretic. The second wave occurs after luteolysis and is associated with estrus. Early in estrus, the endometrial folds of the uterus are edematous, but the edema wanes as ovulation approaches. Usually, one follicle becomes dominant and ovulates when it is ≥ 30 mm in diameter. The dominant follicle enlarges and then softens just before ovulation. The oocyte is released through the ovulation fossa. A corpus hemorrhagicum and subsequent corpus luteum form and produce progesterone, which stimulates closure of the cervix and an increase in uterine tone. This corpus luteum will be mature and become responsive to prostaglandin in ~ 5 days. If pregnancy is not established, luteolysis occurs at 14 days, and the mare returns to estrus and continues to cycle.

Artificial Manipulation of Photoperiod:

After winter anestrus and the vernal transition, cyclicity naturally starts sometime in the spring, when breeding can begin. Because changes in the mare's genital tract are seen in response to the length of daylight, the onset of ovulation and subsequent regular estrous cycles—and thus, the onset of the breeding season—can be hastened by exposing the mare

to 16 hr of light per day; 8–10 wk are required for mares to respond. If the breeding season is scheduled to begin February 15, mares should be exposed to daily supplemental artificial lighting starting on December 1. Mares need to experience a natural photoperiod of decreasing length of daylight in the fall. Mares can then be abruptly exposed to 16 hr of light each day, or the supplemental light can be gradually increased to a 16-hr day throughout 60 days. In an abrupt lighting program, mares living in natural daylight are exposed to supplemental light from ~4:30 pm until 11:00 pm daily. In a less expensive, energy conserving, stepwise program, mares can be exposed to 3 hr of supplemental light in the evening the first week of December, and then the supplemental light is increased by 30 min each week until mares are exposed to 16 hr of light each day. An automatic timer aids compliance and saves on labor.

The supplemental light must be added at dusk; light added in the morning before dawn is not effective. A minimum of 10 foot-candles (107 lux) of incandescent or fluorescent light is necessary. The amount of light should allow one to comfortably read newsprint. Mares can be stimulated individually in a stall or as a group in a lighted paddock.

Manipulation of Ovarian Activity:

Ovarian activity is frequently manipulated by administration of hormones to facilitate scheduling of breeding appointments and to limit the number of breedings per estrus. Breedings should be spaced for stallions with large books of mares so that semen use is optimized. Geographic locations and transportation constraints may also necessitate scheduled breedings. Many situations can benefit from an ovulation control program. (Also see [Hormonal Control of Estrus](#).)

Administration of prostaglandin ($\text{PGF}_{2\alpha}$), IM, to a mare in diestrus causes luteolysis and allows a follicle to mature and ovulate. The corpus luteum must be 5–14 days old to respond to $\text{PGF}_{2\alpha}$. The mare will come into estrus 2–5 days after administration of $\text{PGF}_{2\alpha}$. Time to ovulation is variable (3–10 days) and depends on the stage of the mare's current follicular wave and on the size and character of follicles at the time of $\text{PGF}_{2\alpha}$ administration. It is recommended that the mare's ovaries be examined by palpation and ultrasonography at the time of $\text{PGF}_{2\alpha}$ administration to optimize the prediction of ovulation.

Dinoprost, a naturally occurring $\text{PGF}_{2\alpha}$ (1 mg/45.5 kg, IM), may cause transient adverse effects such as lowered body temperature, increased heart and respiratory rates, sweating, muscle cramping, colic, ataxia, and weakness. Signs are seen within 15 min and usually subside within 1 hr. Synthetic preparations, eg, cloprostenol sodium (0.55 mcg/kg, IM), have fewer adverse effects.

Human chorionic gonadotropin (HCG) 2,500–5,000 IU, IV or IM, has been administered (off-label use) to hasten ovulation of a dominant follicle during estrus. If the mare has a preovulatory follicle ≥ 35 mm diameter, ovulation occurs within 36–48 hr after administration. An FDA-approved preparation of deslorelin acetate is available and eliminates the need to use HCG off-label. This sustained-release GnRH analogue will cause ovulation within 48 hr of administration to an estrous mare with a 30–40 mm follicle.

Ovulation can be timed accurately using the following protocol (not FDA approved): On days 1–10, 10 mg of estradiol 17- β and 150 mg of progesterone are administered IM. On day 10, dinoprost (1 mg/45.5 kg, IM) is also administered. On day 16, mares come into estrus, and insemination should be performed on day 19 or 20. Most (85%) mares ovulate

on day 20, 21, or 22. This regimen is effective at any time in cycling mares except when a large, dominant follicle <48 hr from ovulation is present. If a mature follicle is present, the protocol should not begin until after ovulation.

Altrenogest is a synthetic progestin that suppresses the receptive sexual behavior of estrus. Altrenogest is administered at 0.44 mg/kg, PO by dose syringe or top-dressed on feed for 12–15 days. Estrus occurs 4–5 days after treatment ends, with variable timing of ovulation (8–15 days). Although altrenogest effectively suppresses estrus (sexual receptive behavior), it does not consistently control the time interval to ovulation.

Estrus Detection:

Frequent palpation and ultrasonography of the genital tract, excellent record keeping, and administration of hormones allow veterinarians to intensively monitor and manipulate a mare's estrous cycle. But breeding management can be optimized if a good estrus detection program is in place. A mare detected in estrus will prompt the breeding farm manager to examine and prepare the mare for breeding. Estrus may be the first indication that a pregnant mare has experienced early embryonic death or an abortion.



Estrous mare

Courtesy of Dr. Patricia Sertich.

The mare should be presented to a stallion (teaser) daily or every other day during the breeding season, and the mare's behavioral response accurately interpreted and recorded. Mares in estrus raise their tail, squat, urinate, evert the vulvar lips to expose the clitoris, and ultimately tolerate copulation. Mares in diestrus usually squeal, kick, bite, and reject the stallion's advances. Adequate exposure to and contact with the teaser may be needed to elicit the mare's response; a mare with a dominant follicle may initially not appear receptive because of nervousness or inexperience. Some mares with foals by their side may not exhibit estrus to the teaser because of their protective nature. The mare's behavior when teased should be consistent with the findings on examination of the genital tract. Response to teasing can determine whether estrus has begun and indicate when a mare should be palpated and bred. Failure to return to estrus 2–3 wk after breeding may suggest that the mare is pregnant.

Mares in seasonal anestrus may remain passive in the presence of a stallion.

Some anestrus mares will be receptive when confronted by a stallion and will tolerate a stallion's sexual advances. This tolerance seems to be due to a lack of progesterone, similar to the tolerance seen in an ovariectomized mare when used as a stimulus for semen collection from a stallion.

Mares normally have three or four prolonged periods (7–14 days) of sexual receptivity during the vernal transition before the first ovulation of the breeding season occurs. Similar long periods of sexual receptivity occur during the autumnal transition between the breeding season and winter anestrus.

