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## **Estrous Cycle Characteristics of Donkeys with Emphasis on Standard and Mammoth Donkeys** (8-Feb-2005)

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### **Introduction**

Donkeys (*Equus asinus*) are enjoying increased popularity as pets and working livestock. Information in the veterinary literature on reproductive characteristics of donkeys, including estrus behavior and estrous cycle characteristics, is limited in comparison to the horse. While many similarities in reproductive physiology exist between donkeys and horses, some differences are apparent. The purpose of this article is to briefly review recently published information on estrus behavior and estrous cycle characteristics in female donkeys (jennies).

### **Signs of Estrus**

Perhaps one of the best methods for learning normal reproductive behavior of donkeys is observation of jennies running at pasture with jacks. Henry et al., [1] observed mating behavior of two jacks (usually 6 - 12 hour per day observation periods - when jacks were turned with jennies), each with 21 non-pregnant jennies while running free in pastures. They caught jennies for frequent ultrasound examinations at the end of the day (once daily when in estrus, and once every 3 days when in diestrus) to characterize relationships of specific behaviors to phase of the estrous cycle. Teasing behavior included: naso-nasal contact; nibbling of the head, neck, knee, and flank; and sniffing parts of the body - particularly the perineal area. They noted jennies in estrus approached the jack immediately after he vocalized. Spontaneous vocalization of jacks, and less frequently vocalization by jennies, preceded periods of intense pre-copulatory interaction. A majority (78%) of the jennies that vocalized were in estrus. Additionally, jennies in estrus often gathered in the vicinity of the jack when he was teasing or mounting another jennet. Jennies displayed a variety of behaviors that included mounting (e.g., sometimes the mounted jennet was in estrus; sometimes the mounting jennet was in estrus; sometimes both jennies involved in mounting were in estrus; and, rarely, neither jennet involved in mounting was in estrus), herding/chasing of other jennies, teasing of other jennies, and flehmen response. Estrus behavior was most frequent in the 3 to 4 days prior to and including ovulation. While they did note some jennies would kick the jack when they were in early estrus, the incidence of kicking progressively decreased during the following days as jennies approached ovulation. They concluded that, in comparison to horse mares, jennies played a more active role in the mating process.

Vandeplassche, et al. [2] utilized 7 standard jennies during the summer to characterize duration and intensity of signs of behavioral estrus when jennies were teased individually once daily for 1 - 2 minutes with a jack. They found signs consistent with behavioral estrus included:

1. Mouth clapping (i.e., frequent vertical opening and closing of the mouth accompanied by stretching and lowering of the head and holding the ears back);
2. Winking (rhythmic eversion of the clitoris from ventral labiae);
3. Raising the tail;
4. Urination;
5. Posturing (i.e., abducted rear legs, arched tail, tipped pelvis, and lowered perineal area); and, of course,
6. Standing to be mounted.

Interestingly, they noted that mouth clapping began almost one day earlier, and lasted almost one day later, than expression of other positive signs of estrus.

They noted that some jennies not in estrus would allow mounting by the jack, but the tail would be held down between the hind legs if this occurred. They also noted that some jennies, that would eventually display signs of estrus, would initially kick at the jack when he approached. They concluded that mouth clapping with winking of the clitoris and tail raising were the most consistently observed signs of estrus in jennies. Finally, signs typical of non-estrus were failure to show any interest in the jack, and moving, kicking or tail switching.

### **Estrous Cycle Characteristics, Including Effects of Season**

The mare has a relatively lengthy period of estrus, with ovulation occurring variably from 1 - 10 days after the beginning of sexual receptivity [3]. In comparison to the mare, few studies have been reported regarding the estrous cycle of the jennet. In one study of 20 estrous cycles in 13 jennies, duration of estrus varied from 3 - 13 days and duration of diestrus varied from 14 - 21 days [4]. In a pasture mating observation study, Henry et al., [1] reported mean (+/- SD) duration of estrus to be 6.0 +/- 2.1 D, with ovulation occurring 0.7 +/- 0.7 D prior to the end of behavioral estrus. Vandeplassche [2] also reported cessation of estrus 0.8 +/- 0.2 D (mean +/- SE) after ovulation. There is general agreement that while duration of estrus is similar between jennies and mares, duration of diestrus is longer in jennies [2,4,5]. Mean (+/- SE) diestrus length and interovulatory interval were reported as 19.3 +/- 0.6 D and 24.9 +/- 0.7 D, respectively, in standard jennies during the summer [2]. In another study, mean (+/- SD) diestrus length and interovulatory length were reported as 17.4 +/- 2.6 D and 23.3 +/- 2.6 D, respectively, in mammoth jennies examined year-round.

Follicular growth rates, measured by ultrasound, have been reported for donkeys in estrus. Vandeplassche [2] determined that diameter of the largest follicle and number of large (> 20 mm) follicles began to increase significantly 7 days prior to ovulation, with maximal diameter (averaging 36 mm; range 30 to 40 mm) achieved in dominant follicles the day before ovulation. Dadarwal et al., [6] found follicular growth rates in jennies in estrus averaged 2.7 mm per day, with ovulation usually occurring when follicles reached 41 mm diameter. They also found gradual thickening of the follicular wall, and changing follicular shape from circular to irregular, as ovulation approached in jennies - similar to the follicular changes that have been described for dominant follicles approaching ovulation in horse mares [1].

In general, it is thought that reproductive function is less affected by season in donkeys than in horses. Using 12 standard jennies studied for 1 full year in southern Wisconsin to study effects of season on the estrous cycle, the incidence and length of seasonal anestrus was found to be much lower than reported for the horse [5]. The Wisconsin study revealed a lower percentage of jennies ovulating in December (64%) than during other months of the year (82 - 100%), but only 4 of 12 (34%) jennies experienced periods of seasonal anestrus during the winter, and the period of seasonal anestrus was short (39 - 72 D). In jennies cycling year-round, they did find shorter interovulatory intervals during the summer (23.0 to 24.3 D; May-September) than during the rest of the year (25.0 to 27.3 D). The slight increase in mean interovulatory intervals was due to seasonal effects on length of estrus, with estrus lasting longer during winter (7.4 to 15.2 D; November-April) than in summer months (5.7 to 6.9 D; May-October). Mammoth donkeys may be less affected by season than standard donkeys. In a retrospective study in mammoth donkeys in southeast Texas [7], mean (+/- SD) estrous cycle length (23.3 +/- 2.6 D) and duration of estrus (5.9 +/- 2.1 D) were found to be similar among four seasons of the year (January-March, April-June, July-September, and October-December).

### **Postpartum Onset of Estrous Behavior and Cyclicity**

Little information is available on onset and duration of the first postpartum estrus in donkeys. A recent study performed on 6 French jennies in India found gross uterine involution rates to be similar to horses, with progressively decreasing mean (+/- SE) diameter of the corporo-cornual junction of the previously gravid horn to occur until 22.5 +/- 1.0 D postpartum [6]. These workers noted 10 - 15 mm diameter follicles were present on ovaries of jennies on the day of parturition, and at least one > 25 mm diameter follicle was present in all jennies between day 5 and 12 postpartum. Mean follicle size (+/- SE) reached prior to first postpartum ovulation was 41.3 +/- 1.3 mm, similar to the follicular diameter achieved in non-gravid cycling jennies prior to ovulation. Only 2 of 6 (33%) postpartum jennies expressed behavioral estrus during the first postpartum "estrus" period (beginning 5 and 7 days postpartum in these two jennies), although 5 of 6 (83%) jennies ovulated between 13 and 17 days (14.6 +/- 0.8 D; mean +/- SE) postpartum. The dominant follicle during the postpartum period regressed without ovulating in the remaining jennet. Second postpartum ovulation occurred between 37 and 42 days postpartum, with an interovulatory interval between 1st and 2nd postpartum ovulations of 22 to 26 days.

### **Multiple Ovulations**

The incidence of multiple ovulations for standard jennies has been reported to range from 5.3% to 31.8% [2,4,5]. The incidence of multiple ovulations in a herd of mammoth jennies was found to be higher (61%) than that reported for standard jennies, with several of the multiple-ovulating jennies doing so on several estrous cycles [7]. The incidence of double

ovulations in the horse has been found to be affected by breed, with larger breeds of horses having a higher incidence than smaller breeds of horses or ponies [3]. Ginther [3] also reported that multiple ovulations are characterized by significant repeatability within individual mares, and suggested that the condition may be heritable. The higher incidence of multiple ovulations reported in the herd of mammoth jennies may have been a reflection of size of the animals, or may have been due to selection of certain family lines. Ginther [5] reported no significant effect of season on the incidence of multiple ovulations in jennies, and found multiple ovulations to occur either synchronously (i.e., on the same day) (25%) or asynchronously (i.e., separated by  $\geq 1$  day) up to 11 days apart. Apparently, the majority of standard or mammoth jennies having multiple ovulations remain in estrus until after the final ovulation [5,7].

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