REPRODUCTIVE SEASONALITY OF THE JENNEY

O.J. Ginther, S.T. Scraba, and D.R. Bergfelt

Department of Veterinary Science
University of Wisconsin-Madison
Madison, WI 53706

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ABSTRACT

Reproductive seasonality was studied in 12 jennies in southern Wisconsin for 12 mo. The proportion of jennies ovulating differed ($P < 0.05$) among months due primarily to a lower proportion ovulating during December (64%) than during the other months (82 to 100%). Of 114 interovulatory intervals, eight were considered prolonged (>35 d) due to persistent corpus luteum (two intervals) and a follicular-related anovulatory period (six intervals). Four of the six follicular-related anovulatory periods were attributed to seasonal effects. The anovulatory season in these four jennies occurred in winter, was relatively short (39 to 72 d), and was terminated by a long period (17 to 41 d) of estrous behavior in the continued presence of large follicles (>20 mm).

The prolonged estrus accounted for the lower incidence of ovulations during December and seemed similar to the transition between anovulatory and ovulatory seasons in mares. There was a significant effect of month on length of the interovulatory interval, even after removal of the eight prolonged intervals, due primarily to shorter intervals during May to September (means, 23.0 to 24.3 d) than during October to April (25.0 to 27.3 d). Length of estrus differed significantly among months due primarily to shorter periods during May to October (means, 5.7 to 6.9 d) than during November to April (7.4 to 15.2 d). These results indicated that this species is subjected to seasonal effects on reproductive function. However, contrary to the literature, the dramatic partitioning of the year into ovulatory and anovulatory seasons, as occurs in mares, was absent (eight jennies) or limited (four jennies).

Key words: donkey, reproductive seasonality

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INTRODUCTION

In the temperate zone of the northern hemisphere, horses and ponies (Equus caballus) have ovulatory seasons extending approximately from April to November (horses) and May to October (ponies) (1). In a review of reports from several countries, it was concluded that the breeding season of donkeys (Equus asinus) is similar to that of horses and extends from March to August (2). In South Africa, the breeding season was reported to extend from October to April (equivalent to April to October in the northern hemisphere; 3). Nishikawa in Japan (4) concluded that the reproductive season of jennies was similar to that of horses; however, only two animals were available for study in the winter. Contrary to what has been reported, informal observations in a herd of 20 donkeys in our laboratory indicated that many of the animals ovulated throughout the year. The purpose of our study was to characterize reproductive seasonality in jennies.

MATERIALS AND METHODS

The study was done in southern Wisconsin (43°N latitude) and was initiated in September of one year and terminated in September of the following year. Twelve jennies and two jackasses were used. The animals were purchased in Wisconsin 2 to 4 yr before the experiment. The breeds were unknown, but the animals were gray or brown with a dark dorsal stripe extending the length of the body and down the cranial aspect of each shoulder. The jennies were housed together under natural day length with free access to an outside paddock. Ages were 2 to 20 yr as estimated by eruption and wear of incisor teeth, and weights were 190 to 240 kg. Jennies were individually teased for signs of estrus, as described (5). Ovulation was detected by palpation per rectum. Behavioral and ovarian examinations and collection of blood for progesterone assay were done every 3 d throughout the year and every day when a follicle greater than 25 mm was present.

Endpoints were the proportion of jennies ovulating at least once per month and the length of the interovulatory interval and estrus for each month. The interovulatory interval and estrus were assigned to the month in which they began. When there was doubt about the occurrence of an ovulation or when the interovulatory interval exceeded 35 d, blood plasma was assayed for progesterone concentration; all samples (three-day intervals) between days of accepted ovulations were assayed. Behavioral, assay, and ovarian palpation results were used to estimate if the apparently prolonged intervals were attributable to luteal persistence, a prolonged follicular phase, a prolonged period of luteal and follicular inactivity, or failure to detect ovulation. Luteal persistence was defined as elevated progesterone values (>2 ng/ml) for at least 30 d. A prolonged follicular phase was defined as the presence of estrus and a large follicle (>20 mm) for at least 15 d. A distinct biomodal progesterone profile during the prolonged interovulatory interval was assumed to represent undetected ovulation during the intervening nadir.

A Chi-square analysis was used to detect differences among months in proportion of jennies ovulating. Analyses of variance for sequential

data were used to detect differences among months in the mean lengths of the interovulatory interval and estrus. Only one interovulatory interval and one estrus (the earliest to occur) was used per jenny per month in the data analyses. When a significant effect was obtained, a multiple-range test was used to locate the differences among months.

RESULTS

Of 174 ovulatory periods, six were assumed to have been missed during palpation and were diagnosed on the basis of the progesterone profile. The proportion of jennies ovulating differed ($P < 0.05$) among months due primarily to a lower proportion ovulating during December (64%) than during the other months (82 to 100%, Figure 1). Of 114 interovulatory intervals, eight were longer than 35 d (39, 39, 46, 49, 49, 54, 64, and 72 d). One during April (49 d) and one during May (54 d) were attributed to a prolonged luteal phase (persistent corpus luteum); the approximate length of the luteal phase was 43 and 48 d. For the remaining six intervals, the progesterone concentrations were high for 14 to 16 d and below the sensitivity of the assay (<0.1 ng/ml) for the remainder of the interval. In four of the six intervals, a prolonged follicular phase was associated with estrus and much follicular activity (follicles >20 mm) during December (previous ovulation in November). The prolonged periods of estrus were 17, 21, 28, and 41 d and were associated with interovulatory intervals of 39, 39, 49, and 72 d, respectively. The remaining two prolonged interovulatory intervals with luteal phases of apparently normal length occurred in one jenny during April (64 d) and September (46 d).

There was a significant difference among months in the length of the interovulatory intervals both before and after removal of the eight prolonged intervals from the analyses (Figure 1). After removal of the eight intervals, the significant effect of month seemed due primarily to shorter intervals during May to September (means, 23.0 to 24.3 d) than during October to April (means, 25.0 to 27.3 d). The length of estrus was also different ($P < 0.001$) among months (Figure 1). The significant difference seemed due to shorter periods during May to October (means, 5.7 to 6.9 d) than during November to April (means, 7.4 to 15.2 d). The mean periods were especially long during December (15.2 d) and January (11.2 d).

Quiet ovulation (ovulation without estrus detection) occurred during 14/174 (8%) ovulatory periods. However, 12/14 quiet ovulations occurred in one jenny. This jenny had 14 ovulatory periods--12 with no estrus detected and two with estrus detected on only one day. Double ovulations occurred in 5/12 jennies with an overall incidence of 12.3% among the 12 animals. The incidence of double ovulations in the five jennies was 1/12, 1/16, 3/15, 10/18, and 1/16. The proportion of double ovulations differed ($P < 0.01$) among the 12 jennies. There was no significant effect of month on the incidence of double ovulations. Five of the 20 (25%) double ovulations occurred on the same day. The mean interval between the remaining 15 sets of double ovulations was 3.1 d (range 1 to 11 d). Usually (82%) the jennies remained in estrus during the interval between asynchronous double ovulations, including the 11-d interval.

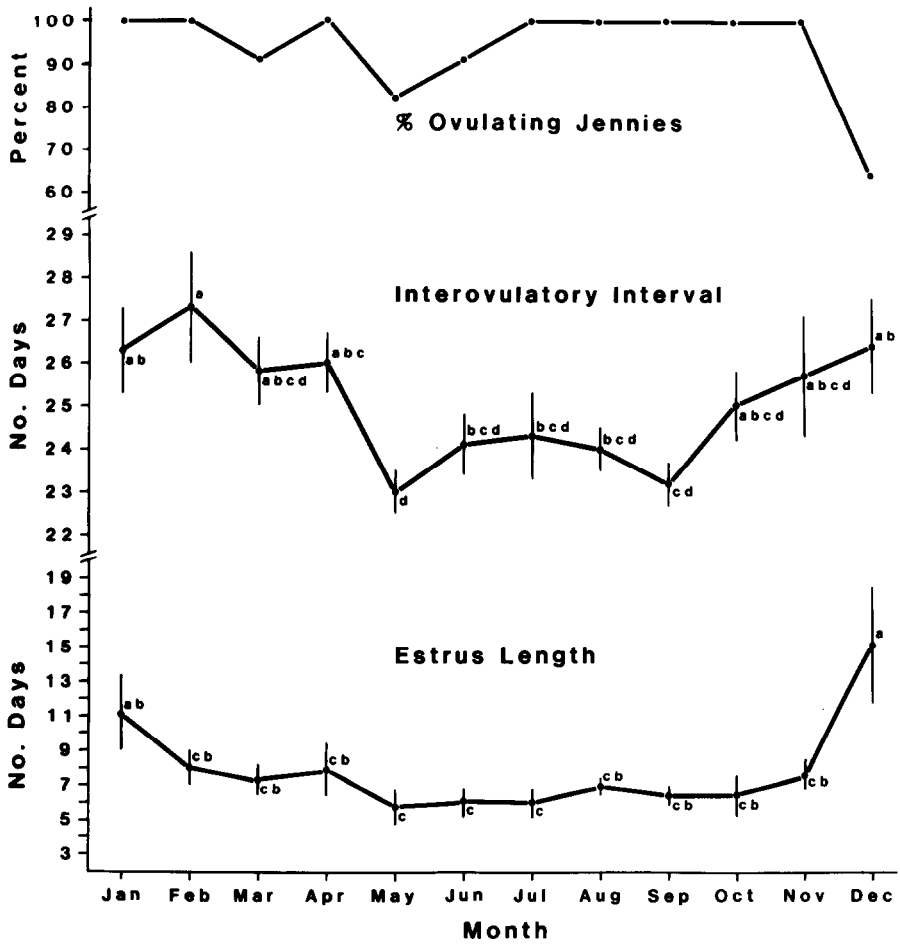

Figure 1. Percentage of jennies ovulating and mean lengths of the interovulatory interval and estrus for each month of the year. Differences among months were significant for all three endpoints. Within each endpoint, any two means with no common superscripts differ significantly.

DISCUSSION

Even though the 12 jennies were maintained in the temperate zone for at least several years, there was no indication that reproductive seasonality was similar to that of mares. These results are inconsistent with statements in the literature (2-4). Of the 12 jennies, six ovulated at least once each month, and in two of the remaining six jennies the anovulatory period was attributed to a persistent corpus luteum. One jenny had two periods of follicular inactivity during April and September; a prolonged 64-d interval was characterized by 16 d of diestrus (based on progesterone profile), 42 d of follicular inactivity (no follicles >20 mm), and 6 d of estrus with large follicles (>20 mm). A 46-d interval was characterized by 14 d of diestrus, 22 d of follicular inactivity, and 10 d of estrus. Since these prolonged intervals occurred at two different times of the year in the same jenny, they likely did not represent seasonal anovulatory periods. This same jenny and three additional jennies had a prolonged interovulatory period beginning in November and extending into January (39 to 72 d).

These four periods likely represented true seasonal effects. They occurred in the winter and were characterized by a luteal phase of approximately 14 d and an estrus phase of 17 to 41 d. The long period of estrous behavior in the continued presence of large follicles (>20 mm) was similar to the transition preceding the first ovulation of the ovulatory season in mares (1). A distinct period of follicular inactivity intervened between the end of the luteal phase and the beginning of the estrous phase in at least two of the jennies. In summary, only 4/12 (33%) jennies were interpreted to have had anovulatory and ovulatory seasons. The anovulatory season in all four jennies occurred in the winter, was short (39 to 72 d), and was terminated by a long period (17 to 41 d) of follicular activity and estrous behavior similar to what occurs in mares before the first ovulation of the year.

The mean length of the interovulatory intervals and estrous periods was similar to the results given in previous reports (2-5). However, in our study, distinct seasonal effects were obtained for both endpoints. The interovulatory intervals and the estrous periods were shorter during May to September or October. The seasonal effects on length of the interovulatory interval were present even after removal of the prolonged intervals that were attributed to luteal-persistent and follicular-related anovulatory periods. This species, therefore, is apparently subjected to environmental influences on reproductive function. However, the dramatic partitioning of the year into ovulatory and anovulatory seasons that is found in almost all pony mares and most horse mares in the temperate zones (1) was either absent (eight jennies) or limited (four jennies).

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