Serum progesterone profiles in pregnant and non-pregnant Asian elephants (Elephas maximus)

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Introduction and objectives

Previous studies, based on radioimmunoassay (RIA) of serum progesterone (P₄), indicated that the estrous cycle of the Asian elephant was on average of 16.3 ± 0.4 weeks. During the oestrus cycle, the luteal phase was 10.5 ± 0.3 weeks and the follicular phase was 5.1 ± 0.4 weeks [1,2]. The corpus luteum of elephants produces relatively small amounts of progesterone compared to other species [3]. Serum P₄ analysis is commonly used to monitor the reproductive status of female elephants. Although the female elephant shows quite a few overt signs of behavioral estrus, elephant bulls can detect estrus by smelling pheromones excreted in the female’s urine. The objectives of the present study is to investigate serum progesterone profiles in pregnant and non-pregnant domestic Asian elephants in Thailand.

Materials and methods

The study, conducted from August 2005 to February 2006, included 8 female Asian elephants from Ayutthaya elephant camp, Thailand. All of the elephants were proven breeders and calved at least once (parity 1-2). Oestrus detection was performed by the owner/mahout with the present of the bull elephant (urine sniff testing) 2-3 times weekly. The elephants were divided into 2 groups, group I (n=4) elephants were naturally mated after standing oestrus and group II (n=4) elephants were not mated after standing oestrus. Blood samples were collected from an ear vein weekly starting from standing oestrus (week 0) until 16 weeks thereafter in both groups. A solid-phase ¹²⁵I Radio-immunoassay (Coat-A-Count®, CA) was used for serum P₄ measurement. Assay sensitivity was 0.03 ng/ml. The intra assay coefficient of variation (CV) for low and high concentration were 7.74 % and 8.20 %, and the inter assay CV for low and high concentration were 1.42 % and 2.74 %, respectively. The means of serum P₄ were compared among animals and between groups (mated versus nonmated) each week after oestrus/mating by student’s t-test. P<0.05 was regarded as statistical significance.

Results

Concentrations of serum P₄ in the Asian elephants of this study varied considerably among individuals and also according to the stages of the oestrus cycle. The individual level of serum P₄ determined in the present study ranged from 0.03 up to 1.82 ng/ml. On average, during the 16 weeks of oestrus cycle, the serum P₄ varied between 0.03 to 1.33 ng/ml in group I and between 0.03 to 0.54 ng/ml in group II. Regardless to the stage of oestrus cycle, the overall mean serum P₄ concentration differed significantly between group I and II (0.56 versus 0.08 ng/ml, P<0.001). Mean serum P₄ was elevated for 5-10 weeks in normal oestrus cycling elephants (group II). In the pregnant elephants (group I), the mean serum P₄ was increased from the 4th week after mating and remained elevated throughout gestation (Fig 1). The levels of serum P₄ in pregnant elephants were significantly higher than non-pregnant elephants after the 13th week post oestrus/mating. (0.89 vs 0.03 ng/ml, P=0.05) (Fig. 1).

Figure 1 Serum P₄ profiles in pregnant (group I, n=4) and non-pregnant (group II, n=4) Asian elephants

Discussion

The present study confirmed that serum P₄ concentrations in Asian elephants change throughout the oestrus cycle, with concentrations being higher during the luteal phase of the cycle. The concentration of serum P₄ detected in the present study (range 0.03-1.82 ng/mL) was in agreement with previous findings [4,5]. The present study also demonstrated significant differences in the P₄ profile between pregnant and non-pregnant Asian elephants (Fig. 1). To our knowledge, no clear P₄ profiles between pregnant and normal cycling Asian elephants have been reported before for elephants in Thailand. It was found that after the 13th week of pregnancy, the P₄ concentration was significantly higher in pregnant than in non-pregnant elephants. These findings imply that serum P₄ might be used as a tool for early pregnancy diagnosis in the Asian elephant. However, caution is advised in using this method as a diagnostic tool because of the considerable variability in serum P₄ among individual animals.

References