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closely related among the four isolates, although the Japanese RHDV isolate had six unique amino acid changes in the range from amino acids 299 to 480 in the VP60 region. I concluded that the RHDV isolates of four different countries share

highly conserved nucleotide and amino acid sequences in the VP60 region, while there may be an internal hypervariable region as reported for feline calicivirus.

### Annual and perinatal changes in fecal testosterone concentrations in Ezo Sika deer (*Cervis nippon yeoensis* HEUDE)

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The testosterone concentrations in both the feces and blood of Ezo Sika deer were examined during the annual and the perinatal periods. Moreover, the influence of preservation methods on the changes in fecal testosterone concentrations was also examined.

The subjects were stags (total  $n=4$ ) and does (total  $n=13$ ) kept at the Haiji farm in Hokkaido. The fecal and blood samples were collected from August, 1994 to August 1996. The fecal samples were frozen immediately after evacuation. The fecal and blood testosterone concentrations were assessed by radioimmunoassay.

When the values were transformed to common logarithms, correlation was shown between the testosterone concentrations in the feces and the blood collected in the stag ( $n=1$ ) and does ( $n=5$ ) during the annual season.

In the stag, the testosterone concentrations in both the feces and blood sharply increased late in August and peaked at the pre-breeding season (early October). They were decreased in November regardless of breeding behaviors that were maintained until February. In does, the testosterone concentrations in both the feces and blood were at lower levels than in the stag. But

the fecal testosterone concentrations of the does showed small changes during the breeding season (from October to December). In parturient does ( $n=4$ ), the fecal testosterone concentrations increased before parturition. In one non-parturient doe, no change was shown during the same period.

In the pregnant does ( $n=9$ ), the fecal testosterone concentrations increased from about six weeks before parturition and decreased rapidly after parturition. They were higher than in the non-pregnant does ( $n=3$ ) and the stags ( $n=3$ ) during the same period.

The fecal testosterone concentrations increased when the feces were preserved for 48 hours at room temperature compared to those immediately preserved at  $-40^{\circ}\text{C}$  after the evacuation. The testosterone concentrations were not increased when the feces were preserved with ethanol or antibiotics for 48 hours at room temperature.

In conclusion, the fecal testosterone concentrations were correlated (male  $r=0.93$ , female  $r=0.71$ ) to those of blood in Ezo Sika deer. Moreover they showed similar patterns during the annual cycle. The testosterone concentrations increased during the pre-partum period. It

might be possible to predict the time of parturition in does by detecting an increase in the fecal testosterone concentrations. It is suggested that the feces must be preserved with ethanol or

antibiotics to prevent an increase in the testosterone concentrations during the preservation period if feces are to be kept at room temperature for a prolonged period.

Behavioral development of foals during the preweaning period in  
Thoroughbred (*Equus caballus*): spatial and nearest neighbor  
relations, and day-time time-budgets

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The aim of this study was to examine the developmental changes of the foal's behavior in Thoroughbreds. Nine colts, 13 fillies and their mares were observed from May to October in 1995. Foals were delivered between May 2 and June 6, and weaned by the end of October. Data on the distance between the foal and mare, the foal's nearest neighbor, and daytime time-budgets were recorded by scan sampling for 2 hours per week. The results are as follows:

(1) During the first 2 weeks: Foals remained very close to their mares and had little contact with other horses. The amount of time foals spent on nursing, recumbency rest and solitary-play peaked during this period.

(2) During the first 2 months of life: As foals matured, they spent more time at greater distances from their mares, and had contact with other horses, especially with other foals. Nursing time decreased sharply and feeding time increased. Mutual-grooming and social-play with other foals increased while solitary-play decreased. Recumbency rest decreased and upright rest increased, although recumbency rest was more popular than upright rest.

(3) During the third month of life: Developmental changes of foals were interrupted in spatial relation, feeding time and recumbency rest time. Foals engaged in upright rest longer than in earlier months, although recumbency rest was still more popular. Mutual-grooming peaked during this period.

(4) During the fourth and fifth months: Foals spent more time at greater distances from their mares. Feeding time increased and recumbency rest time further decreased. Mutual-grooming and upright rest time decreased.

(5) Colts spent more time in social-play than fillies. There were no prominent differences in other behavior between the sexes.

(6) Mares didn't exhibit the recumbency response. Namely, mares were closer to their foals when foals were upright than when they were recumbent during the first 2 months of foal life.

In summary, behavior of foals changed evidently during the first 2 months, and between the fourth and fifth month of life. During the third month of life (July-August), the behavioral change was interrupted.