

# **Plasma Estrone Sulphate (E<sub>1</sub>S) and Estradiol -17 $\beta$ (E<sub>2</sub> $\beta$ ) Profiles during Pregnancy and their Relationship with the Relaxation of Sacrosciatic Ligament and Prediction of Calving Time in Holstein-Friesian Cattle**

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The aims of this study were to investigate the plasma E<sub>1</sub>S and E<sub>2</sub> $\beta$  profiles during pregnancy and their relationship with the relaxation of sacrosciatic ligament in Holstein-Friesian cattle and then to predict the calving time on the basis of E<sub>1</sub>S and E<sub>2</sub> $\beta$  profiles and relaxation of the ligament. The study was conducted in 37 Holstein-Friesian cattle of Hiroshima University Experimental Farm in Japan that were due to calve between May 2002 and September 2003. Blood samples were collected at 4 weeks intervals from days 100 to 190, at 2 weeks intervals from days 190 to 250, every week from days 250 to 270 and thereafter every day from day 270 of gestation until the day after calving. The relaxation in the ligament was measured by using 2 scales as a distance at a schedule similar to blood sampling plus 5 days postpartum. One scale was kept firm exactly parallel to the ligament between the sacrum and the tuber ischii and other scale was erected perpendicularly to the first scale with the base just touching the ligament and the depth was measured in the second scale from the point where it touched the ligament to the point where it touched the first scale. Plasma samples were analyzed for E<sub>1</sub>S and E<sub>2</sub> $\beta$  by enzyme immunoassay. E<sub>1</sub>S concentration was low at day 100 ( $0.8 \pm 0.3$  ng/ml), then increased progressively and drastically to reach the level of  $28.4 \pm 3.6$  ng/ml on the day before calving and declined significantly ( $p < 0.001$ ) at  $9.5 \pm 3.1$  ng/ml within 1 day postpartum. There was a gradual increase in concentration of E<sub>2</sub> $\beta$  from day 100 of gestation ( $0.1 \pm 0$  ng/ml) until day 4 prepartum ( $0.6 \pm 0$  ng/ml). Thereafter, it increased drastically and reached the peak level of  $1.0 \pm 0.1$  ng/ml ( $p < 0.005$ ) on the day before calving and declined markedly at  $0.4 \pm 0.1$  ng/ml within 1 day postpartum ( $p < 0.001$ ). Corresponding to E<sub>2</sub> $\beta$  concentration, a gradual increase in the relaxation of the ligament was observed from day 100 of gestation ( $8 \pm 1$  mm) until day 2 prepartum ( $24 \pm 2$  mm). Thereafter, it showed a significant increase ( $p < 0.001$ ) within 1 day before calving ( $31 \pm 2$  mm) and almost no difference between day 1 prepartum and day 1 postpartum. A marked decrease ( $p < 0.001$ ) was observed thereafter until day 4 postpartum ( $10 \pm 2$  mm) and no significant change between day 4 and 5 postpartum. The accuracy for prediction of calving within 24 hours was 100 % when the level of E<sub>2</sub> $\beta$  was  $> 1.5$  ng/ml and 82 % when the increment of E<sub>2</sub> $\beta$  was  $> 0.4$  ng/ml from the preceding day value. The accuracy was 75 % when ligament measurement was 36 mm or above and it was 100 % when the measurement increased by 8 to 10 mm from the preceding day measurement. In conclusion, the relaxation in the ligament corresponded well to E<sub>2</sub> $\beta$  concentration and prediction of calving was possible by E<sub>2</sub> $\beta$  profile and relaxation in the ligament but not by E<sub>1</sub>S profile.

Keywords: E<sub>1</sub>S, E<sub>2</sub> $\beta$ , relaxation of ligament, prediction of calving, Holstein-Friesian cattle.