

Heart Rates before, during and after Allo-Grooming in Cattle (*Bos taurus*)

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There have been some studies suggesting that allo-grooming in cattle has effects on the animal's psychological state. Brownlee (1950) suggested this hypothesis after observing that cattle sometimes half-closed their eyes while receiving allo-grooming. Sambraus (1969) and Sato et al. (1991a) suggested that allo-grooming calms the animals after disturbances such as herding, handling or fasting. In addition, the former author suggested that allo-grooming of bulls may calm estrous cows. Wood (1977), Sato (1984) and Sato (1991b) suggested from the positive relationship between the duration of allo-grooming and production (milk yields and weight gains) that allo-grooming may contribute to social stability. However, the physiological effect of allo-grooming in cattle has not been investigated. One of the methods for investigating the calming effect on physiology is monitoring the heart rate (HR) response to allo-grooming, which was also used in a study of allo-grooming in a pigtail macaque by Boccia et al. (1989). Here we investigated HR changes before, during and after cattle received allo-grooming.

Materials and Methods

Two groups consisting of 5 animals aged 2-years-old were used for the monitoring of HRs. Each group was reared in a pen measuring 14.7 × 7.0 m covered with a half roof. They were fed concentrates of about 10 kg/animal/day at 9:00 and 16:00 and hay ad libitum. One group consisted of 3 steers and 2 heifers and another consisted of 5 steers. Although 2 steers and 1 heifer were selected randomly from the former group as the focal animals for monitoring HRs.

allo-grooming was rare in this group. Two steers frequently allo-groomed in a preliminary survey were then selected from the latter group.

A biotelemetric cardiogram was attached on the focal animal under normal rearing conditions and HRs were monitored for 10 days from 17:00 to 19:00. Observations were before sunset, since it is during this time that allo-grooming frequently occurs. This procedure was repeated in each of 5 focal animals. Two biopotential skin electrodes were attached on the top and bottom of the left part of the chest (the A-B lead method) by a bonding agent. These areas on the animals had been shaved and cleaned with alcohol. The electrodes were covered by a girth belt, to which a 1.8 × 3.0 × 3.3 cm biotelemetric cardiogram (NIHON KOHDEN Co., ZB-141G) covered by a styrene foam box, was attached. The cardiograph was received by a telemetry receiver unit (NIHON KOHDEN Co., ZR-600G) in an alley adjacent to the pens.

Allo-grooming bouts exceeding 24s were investigated and HRs were compared before and after allo-grooming for up to 2 min (range 12s to 120s), and during allo-grooming by the paired t-test. Allo-grooming was observed only when the animals were standing. There was no increase in HRs before allo-grooming due to cattle movement.

Results and Discussion

Two of 3 animals in the former group received allo-grooming only once. The remainder was allo-groomed 9 times. Two animals in the latter group received allo-grooming 9 and 7 times, respectively. Durations of analysed

allo-grooming ranged from 24s to 264s.

Table 1 shows HR changes in connection with allo-grooming in the cattle. As the usual HR varied among individual cattle, the HRs in each animal before, during and after allo-grooming were compared, in addition to comparisons with the entire data. HRs during the allo-grooming period decreased significantly ($P < 0.05$) in 2 animals and also tended to decrease in the other 3 animals ($P < 0.1$ in 903).

In addition, HRs after conclusion of allo-grooming tended to increase ($P = 0.06$ in 812 and $P < 0.1$ in 903). HRs in the entire data decreased significantly ($P < 0.01$) during allo-grooming, and increased again significantly ($P < 0.01$) after that. This indicates that allo-grooming may affect psychological stability, as reflected in the HR changes. Boccia et al. (1989) reported that HR showed significant declines during grooming bouts, (especially following aggression) and suggested that it may reduce tension. Keverne et al. (1989) and Niesink and van Ree (1989) reported opioid involvement in allo-grooming in monkeys and in rats, and suggested that it may form an integral part of social reward. Our result, combined with these results, suggests that allo-grooming

may also have a calming effect in cattle.

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Table 1. Heart rates (mean \pm SD/min) before, during and after receiving allo-grooming in cattle

No. Animal	Before 12 ~ 120s	During 24 ~ 264s	After 12 ~ 120s
713(9)	87.0 \pm 4.4 _b	82.7 \pm 3.9 _a	85.0 \pm 5.2 _{ab}
812(9)	90.1 \pm 5.7 _b	86.9 \pm 5.5 _a	88.9 \pm 5.9 _{ab}
903(7)	85.0 \pm 4.3	83.1 \pm 5.4	86.3 \pm 5.7
710(1)	78.5	75.0	77.5
712(1)	100	82.5	85.5
All(27)	87.7 \pm 5.8 _d	83.9 \pm 5.3 _c	86.4 \pm 5.7 _d

Figures in parentheses are the numbers of observations. The differences between figures with different superscripts are significant in each animal (a,b: $P < 0.005$, c,d: $P < 0.01$).

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