Comparison of telemetric cardiovascular parameters in single and pair housing of cynomolgus monkeys

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INTRODUCTION AND AIM

Social housing of laboratory animals is strongly recommended in terms of animal welfare. In Japan, animals have had to be single-housed during telemetry recording periods in safety pharmacology and toxicology studies to avoid cross-talk between signals of legacy devices. A novel device [PhysioTel™ Digital (PTD)], which can acquire telemetry data from animals housed socially, was finally released in Japan. Using the novel device, we investigated whether there were differences in cardiovascular (CV) parameters and a stress biomarker between single and pair-housed cynomolgus monkeys (non-treated).

METHODS

Animals

Species: *Macaca fascicularis*, Origin: China
Number of animals: 4 males and 4 females
Body weight: 2.5 to 3.5 kg, Age: 2 to 3 years

Cages

Individual cage dimensions are 680 mm (D) x 620 mm (W) x 770 mm (H). The animals were pair-housed in 2 connecting cages.

Surgical implantation of telemetry devices

PTD was implanted intraperitoneally. A blood pressure catheter was inserted via the right femoral artery and positioned in the abdominal aorta, and electrocardiogram (ECG) leads were inserted in the thoracic cavity via the bilateral intercostals and fixed in the pericardium near the right atrium and apex.

Study design

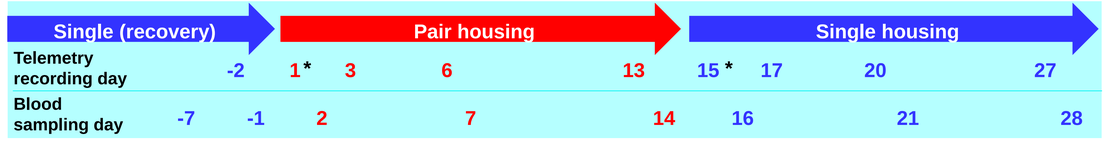
The initiation day of pair housing was designed as Day 1.

1. Prior to the implantation of telemetry devices, same-sex animals had been acclimated to pair housing for 2 weeks.
2. Animals that had been single-housed for 3-4 weeks after surgery were returned to their former pairs.
3. During the recovery periods, telemetry data quality was assessed by examining the data for signal loss.
4. CV parameters*1 and plasma cortisol level, hematology (HE), and blood chemistry (BC)*2 were evaluated for 2 weeks in pair housing and 2 subsequent weeks in single housing.

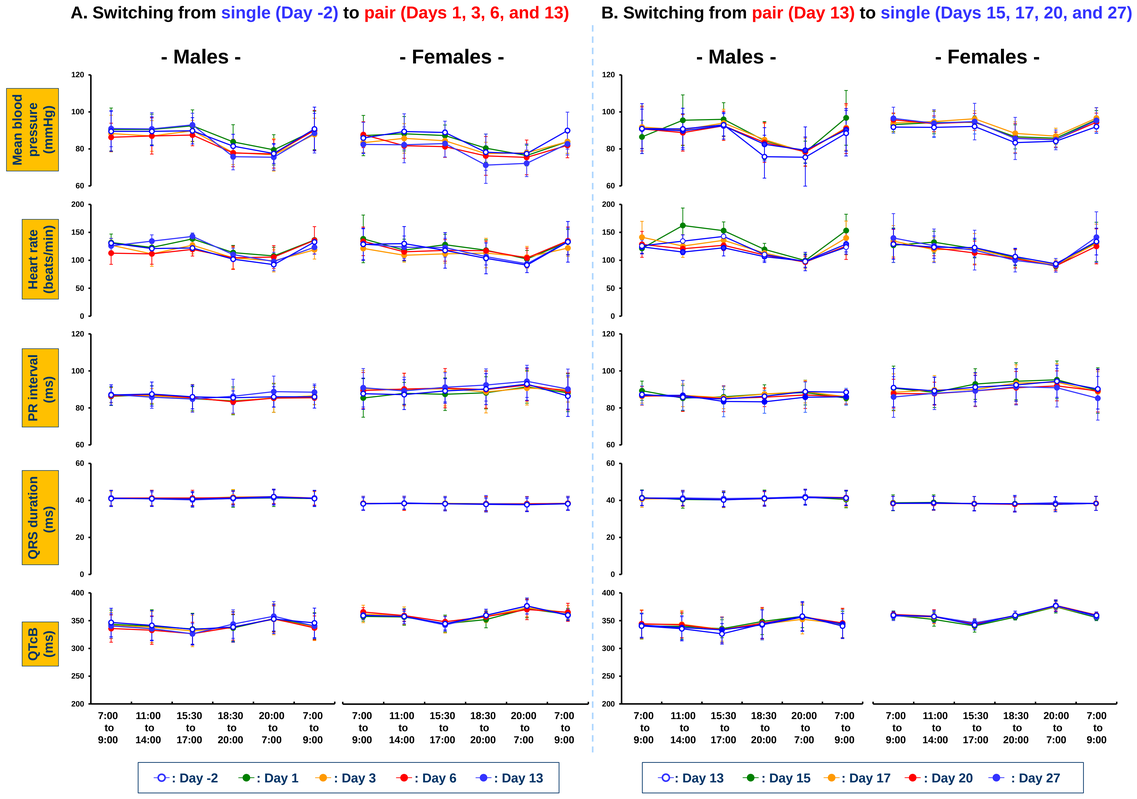
*1: Telemetry data was measured for 26 hours continuously using a telemetry system, PONEMAH (ver. 5.2, DSI Inc.). Blood pressure (systolic, diastolic, and mean), heart rate, ECG parameters [PR interval, QRS duration, QT interval, and QTc (Bazett's formula)] were derived as the average for 1.5 to 11 hour-intervals at 6 points.

*2: Blood sampling was performed in the morning.

Figure 1. Experimental design and effects of housing condition on CV parameters

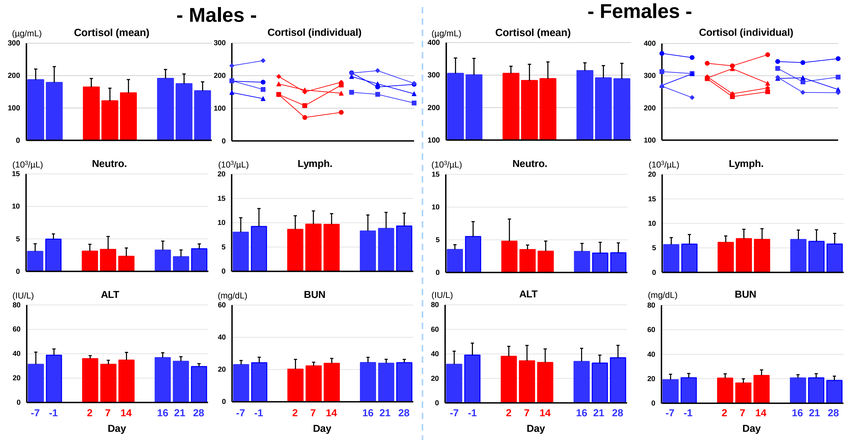


*: Housing condition was switched at 9:00-11:00 on Days 1 and 15.



Each point represents the mean ±SD for 4 animals.

Figure 2. Effects of housing condition on cortisol, HE, and BC



Neutro.: Neutrophils, Lymph.: Lymphocytes, ALT: Alanine aminotransferase, BUN: Blood urea nitrogen
Each point represents the mean ±SD for 4 animals.

RESULTS

The percentage of data loss with PTD devices was confirmed during the 26-hours telemetry recording periods (less than 0.2% in total, *Data not shown*), and the quality of the blood pressure signal and ECG waveforms was sufficient for analysis. No remarkable changes were noted in any CV parameter between the 2 housing conditions in either sex, although transient increases in heart rate were observed in only males at 11:00-14:00 on Day 15, just after the switch from pair to single housing (*Fig. 1*). No remarkable changes in cortisol level were noted throughout the study period but 1 male showed a low cortisol level at pair housing. No remarkable changes in HE or BC were noted. (*Fig. 2*).

CONCLUSION

- Social housing during telemetry recording periods is feasible using novel devices.
- In the 2 conditions of single and pair housing, no differences were noted in any CV parameter or clinical pathology data including a stress biomarker.
- Careful evaluation is necessary for telemetry data such as heart rate, only when switching from pair to single housing.

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