



DVC[®] PUBLICATIONS COLLECTION

3



TOWARDS LARGE SCALE AUTOMATED CAGE MONITORING – DIURNAL RHYTHM AND IMPACT OF INTERVENTIONS ON IN-CAGE ACTIVITY OF C57BL/6J MICE RECORDED 24/7 WITH A NON-DISRUPTING CAPACITIVE-BASED TECHNIQUE

Karin Pernold, F. Iannello, B. E. Low, M. Rigamonti, G. Rosati, F. Scavizzi, J. Wang, M. Raspa, M. V. Wiles, B. Ulfhake

BACKGROUND AND AIMS - Automated recording of laboratory animal's home cage behavior is receiving increasing attention since such non-intruding surveillance will aid in the unbiased understanding of animal cage behavior potentially improving animal experimental reproducibility.

MATERIAL AND METHODS - Here we investigate activity of group held female C57BL/6J mice (*mus musculus*) housed in standard Individually Ventilated Cages across three test-sites: Consiglio Nazionale delle Ricerche (CNR, Rome, Italy), The Jackson Laboratory (JAX, Bar Harbor, USA) and Karolinska Institutet (KI, Stockholm, Sweden). Additionally, comparison of female and male C57BL/6J mice was done at KI. Activity was recorded using a capacitive-based sensor placed non-intrusively on the cage rack under the home cage collecting activity data every 250 msec, 24/7. The data collection was analyzed using non-parametric analysis of variance for longitudinal data comparing sites, weekdays and sex.

RESULTS - The system detected an increase in activity preceding and peaking around lights-on followed by a decrease to a rest pattern. At lights off, activity increased substantially displaying a distinct temporal variation across this period. We also documented impact on mouse activity that standard animal handling procedures have, e.g. cage-changes, and show that such procedures are stressors impacting in-cage activity. These key observations replicated across the three test-sites, however, it is also clear that, apparently minor local environmental differences generate significant behavioral variances between the sites and within sites across weeks. Comparison of gender revealed differences in activity in the response to cage-change lasting for days in male but not female mice; and apparently also impacting the response to other events such as lights-on in males. Females but not males showed a larger tendency for week-to-week variance in activity possibly reflecting estrous cycling.

CONCLUSIONS - These data demonstrate that home cage monitoring is scalable and run in real time, providing complementary information for animal welfare measures, experimental design and phenotypic characterization.