THE EFFECT OF EXPOSURE TO LOW FREQUENCY ELECTROMAGNETIC FIELDS (EMF) AS AN INTEGRAL PART OF THE HOUSING SYSTEM ON ANXIETY-RELATED BEHAVIOUR, COGNITION AND WELFARE IN TWO STRAINS OF LABORATORY MOUSE

Author: O. Burman, G. Marsella, A. Di Clemente, L. Cervo
Journal: PloS one
Year: 2018

ABSTRACT

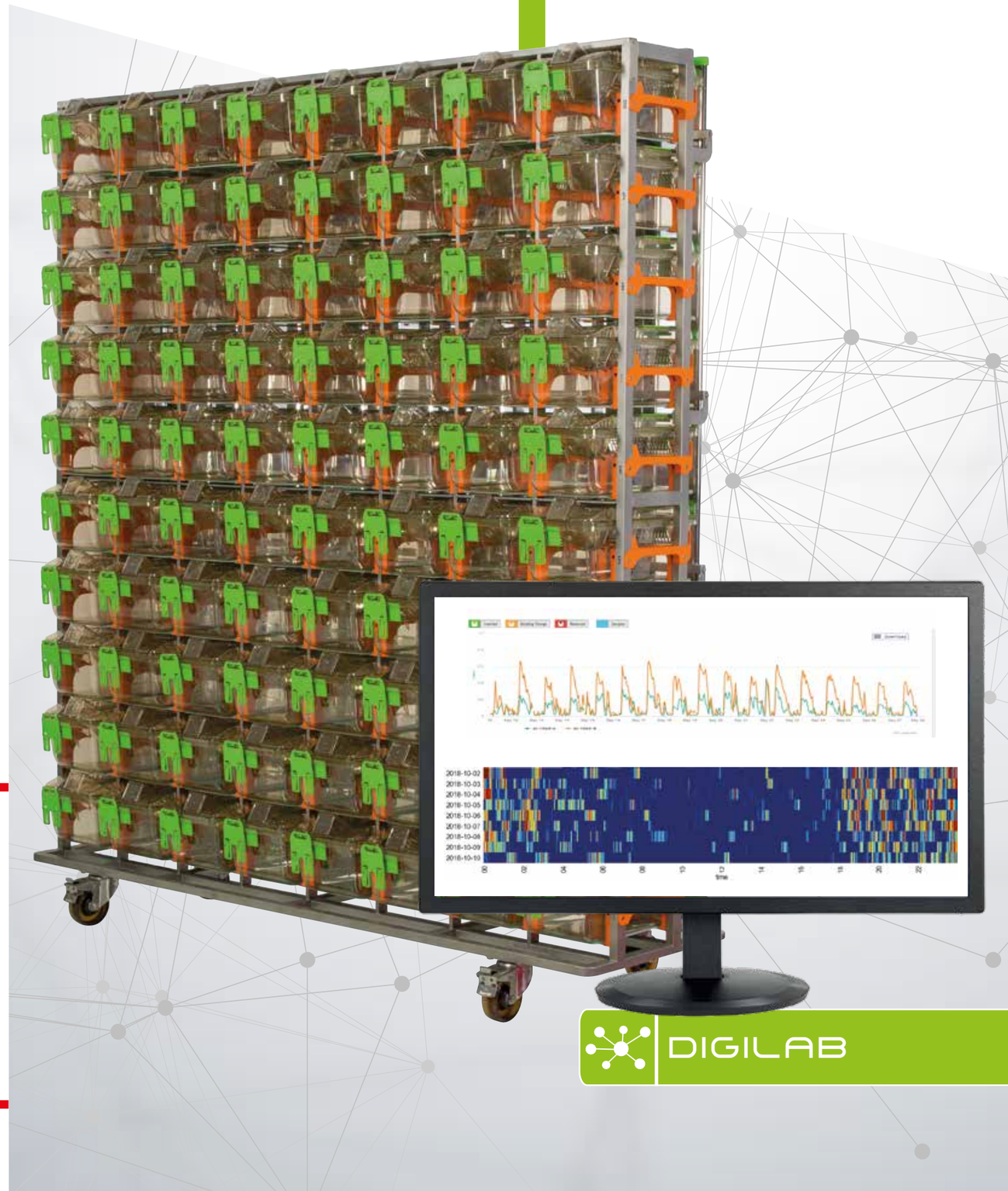
Electromagnetic field (EMF) technology has the potential to improve scientific data capture and welfare assessment by allowing automated data collection from individual cages. However, it is important to determine any impact that a new technology itself may have on animal welfare, and previous studies have found contrasting results of EMF on laboratory rodent anxiety-like behaviour and cognition. We therefore investigated whether there was an effect of low frequency EMF experienced continuously over a six-week period, as an integral part of the animal housing system, on measures of mouse anxiety-related behaviour, cognition and welfare. We housed mice (N = 80) of two strains (BALB/cAnNCrl and C57BL/6NCrl) separately in Individually Ventilated Cages (IVCs) in groups of four, either with the EMF plate turned `on' or `off' (n = 5). Some measures, e.g. food and water utilisation, were collected at regular intervals, whereas measures of anxiety-like behaviour (e.g. open field test) and cognitive performance (novel-object recognition test) were collected only at the end of the study. We found expected strong strain differences in most measures, e.g. latency to leave the starting square in an open field test, with C57BL/6NCrl mice moving away sooner, and interactions between strain and time for those measures recorded at more than one time point, e.g. significant weight gain over time for both strains, but with BALB/cAnNCrl mice weighing more. However, we found no significant effects of treatment (EMF `on'/`off') for any of the measures collected. These results indicate that, for the measures recorded here, there was no measurable impact on the behaviour and welfare of low frequency EMF exposure experienced continuously over a six-week period. Housing systems that include EMF monitoring technology may therefore be suitable for use without influencing either animal welfare or scientific outcomes.

https://doi.org/10.1371/journal.pone.0197054

Scan me

TECNIPLAST
innovation through passion

DIGILAB
SCIENTIFIC
PAPER
COLLECTION



DIGILAB

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

Author: K. Pernold , F. Iannello , B. E. Low, M. Rigamonti, G. Rosati, F. Scavizzi, J. Wang, M. Raspa, M. V. Wiles, B. Ulfhake
Journal: PloS one
Year: 2019

ABSTRACT

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 Insititutet (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 phenotype characterization.

https://doi.org/10.1371/journal.pone.0211063

Scan me

EFFECT OF ENVIRONMENTAL ENRICHMENT ON AGGRESSION IN BALB/CJ AND BALB/CBYJ MICE MONITORED BY USING AN AUTOMATED SYSTEM

Author: J.M. Giles, J.W. Whitaker, S.S. Moy, C.A. Fletcther
Journal: American Association for Laboratory Animal Science
Year: 2018

ABSTRACT

Aggression among mice remains a common undesirable problem in laboratory settings, and animal welfare and scientific outcomes may become compromised depending on the severity of aggression. This study evaluated the effect of cage enrichment comprising a bilevel, mounted 'mezzanine' compared with a cotton square or shelter on intracage male aggression over a 6-wk period. Our first study involved home-cage behavioral challenges to male mice from a highaggression substrain (BALB/cJ) and low-aggression substrain (BALB/cByJ). Aggressive interactions and locomotor activity were scored manually and then compared with measures of activity obtained by using a continuous automated home-cage monitoring system, the Digital Ventilated Caging (DVC) system. BALB/cJ mice exhibited similar levels of aggression across housing conditions, whereas BALB/cByJ mice had lower aggression when housed with a mezzanine. In the second study, videorecordings and continuous DVC automated measures were collected over 24 h and divided into 12-h light and dark phases.
BALB/cByJ mice-but not BALB/cJ-mice had increased aggressive behaviors during the dark phase. However, the DVC detected higher activity levels during the dark phase, compared with the light phase, in both substrains. Elevated activity levels recorded by the DVC correlated with fighting bouts and high levels of locomotion. These results show that a bilevel structural form of enrichment reduces aggression, depending on the BALB/c substrain, and confirms higher aggression levels in the BALB/cJ substrain. In addition, our findings provide evidence that the DVC is effective in identifying mouse cages with patterns of high activity levels, signaling possible aggression incidences, thus potentially allowing for early intervention and consequently improving animal welfare.

https://doi.org/10.30802/AALAS-JAALAS-17-000122

Scan me

FOOD AND WATER RESTRICTION LEAD TO DIFFERENTIAL LEARNING BEHAVIORS IN A HEAD-FIXED TWO-CHOICE VISUAL DISCRIMINATION TASK FOR MICE

Author: P.M. Goltstein, S. Reinert, A. Glas, T. Bonhoeffer, A. Glas , M. Hübener
Journal: PloS one
Year: 2018

ABSTRACT

Head-fixed behavioral tasks can provide important insights into cognitive processes in rodents. Despite the widespread use of this experimental approach, there is only limited knowledge of how differences in task parameters, such as motivational incentives, affect overall task performance. Here, we provide a detailed methodological description of the
setup and procedures for training mice efficiently on a two-choice lick left/lick right visual discrimination task. We characterize the effects of two distinct restriction regimens, i.e. food and water restriction, on animal wellbeing, activity patterns, task acquisition, and performance.
While we observed reduced behavioral activity during the period of food and water restriction, the average animal discomfort scores remained in the `sub-threshold' and `mild' categories throughout the experiment, irrespective of the restriction regimen. We found that the type of restriction significantly influenced specific aspects of task acquisition and
engagement, i.e. the number of sessions until the learning criterion was reached and the number of trials performed per session, but it did not affect maximum learning curve performance.
These results indicate that the choice of restriction paradigm does not strongly affect animal wellbeing, but it can have a significant effect on how mice perform in a task.

https://doi.org/10.1371/journal.pone.0204066

Scan me

NON-INTRUSIVE HIGH THROUGHPUT AUTOMATED DATA COLLECTION FROM THE HOME CAGE

Author: F. Iannello
Journal: ELife
Year: 2019

ABSTRACT

Automated home cage monitoring represents a key technology to collect animal activity information directly from the home cage. The availability of 24/7 cage data potentially enables more extensive and quantitative assessments of mouse behavior and activity over long periods of time than possible otherwise. When home cage monitoring is performed directly at the home cage rack, it is possible to leverage additional advantages, including, e.g., partial (or total) reduction of animal handling, no need for setting up external data collection system as well as not requiring dedicated labs and personnel to perform tests. In this work we introduce DVC® (Digital Ventilated Cage), a home cage-home rack monitoring system that is capable of continuously detecting spontaneous animal activity occurring in the home cage directly from the home cage rack. We then present a few animal activity metrics and validate DVC®-based metrics via comparison against a video camera-based tracking system. The results show that DVC® can provide animal activity metrics that are comparable to the ones derived via a conventional video tracking system, with the advantage of system scalability, limited amount of both data generated and computational capabilities required to derive metrics.

https://dx.doi.org/10.1016%2Fj.heliyon.2019.e01454

Scan me