

The effect of long-term exposure to low electromagnetic fields (EMF) as an integral part of an IVC housing system on anxiety-related behaviour, cognition and welfare in two strains of laboratory mouse.

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Introduction

Electromagnetic field (EMF) technology has the potential to improve scientific data capture and welfare assessment by allowing automated data collection (e.g. animal activity) from individual cages, potentially improving accuracy, detail & range of data. However, it is important to determine any impact that a new technology itself may have on animal welfare or scientific outcomes, and previous studies have found contrasting results of EMF on laboratory rodent anxiety-like behaviour and cognition^{1,2} that may be due to different durations and/or intensity of the EMF studied. We therefore investigated whether there was an effect of extremely low EMF experienced continuously over a six-week period, as an integral part of the animal housing system, on a range of measures of mouse anxiety-related behaviour, cognition and welfare³.

Materials and Methods:

We housed mice (N=80) of two strains (BALB/c and C57BL/6J) separately in IVC cages (cage rack modified to accommodate EMF plates, with a frequency range of 5-100Hz) in groups of four, either with the EMF plate turned ‘on’ or ‘off’ (n=5). Some measures, e.g. food utilisation and position in the cage, were collected at weekly intervals, whereas measures of anxiety-like behaviour and cognitive performance were collected once at the end of the study.

Results

We found expected strong strain differences in most measures, e.g. latency to leave the starting square in an open field test (see Fig. 1): $F_{1,76}=6.9$, $P=0.0104$, with C57BL/6J mice moving away sooner, and interactions between strain and time for those measures recorded at more than one time point, e.g. bodyweight: $F_{6,96}=7.442$, $P<0.001$, reflecting significant weight gain over time for both strains, but with BALB/c mice weighing more. BALB/c mice also spent more time at the back of the cage. However, we found no significant effects of treatment (EMF ‘on’/‘off’) for any measures, e.g. bodyweight: $F_{1,16}=0.021$, $P=0.886$; latency to leave starting square in the open field test: $F_{1,76}=1.3$, $P=0.254$ (see Fig. 1); novel-object recognition test: $t_{38}=1.586$, $P=0.121$.

Discussion & Conclusions

The observed strain differences reflect the general finding in the research literature that BALB/c mice show more anxiety-like behaviour than C57BL/6J mice⁴. However, our results indicate that, at least for the measures recorded, there was no measurable impact on the behaviour and welfare of EMF exposure experienced continuously over a six-week period for these mouse strains. Housing systems that include extremely low EMF monitoring technology may therefore be suitable for use without influencing either animal welfare or scientific outcomes.

References

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