EXPERIMENTAL MODEL

# Housing and husbandry impact mouse phenotypes

Jaric, I. et al. *PLoS Biol.* **20**, e3001837 (2022)

The environment in which genetically defined mice are reared can affect their phenotype, a concept known as phenotypic plasticity. Although phenotypic plasticity is known to impact the reproducibility of animal studies, most research to date has used single-lab experiments and experimentally induced environmental interventions.

Now, a paper in *PLoS Biology* describes a broader multi-site study. In the study, pregnant C57BL/6JRj mice from a single breeding population were randomly allocated to five independent rearing facilities, where their offspring were born and reared under facility-specific housing and husbandry conditions. Then, offspring from the five facilities were taken to a single test lab that was new for all mice. To assess the impact of the rearing facility on phenotype, the authors measured phenotypic profiles shortly before the mice were moved to the test lab and after habituation at the test lab.

Their results showed that mice reared at different rearing facilities had different microbiome compositions, with differences most pronounced at the rearing facility but persisting during the 6 weeks at the test lab. Specifically, mice could be clustered into two groups based on their type of diet, and the two groups had different abundance of two bacterial phyla previously shown to be associated with phenotypic differences in animals and humans.

Mice from different rearing facilities had different body weights, and these differences persisted at the test laboratory. The rearing facility did not affect neuroendocrine stress reactivity (changes in plasma corticosterone; a measure of acute stress) but did affect adrenal weight (a marker of chronic stress) in males. The rearing facility strongly affected the mouse behavioral phenotype in behavioral tests of exploration (the open field test) and emotionality (the light–dark box).

Finally, the authors assessed alterations in neural chromatin and related genes in brain areas involved in behavioral control. They showed that the rearing facility influenced changes in the regulatory regions of genes involved in nucleosome assembly, neuronal differentiation, synaptic plasticity — mainly related to GABAergic and glutamatergic transmission — and behavioral regulation.

Overall, the authors advocate that study designs should account for environmental background, in a similar way to genetic background, to increase study robustness and replicability. The next steps of research include investigating whether the mouse diet underlies some of the variation in epigenetic and behavioural profiles.

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Published online: 20 December 2022
https://doi.org/10.1038/s41684-022-01105-w