Sex and Strain-Specific Effects of Cage Enrichment in A/J, BALB/c and C57BL/6 Mice

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Aim:
Environmental enrichment is often considered to improve animal welfare not only for captive animals, but also for laboratory animals. Although many researchers reported that environmental enrichment can be a possible method to improve animal well-being, there is some evidence that enrichment differs in its effects on physiology and behavior between species and strains.

This present study was focused on the effects of cage enrichment on physiology and behavior between strains and sex of mice.

Material & Method:
Three inbred strains of mice, A/J, BALB/c and C57BL/6 originated from Harlan Winkelmann, were used for the experiments, 16 mice/sex/strain.

After arrival at about 3 weeks of age animals were marked and randomly allotted to enriched or non-enriched cages, half for enriched and half for non-enriched cages, in group of four.

All cages were type III Makrolon cages, only the enriched cages contained a nest box, a wood bar for climbing and nest material (Figure 1).

Behavior tests, such as open field, food drive and elevated plus maze were done at 9-11 weeks of age. Blood samples for hematological analysis were collected at 14 weeks of age.

At 15 weeks of age, the animals were euthanized by CO2 in their home cages and final body weight and organ weights were measured immediately.

Health monitoring was done at the end of experiment.

Results:
Significant housing differences were found for the relative organ weights, hematological data and the elevated plus maze test showed more often a significant housing difference. BALB/c groups showed more housing differences than A/J and C57BL/6.

For relative organ weights, hematological data, open field and food drive test the enriched groups was often found having an increased coefficient of variation, but not for the elevated plus maze test. The frequency of the increased coefficient of variation is higher in C57BL/6 groups, lower in A/J, lowest in BALB/c (Table 3).

The data show, that there are differences in the reaction of the three different inbred strains to the enriched housing conditions. However the effects of enrichment are strain-, sex- and test-dependent.

Table 1: Body Weight, Haemological Analysis, Behavioral Test and Organ Weight - Mean (CV)

Table 2: Ratio of Significant Housing Difference in Mean Value

Table 3: Ratio of Higher Coefficient of Variation Values in Enriched Group

Figure 1: Enriched Cage

Conclusion:
According to these data, cage enrichment might lead to a different result and/or to an increased variation in some experiments. It seems necessary to collect more information about the effects of enriched housing before an enrichment design is introduced for any animal experiments.