Impact of Environmental Enrichment on the Breeding Performance of Mice

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Aim:
The high level of standardisation has been made responsible for the great decrease in the number of laboratory animals used in experimental research in many countries over the last ten years.

Recently environmental enrichment seems to be a very common way for improving animal well-being, especially for laboratory animals. Many researchers reported, that animals could keep more natural behavior or show less stress level, when they live in an enriched environment.

However the production of animals, such as reproduction index, can be used for assessing the level of internal welfare. This present study focuses on the breeding performance of mice under enriched and non-enriched housing condition.

Material & Method:
DBA/2N, 60 males and 60 females, originated from Charles River, were used in this study.

Following 4 weeks of adaptation, from 10 weeks of age, animals were regrouped to one breeding pair per cage, marked and separated randomly to enriched or non-enriched cages, half of animals for each treatment.

Both cages were type II long Makrolon cages, only enriched cages contained a nest box, a wood bar for climbing and nest material.

Enriched and non-enriched cages were separated randomly to three different rack systems, IVC rack, scantainer and a normal open rack, 10 enriched cages and 10 non-enriched cages for each rack.

After animals were regrouped to one breeding pair, reproduction performance such as litter size, the number of birth, the number of weaned puppies and the body weight at weaning, were recorded for 8 months.

Result:
In this present experiment significant differences were found between enriched and non-enriched conditions, in the number of litters per dam, the number of puppies born per dam, the time distances between litters and the body weights of puppies at weaning.

Enriched groups had less litters, in total they gave birth to less puppies and the number of puppies per litter was smaller at birth. A lower number of puppies weaned per dam were recorded in enriched groups, but no significant differences were found.

Even though enriched groups had a lower total number of puppies weaned per dam, the weaning body weights of enriched groups are higher in comparison to non-enriched groups.

In most of the reproduction data enriched group showed a higher coefficient of variation (CV), except the time distance between litters and the body weight of puppy at weaning.

Table 1: Reproduction Index of Non-Enriched and Enriched Groups

<table>
<thead>
<tr>
<th></th>
<th>Standard</th>
<th>Enriched</th>
<th>P Value</th>
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</thead>
<tbody>
<tr>
<td>Total No. of Litters / dam (CV)</td>
<td>5.4 (36%)</td>
<td>4.2 (58%)</td>
<td>&lt;0.0001 s</td>
</tr>
<tr>
<td>Distance between Litters (day) (CV)</td>
<td>32.0 (46%)</td>
<td>41.1 (36%)</td>
<td>&lt;0.0001 s</td>
</tr>
<tr>
<td>Total No. of Puppies born / dam (CV)</td>
<td>24.9 (52%)</td>
<td>15.9 (77%)</td>
<td>0.0146 s</td>
</tr>
<tr>
<td>No. of Puppies born / litter (CV)</td>
<td>4.4 (75%)</td>
<td>5.4 (55%)</td>
<td>0.9907 n.s.</td>
</tr>
<tr>
<td>Total No. of Puppies weaned / dam (CV)</td>
<td>15.7 (56%)</td>
<td>10.8 (91%)</td>
<td>0.0089 s</td>
</tr>
<tr>
<td>No. of Puppies weaned / litter (CV)</td>
<td>2.4 (47%)</td>
<td>2.5 (59%)</td>
<td>0.1933 n.s.</td>
</tr>
<tr>
<td>Puppy Weight at Weaning (18 days, g) (CV)</td>
<td>4.7 (20%)</td>
<td>7.8 (37%)</td>
<td>&lt;0.0001 s</td>
</tr>
</tbody>
</table>

* CV: Coefficient of Variation
* s: Significant Difference; n. s.: No significant difference.

Conclusion:
The data presented show, that enrichment did not increase the reproduction in our experiment as assumed, only a positive influence on the body weight of puppies at weaning time was found. But enrichment did increase the variation of most reproduction data.

According to this results, enrichment necessarily does not improve the reproduction, even though the body weight of puppy at weaning time can be enhanced.