EFFECT OF HOUSING SYSTEMS OF RABBITS ON DOE BEHAVIOURS AND LITTER DEVELOPMENT

By

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SUMMARY

In view of recent concerns regarding the current method of housing laboratory rabbits, this work was conducted to study the housing quality of rabbits through comparing two different indoor housing systems i.e. single caging or individual rearing and group - penned or floor rearing systems. A total of Twenty-two (16 females and 6 males) adult New Zealand White rabbits aged between 9 and 12 months were used in this work. The behaviours of doe and the litter development in both housing systems were recorded and analyzed. Results showed that, behavioral differences were observed when caged rabbits were compared with penned rabbits as maintenance behaviors were observed significantly (p<0.05) more commonly in caged rabbits (44.2 ± 8.1% of observed behaviours) than in penned rabbits 28.8±6.39% of observed behaviour. The reverse was true for comfort behaviours (24.8±5.9% and 41.6 ± 8.3%, respectively).

Investigatory behaviours were observed more in penned rabbits (18.6±3.2%) than in single caged rabbits (9.7±1.3%).

Agonistic behaviours occurred only in group rabbits (3.2±0.3%) while stereotypic behaviours were only observed in single caged rabbits (7.3±1.2%).

Regarding the litter development the penned young rabbits (litters) developed more earlier than the caged ones, as their eyes and ears were opened earlier and existed out the nest earlier than caged rabbits.

Also rabbits in pens gained more weekly body weights than caged rabbits while there was no differences in birth weight and mortality rates between litters.

INTRODUCTION

Charles Darwin, writing in 1888 believed that, the rabbit was probably domesticated in China at time of 551 - 479 B.C. The present domestic rabbits originated from the native wild white rabbit of China. It is often suggested that the first true domestication of the rabbit took place in medieval France and that it was not the Romans who first domesticated the rabbit (Sandford, 1990).
Some housing systems for farm animals or treatments such as handling, transportation, or farm operations lead to more welfare problems than do others (Fraser and Broom, 1990). Animal welfarists require housing suitable to the animal’s behaviour as well as the possibility of species suitable movement. For rabbits, this means group housing with the possibility of social contacts with conspecifics in an environment that admits all kinds of rabbit specific behaviours (Broom, 1993 and Held et al., 1994).

From a scientific points of view, there is a need to improve housing to provide a normal “physiologically psychologically, and behaviourally” experimental animal. Traditional husbandry conditions have evolved to deal with animal health concerns, but many produce abnormalities that could confound some scientific data obtained, e.g. cage animals develop oesteoporosis of the femur (Lehamann, 1987) backbone disturbance and high percentage of intestinal disorders which may be stress-induced and other behavioural disorders (Stauffacher, 1993).

A few studies have been conducted on normal behaviour of the laboratory rabbit (Maertens and DeGroote, 1984, Metz, 1987 and Lehmann, 1989). For young domestic rabbits, information is virtually restricted to special situations such as fattening or laboratory animals in small cages (Bell, 1984). Housing in battery cages is actually not adequate to the animal’s needs as the lack of spaces impairs the rabbit’s ability to move and cause poor bone growth and losses may be considerable (Lehmann, 1991).

A common method for comparing the quality of housing systems for farm animals is to measure frequencies and durations of behavioural elements, so the diversity of the behaviours displayed in an environment may be a good measure of the quality of housing from a welfare point of view (Wechsler and Hirt, 1991 and Morton et al., 1993).

The objective of the present study is to add further informations on the behaviour of rabbits by comparing the effects of two different indoor housing systems (single caging and group penned) on the behaviour and performance of the doe and offsprings.
MATERIALS AND METHODS

Animals:

Twenty-two (sixteen females and six males) adult New Zealand White rabbits (aged 9-12 months) weighed between 3 and 4 kg, were used in this experiment. The animals were housed in a private farm located in Faisal region, Giza Governorate. They were housed in non-barrired room. All rabbits were fed ad-libitum with rabbit pellets diet and fresh water provided ad-libitum. All rabbits were vaccinated against the serious rabbit diseases and also they were mated at the same time (within 2 days).

1- Experimental design:

The experiment was designed to compare between two different indoor housing systems (i.e single-caging and group penned housing system) on the doe behaviour and litter development. Therefore the twenty-two rabbits were divided equally into two groups as follows:

Group 1: (Single caging or cage rearing): It contains eight females (does) and three males (bucks). They were individually housed in separate cages with grid floor measuring 0.45 x 0.45 x 0.60 m.

Group 2: (Group penned or floor rearing): This group contains also eight females housed in one pen with concrete floor providing each rabbit with floor space of 0.28 m² while the three males housed separately adjacent to the females with wire net partitions.

Rabbits in both groups were identified using the record cards for caged rabbits and plastic leg bands on the back legs for penned rabbits. The microclimatic conditions were the same in both groups of rabbits. In each housing system, there are adequate numbers of nest boxes for kindling (podberscek, et al. 1991).
III- Parameters measured:

A- Behaviours of does:
Written observations were made on the marked does in each of the pen and cages. Over a two months period, two observational periods at 08.00 to 10.00 a.m and 14.00 to 16.00 p.m three days per week were made for recording the behaviours of female rabbits in both groups (Wechsler and Hirts 1991). The percentage frequency of each behaviour for individual rabbit was recorded, adding these values together, and divided by the number of rabbits to give a mean and standard error for the whole group (Gunn and Morton, 1993 and Gunn, 1994). The observer stood approximately 0.5 m away from the pens and 1 m away from the cages. No interaction occurred between the observer and the rabbits. The following behaviours were observed for each of caged and penned rabbits:

1- Behaviours for maintenance (Fraser, 1980):
   They are behaviours related to self - maintenance of the animal and including eating, standing, drinking, resting, urinating and defecating behaviours.

2- Comfort behaviours: (McFarland, 1981b):
   Are a heterogenous group of behaviours related to body care including, scratching, grooming, head shaking and stretching behaviours.

3- Investigatory or exploratory behaviours (McFarland, 1981 c,d):
   Are those behaviours which may be aimed at a particular commodity or environment situation including, Licking (wall or urine on floor), sniffing (ear, body or anal region) and rubbing behaviours.

4- Agonistic behaviours (McFarland, 1981 a,e):
   Refers to the complex of aggression, threat and avoidance behaviours that often occur during encounters between members of same species such as biting (another or cage bars or food hoppers, chasing and clawing at wall or corners.

5- Stereotypic behaviours:
   Are performed repeatedly in a fixed manner and in response to discernible stimuli.
without goal (Murphy, 1978) as gnawing of cage bars, fur chewing, bar chewing, head weaving (swaying) and pawing (Dantzer, 1986).

3- Litter development:
The following parameters were measured during the period from birth of youngs till weaning (5 weeks):

1. Litter size (No of litters per birth) and survival %:
Survival percentage calculated according to the following equation according to (Hub et al., 1991)
\[
\text{No of alive young birth} \times 100
\]
\[
\text{Total of no young / birth}
\]

2. Litter body weight:
Young rabbits were weighed using a pan-scale balance, the weighing pan should be of sufficient size to allow the rabbits to sit comfortably. Birth body weight was recorded and also the average weekly body weight and weight gains until the weaning age (5th week of birth) were recorded (Drescher, 1991).

3- Appearance of fur on pup’s body.
4- Opening of eyes (the age at which the sealed eye was opened).
5- Opening of ears (the age at which the ear was opened).
6- Exist out of the nest (age at which the young leaves the nest for the first time).
7- Starting of pups to nipple dry food (from hoppers or feeders).
8- Mortality rate:
Mortality rate was calculated throughout the rearing period (5 weeks) for young rabbits as follows:
\[
\text{Mortality} \% = \frac{\text{No of dead young}}{\text{Total no of young}} \times 100 \quad (\text{Denis - Fielding, 1993}).
\]

RESULTS AND DISCUSSION

A- Doe behaviours:

1- Behaviours of maintenance:
Table (1) showed that, caged rabbits displayed more standing behaviour and appeared
to be more restless than penned ones as it was found that, rabbits housed in cages lay and sat more than those kept in pens. Caged rabbits spent more time eating food pellets than penned ones. This result agrees with that reported by Podberscek et al. (1991) and Stauffacher (1992) who stated that, caged rabbits have been reported to be more restless than those in pens but still spend more time in sternal recumbency (Lehmann, 1987, Metz, 1987 and Huls et al., 1991).

Table (1): Mean percentage frequencies of behaviours observed in caged and penned rabbits (mean + SE).

<table>
<thead>
<tr>
<th>Treatment Behaviour</th>
<th>Frequency % of observed behaviours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Single-caged rabbits</td>
</tr>
<tr>
<td>Behaviour of maintenance</td>
<td></td>
</tr>
<tr>
<td>- Feeding</td>
<td>44.2±8.1</td>
</tr>
<tr>
<td>- Standing</td>
<td>21.9±4.3</td>
</tr>
<tr>
<td>- Resting</td>
<td>17.3±3.8</td>
</tr>
<tr>
<td>Comfort behaviours</td>
<td>8.2±1.3</td>
</tr>
<tr>
<td>- Stretching</td>
<td>24.8±5.9</td>
</tr>
<tr>
<td>- Head shaking</td>
<td>14.3±3.1</td>
</tr>
<tr>
<td>- Grooming</td>
<td>2.1±0.9</td>
</tr>
<tr>
<td>- Scratching</td>
<td>3.6±1.0</td>
</tr>
<tr>
<td>Investigatory behaviours</td>
<td>4.8±1.3</td>
</tr>
<tr>
<td>- licking</td>
<td>9.7±1.3</td>
</tr>
<tr>
<td>- sniffing</td>
<td>3.2±0.8</td>
</tr>
<tr>
<td>- rubbing</td>
<td>2.5±0.6</td>
</tr>
<tr>
<td>Agonistic behaviours</td>
<td>4.1±0.2</td>
</tr>
<tr>
<td>- Biting</td>
<td>--</td>
</tr>
<tr>
<td>- Chasing</td>
<td>--</td>
</tr>
<tr>
<td>Stereotypic behaviours</td>
<td>7.3±1.2</td>
</tr>
<tr>
<td>- fur chewing</td>
<td>2.7±0.1</td>
</tr>
<tr>
<td>- head weaving</td>
<td>3.1±0.2</td>
</tr>
<tr>
<td>- gnawing bars</td>
<td>--</td>
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</tbody>
</table>
### Table (2): Parameters of litter development for single caged and Group-penned rabbits.

<table>
<thead>
<tr>
<th>Treatment parameters</th>
<th>Single-caged</th>
<th>Group-penned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Litter size (number)</td>
<td>6.9</td>
<td>6.1</td>
</tr>
<tr>
<td>Survival% at birth</td>
<td>87.2</td>
<td>79.8</td>
</tr>
<tr>
<td>Appearance of fur (days)</td>
<td>6.2</td>
<td>6.0</td>
</tr>
<tr>
<td>Opening eyes (days)</td>
<td>11.2</td>
<td>9.1</td>
</tr>
<tr>
<td>Opening ears (days)</td>
<td>13.4</td>
<td>10.2</td>
</tr>
<tr>
<td>Existing out the next (day)</td>
<td>17.1</td>
<td>15.0</td>
</tr>
<tr>
<td>Starting nipping dry food</td>
<td>23.3</td>
<td>19.7</td>
</tr>
<tr>
<td>Mortality rate for Youngs</td>
<td>4%</td>
<td>3.8%</td>
</tr>
</tbody>
</table>

### Table (3): Average body weight and body weight gain for young single caged and penned rabbits.

<table>
<thead>
<tr>
<th>Treatment parameters</th>
<th>Body weight (gm)</th>
<th>Body weight gain (gm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Single caged</td>
<td>Group-penned</td>
</tr>
<tr>
<td>Birth weight</td>
<td>68.3±4.8</td>
<td>72.1±4.3</td>
</tr>
<tr>
<td>1st week</td>
<td>147.4±12.1</td>
<td>163.2±11.9</td>
</tr>
<tr>
<td>2nd week</td>
<td>215.8±11.7</td>
<td>261.7±13.2</td>
</tr>
<tr>
<td>3rd week</td>
<td>306.6±18.2</td>
<td>372.4±19.1</td>
</tr>
<tr>
<td>4th week</td>
<td>388.6±19.8</td>
<td>470.1±20.3</td>
</tr>
<tr>
<td>5th week (weaning)</td>
<td>528.2±22.7</td>
<td>610.3±25.2</td>
</tr>
</tbody>
</table>
2- Comfort behaviours :

Also, as shown in table (1), rabbits in pen were more comfortable than those in cages (41.6% and 24.8%, respectively). Higher frequencies of grooming, scratching, stretching and head shaking behaviours were observed in penned rabbits compared with caged ones. The higher frequencies of comfort behaviours in penned rabbits may reflect the type of living conditions and also the higher stretching frequency might be a reflection of more space in pen.


3- Investigatory behaviours :

It was observed that, the marking and investigatory behaviours were significantly (p<0.05) more frequently occurred in penned rabbits than in caged ones. The less evident behaviours in caged rabbits may reflect the lack of ability to socialise in cages while the rabbits in pens were in a state of flux owing to the addition of new rabbits and the loss of others, and there was a need for investigation to assert their position in the dominance hierarchy. This result and explanation agreed with (Vastrade, 1986 and 1987, Huls et al., 1991 and Held et al., 1995).

4- Agonistic and stereotypic behaviour :

As shown in table (1), it was observed that, agonistic behaviours were not observed in caged rabbits, this may be due to the individually housing of rabbits in separate cages and absence of conspecifics. This hypothesis agrees with that of Dantzer (1990), who stated that, social isolation can also produce physiological symptoms of stress particular in gregarious species such as rabbits, while in penned group, the rabbits were as aggressive as bucks specially during feeding. On the other side, the stereotypic behaviours were not observed in penned rabbits. Fur chewing and licking in caged rabbits may indicate social deprivation, while head weaving and pawing indicate psychological problems. Also rabbits in cage have no possibility of escaping and hiding, so they become more nervous and restless than those with an escape area in pens. Lack of appropriate environmental stimuli may cause increase in gnawing of the wire cage (Lehmann, 1987, Held et al, 1991 and Stauffacher, 1993).
B - Litter development:

Table (2) showed that, the rabbits in pens were earlier in development than those in cages as their eyes and ears were opened earlier and also they existed out and nipple dried food more earlier than those housed in cages. Regarding the body weight and body weight gain as shown in table (3), penned litters were heavier and gained more weekly body weight than caged litters. This early development and more body weight gain may be due to the rabbits in pens are more social and less restless, so this leading lesser energy expenditure and more body weight gain (Love and Hammond, 1991 and Stauffacher, 1992).

Conclusively, behavioural differences were observed when caged rabbits were compared with penned rabbits. Only caged rabbits showed stereotypic behaviours and only penned rabbits showed aggression. Penned rabbits also exhibited higher frequencies of comfort and investigatory behaviours and gained more body weight than caged rabbits so the group in penned housing system is more acceptable than system and has been suggested as alternative to the conventional, single caging system because single caging can lead to behavioural and physiological abnormalities in the rabbits while penned housing system allows the rabbits to socialise and to hope fully.

REFERENCES


Fayed


