SHORT NOTES

B chromosomes and asymmetry of eye lenses in the yellow-necked mouse, *Apodemus flavicollis* (Rodentia, Mammalia)

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Samples of the yellow-necked mouse *Apodemus flavicollis* were collected from three localities in Yugoslavia. These were Mt. Cer (CQ84), Mt. Avala (DQ64) and Mt. Fruska Gora (DR00) from 1993-1995, and from 1997-2000 (UTM coordinates are in brackets). A total of 133 animals were collected (Cer n=54, Avala n=48, Fruska Gora n=31). Chromosomes were prepared from bone marrow according to the standard procedure (9). The number of chromosomes was defined by scoring 30 metaphases per animal. The number of animals with B chromosomes per population was expressed as a frequency designated as fB. Eyeballs were removed and stored in 10% formaldehyde. After two weeks the lenses were dissected from the eyeballs, cleaned, rinsed with distilled water and dried in an oven at 80°C for 48 h (10). Immediately after removal from the oven, they were weighed to an accuracy of 0.01 mg using a Mettler laboratory scale. Each lens (l1, l2) of an individual specimen was weighed separately, but without knowledge about left or right orientation. Weighing of the lenses was performed by the same person (M.V.), with double-checking, without any prior knowledge of the results of chromosome analyses. The mass of a pair of lenses was used as an age indicator. Weighing of the lenses was performed by the same person (M.V.), with double-checking, without any prior knowledge of the results of chromosome analyses. The differences between pairs of lenses (asymmetry) were calculated as abs(l1-l2). Correlation analysis and Student t-test were performed using Stat 5.0 software.

The frequencies of animals with Bs were similar at the Cer and Avala (0.37 and 0.35) localities, while at Fruska Gora the frequency was higher (0.45), with average frequency 0.38. Dry eye lens weight measurements revealed that the population of specimens from Fruska Gora was the youngest, whereas the population from Avala was the oldest (Table 1). Samples from all three localities were pooled in order to analyze the effects of B chromosomes. Sample of animals with Bs was mostly made of animals with 1B (68.6%) and the rest was made of animals with 2B (19.6%), 3B (9.8%) and 4B (2%). Due to the small number of animals with more than one B we analyzed only the effects of presence of Bs. In pooled samples the ratio of males to females was 1:1.38. Absolute differences in lens masses ranged from 0.1 to 3.1 mg, representing 0.29-21.65% of the weight of the lens. Estimated measurement error does not exceed significantly the mean value of asymmetry. Taking into consideration

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**KEY WORDS**: *Apodemus flavicollis*, B chromosomes, eye lens, asymmetry.
these variations of lens mass, the correlation coefficients between the total weight of both lenses (age) and the absolute asymmetry were calculated for animals with and without B chromosomes (Fig. 1).

TABLE 1.
Weights of dry eye lenses (in mg) ±SE in males (M) and females (F) without (B0) and with (B+) B chromosomes (n – number of animals, fB – frequency of animals with Bs).

<table>
<thead>
<tr>
<th>Locality</th>
<th>B0</th>
<th></th>
<th>B+</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>M</td>
<td>n</td>
<td>F</td>
</tr>
<tr>
<td>Mt. Cer</td>
<td>23.9</td>
<td>±1.17</td>
<td>34</td>
<td>24.3</td>
</tr>
<tr>
<td>Mt. Avala</td>
<td>22.7</td>
<td>±1.80</td>
<td>31</td>
<td>24.4</td>
</tr>
<tr>
<td>Mt. Fruška Gora</td>
<td>20.4</td>
<td>±2.39</td>
<td>17</td>
<td>20.7</td>
</tr>
<tr>
<td>Total</td>
<td>23.5</td>
<td>±0.80</td>
<td>82</td>
<td>22.4</td>
</tr>
</tbody>
</table>

Fig. 1. – Correlation between dry eye lens mass (in mg) and lens asymmetry (abs(l1-l2)) in the group of animals without (B0) and with (B+) B chromosomes

The aim was to see whether the level of asymmetry of the lens was age-dependent in these two groups. It appears that in the group of animals without Bs (B0), the age and asymmetry of eye lenses were not dependent ($r=0.08$), while in the group of animals with Bs (B+) the correlation was significant and with a negative sign ($r=-0.38$). Results of t-test ($t=-2.88, p=0.006$) approve that the correlation coefficient differs significantly from zero. Therefore, in the last group the asymmetry decreased with age. It is possible that B chromosome carriers with a high degree of asymmetry were eliminated from populations at a higher rate. Previously it was shown that the presence of Bs had an effect of prolonging the mitotic cycle in the plant *Lolium perenne* (11). It is possible that the presence of Bs affected early embryonic and postnatal development. GLIWICZ & JANCEWICZ (12) proposed that significant differences in weight between left and right lenses in specimens of *Sorex minutus* are the consequence of illness. It is possible that weight differences between left and right lenses could be ascribed to different diseases and developmental disturbances. If differences in the weights of the lenses lead to anomalies in vision (which is very important for *A. flavicollis* as they are mostly nocturnal animals), it can be expected that selection pressure will be very high in animals that have such disorders. But differences in dry weight between lenses could be also produced by differences in developmental stability between groups of animals with and without Bs.

In the population from Mt. Jastrebec, BLAGOJEVIĆ & VUJOŠEVIĆ (13) found that under conditions of stress due to overcrowding, young animals with Bs were preferentially eliminated. Furthermore, it was found that B chromosomes in this species were characterized by the presence of specific molecular marker sequences (14). The results of this study imply that the presence of B chromosomes influences relation between lens asymmetry and age, although the causative role of Bs remains to be established.

ACKNOWLEDGMENTS

Supported by Ministry of Science and Technology of Serbia, contract No. 1693.

REFERENCES


Received: August 3, 2003
Accepted: December 10, 2004