HOMOZYGOSIS AND COLOR GENOTYPIC STABILITY OF ALBINO MICE OF INBRED LINES Af, BALB/cDe, AND CC57W

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It was shown by the method of genetic analysis that the color genotype of line CC57W mice is aabbcc. A similar method demonstrated the stability of the color genotype of mice of lines Af, BALB/cDe, and CC57W in several generations and confirmed their inbred nature.

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Stability of the color genotype of albino mice in several generations has been used as a criterion of their inbreeding [5] in conjunction with the more generally used method of serial skin isografts [1].

One of the objects of the present investigation was to determine the color genotype of albino mice of inbred line CC57W, so that their stability relative to this characteristic could subsequently be verified. Another object was to verify the homozygosis and stability of the color genotype of albino mice of lines Af, BALB/cDe, and CC57W in several generations.

EXPERIMENTAL METHOD

Mice of the following inbred lines were used in the experiments: Af of the 98th, 105th, and 108th inbred generations (F98, 105, and 108), bred in the USSR since 1943 [4] during which time they have passed through about 50 inbreeding generations; BALB/cDe (abbreviated to BALB/c), F96-98, brought into the Soviet Union in 1960 at F94; Soviet [2] line CC57(W), F 43, 44, 47, 51, and 53; and lines CC57BR (BR), C3H/HeDiSn (C3H), C57BL/He (B), C57BL/10ScSn (B10), and C57L/J (L). The origin of the mice of all these lines has been described by N. N. Medvedev [3].

Mice of the different lines were crossed in separate cages in the ratio of 3 females (of one line) to 1 male (of the other line). The parents and F1 hybrids were marked in accordance with the usual system [3]. The F1 hybrids of identical type were crossed with each other, and the number of mice of different colors counted in the F2 progeny. Coincidence between the numbers of mice of different colors with the theoretically expected numbers from Mendel's laws was determined by the χ^2 method.

EXPERIMENTAL RESULTS

The ancestors of the line W mice were BALB/c females and a line C57BL male [2]. The BALB/c mice are white and their genotype is bbcc. Mice of line C57BL are black and their genotype is aa [6]. Conquently, the genotype of the W mice could be cc, aacc, bbcc, or aabbcc.

TABLE 1. Dissociation of (W×B10)F2 Hybrids by Color

Color of mice	No. of F_2 mice	Theoretically expected ratio	Statistical agreement between ratios
Black	60	60,75	$f=2$
White	32	27,00	
Brown	16	20,25	$\chi^2=1,819$
Total	108	108	$0,50>P>0,30$

To determine the genotype of the line W mice, we crossed W (F43) and B10 mice (this cross was carried out in 1961). All the first generation hybrids were black. The (W × B10)F1 hybrids were crossed with each other to obtain F2 hybrids. In the second generation dissociation of the hybrids took place into black, white, and brown (Table 1). This suggests that three pairs of genes took part in the crossing (+a, +b, and +c), and that, consequently, the genotype of the W mice is aabbcc.

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TABLE 2. Results of Repeated Hybridologic Analysis of Color Genotypes of Albino Mice of Different Lines

Parent line					Hybrids	
line of albino mice	generation	hypothetical genotype	line of colored mice	genotype	generation of hybrids	dissociation relative to genes
CC57W	F43	aabbcc	C57BL/10Sn	aa	F2	+b+c
»	F44	»	CC57BR	aabb	»	c
»	F44	»	C57BL/10Sn	aa	»	+b+c
»	F51	»	CC57BR	aabb	»	c
»	F53	»	C57BL/10Sn	aa	»	+b+c
Af	F98	»	C57BL/He	aa	»	+b+c
»	F105	»	C57BL/10Sn	aa	»	+b+c
»	F108	»	C3H/Sn	+	»	+a++c
BALB/cDe	F96	bbcc	C3H/Sn	+	»	+b+c
»	F97	»	C57L/J	aabbinln	»	+a+c+ln
»	F98	»	C57BL/10Sn	aa	»	+a+b+c

Taken as a whole, the dissociation must have taken place in the ratio of $^9/_{16}$ black; $^4/_{16}$ white, $^3/_{16}$ brown. As Table 1 shows, the observed ratio of 60 black; 32 white; 16 brown agrees well with that expected theoretically. Consequently, the genotype of the W mice was in fact aabbcc.

Subsequently, the stability of the genotype of the line W mice was verified in the 44th, 47th, 51st, and 53rd inbred generations by crossing them with colored mice of lines BR (aabb), and B10 (aa), and by obtaining F2 hybrids from these crosses. The last test was carried out in 1965. In every case the color of the F1 hybrids and the dissociation in F2 corresponded to that expected (Table 2). For example, in the case of modification of the color genotype of W mice as a result of mutation of the $+^{\alpha}$ gene to its D allele, in the second generation dissociation of the hybrids would also take place relative to this gene. The colored hybrid mice, homozygous relative to dd, would differ in phenotype from all others. In the case of modification of the color genotype of the W mice as a result of unpremeditated crossing with another line, this mutation also would be revealed by dissociation of the F2 hybrids. Since this did not occur, we may conclude that in ten generations (from 1961 through 1965) line W remained stable and homozygous relative to color genes.

It was also interesting to verify the genotype of albino mice of line Af. According to data in the literature, the genetic formula of line A is aabbcc [6]. We crossed Af mice (F98, 105, and 108) with mice of lines B (aa), C3H (+), and B10 (aa), and obtained dissociation in F2 relative to genes +b, +c, +a +b + c, and +b +c respectively (see Table 2). Consequently, the genetic formula of subline Af is the same as that of the main stem of line A (aabbcc). The mice of subline Af remained stable and homozygous relative to color genes after 40-50 generations of breeding separately from the main stem of line A.

According to reports in the literature, mice of line BALB/c have genotype bbcc. We crossed BALB/c females (F96, 97, and 98) with C3H, L, and B10 males respectively (see Table 2). Dissociation was obtained in F2 relative to genes +b +c, +a +c + ln, and +a +b +c respectively. Consequently, the genotype of our subline BALB/c coincides with that expected and the mice of this line are homozygous relative to the color gene.

Hence, by genetic analysis of color the inbreeding of three lines of mice – Af, BALB/cDe, and CC57W – was confirmed.

LITERATURE CITED

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