

T. Khodzhagel'diev

UDC 618.69-008.441.13:547.944.
3/-055.5/.7-092.9-07

KEY WORDS: nicotine; genetic factors; addiction; mice

Definite interlinear differences are known to exist in the consumption of habit-forming substances and, in particular, of ethanol [3, 8, 9], opium preparations [6], and barbiturates [10], by animals (rats and mice).

Most investigators have observed that C57BL/6 mice, unlike mice of other lines, consume large quantities of ethanol solution [3, 8, 9] and opium preparations [6]. In addition, the rate of development of tolerance to certain effects of ethanol and opiates is higher in mice of this line than in mice of other lines [4, 5]. Analysis of correlation between lines of mice and activity of various enzymes and the development of tolerance has shown that the cholinergic system determines sensitivity and the development of tolerance to habit-forming substances at the neurochemical level [5].

The aim of this investigation was to study interlinear differences in predisposition of mice to nicotine consumption.

EXPERIMENTAL METHOD

Experiments were carried out on 22 inbred (11 C57BL/6 and 11 CBA mice) and 11 noninbred mice. The animals were kept in individual cages measuring 16×5.5×7 cm, equipped with a feeding bowl (food *ad lib*) and two graduated drinking bowls — one with water, the other with 0.005% nicotine solution, for a period of 24 days. The volume of water and nicotine solution drunk during the 24-h period by each mouse was measured and preference of each animal for one or other fluid was calculated.

The numerical results were subjected to statistical analysis and the significance of differences was determined by Fisher's method [2] and the nonparametric differences test [7].

EXPERIMENTAL RESULTS

Noninbred mice kept in individual cages, and with freedom of choice between water and 0.005% nicotine solution, could be divided into three groups from the 1st day of the experiment, depending on their preference for one or other fluid (Table 1).

On the 1st day 58% of all the noninbred mice preferred to drink water, 5% had no preference for either fluid, and 37% of all the animals preferred to drink the nicotine solution. However, after 1 week the number of mice with a preference for drinking nicotine solution had increased to 49% ($P < 0.05$), and there was a corresponding decrease in the number of animals preferring water ($P < 0.05$). The number of mice with no preference for either fluid also had increased at this time ($P < 0.05$). These relative proportions were mainly preserved until the 21st day of contact of the noninbred mice with nicotine solution. By the 21st day the number of noninbred mice preferring nicotine solution had fallen to 32% ($P < 0.05$) at the expense of mice consuming water and nicotine solution. These quantitative proportions were largely preserved until the end of the experiment.

On the 1st day of free choice between water and nicotine solution, 40% of C57BL/6 mice (Table 2) preferred the nicotine solution, 36% preferred water, and 24% of the mice consumed the two liquids in equal amounts. As Table 2 shows, the number of C57BL/6 mice with no preference for either fluid, after 1 day of contact with the nicotine solution, exceeded the number of noninbred mice under these conditions.

Department of Neuropharmacology, Institute of Pharmacology, Academy of Medical Sciences of the USSR, Moscow. (Presented by Academician of the Academy of Medical Science of the USSR A. V. Val'dman). Translated from *Byulleten' Éksperimental'noi Biologii i Meditsiny*, Vol. 101, No. 1, pp. 48-50, January, 1985. Original article submitted April 19, 1985.

TABLE 1. Distribution of Noninbred Albino Mice by Preference for Water or for 0.005% Nicotine Solution

Duration of experiment, days	Number of mice, %		
	Preferring water	Preferring nicotine solution	Without preference for either fluid
1	58	37	5
7	33	49	18
14	50	44	6
21	52	32	16
24	68	32	—

TABLE 2. Distribution of C57BL/6 Mice by Preference for Water or for 0.005% Nicotine Solutions

Duration of experiment, days	Number of mice, %		
	Preferring water	Preferring nicotine solution	Without preference for either fluid
1	36	40	24
7	36	52	12
14	38	50	12
21	40	54	6
24	52	48	—

TABLE 3. Distribution of CBA Mice by Preference for Water or for 0.005% Nicotine Solution

Duration of experiment, days	Number of mice, %		
	Preferring water	Preferring nicotine solution	Without preference for either fluid
1	59	36	5
7	60	38	2
14	65	35	—
21	70	28	2
24	79	21	—

By the 7th day of the experiment the number of C57BL/6 mice which preferred nicotine solution had increased to 52% ($P < 0.05$) on account of a decrease in the number of mice with no preference for either fluid. By the 24th day of the experiment the number of C57BL/6 mice preferring water had increased to 52% on account of animals with no preference for either fluid, whereas the number of animals preferring nicotine solution was virtually unchanged.

It will be clear from Tables 1 and 2 that the number of C57BL/6 mice which preferred nicotine solution was greater than the number of noninbred mice which preferred nicotine solution.

On the 1st day of free choice between water and 0.005% nicotine solution 36% of CBA mice preferred nicotine solution ($P < 0.05$), 59% preferred water ($P < 0.05$), and 5% of the CBA mice consumed equal quantities of both liquids (Table 3). Virtually the same distribution of CBA mice with respect to consumption of nicotine solution and water remained almost unchanged until the 24th day of the experiment. On the 24th day the number of CBA mice preferring nicotine solution had fallen to 21% ($P < 0.05$), whereas the number of mice preferring water, on the other hand, had increased to 79% ($P < 0.05$) on account of animals preferring nicotine solution or with no preference for either liquid.

The mean daily consumption of nicotine by C57BL/6 and noninbred mice, it will be noted, rose gradually until the end of the experiment (Fig. 1). Unlike the noninbred and CBA mice,

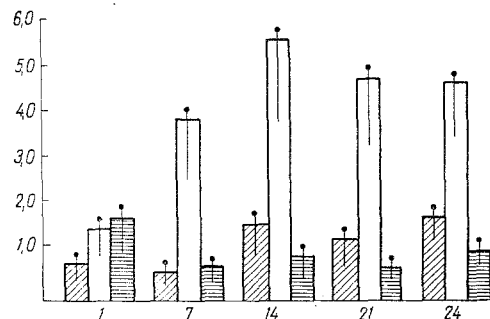


Fig. 1. Consumption of nicotine by mice. Abscissa, time of experiment (in days); ordinate, quantity of nicotine consumed (in mg/kg). Obliquely shaded columns — noninbred mice, unshaded columns — C57BL/6 mice, horizontally shaded columns — CBA mice.

C57BL/6 mice consumed larger quantities of nicotine (2.6 and 6 times more respectively). CBA mice differed significantly from C57BL/6 and noninbred mice as regards nicotine consumption, for their nicotine consumption decreased until the 7th day by comparison with the 1st day, after which it remained almost unchanged until the end of the experiment.

Thus C57BL/6 mice consumed larger quantities of nicotine solution than CBA and noninbred mice.

Considering data in the literature showing that C57BL/6 mice prefer ethanol and opiates [4, 5], and the results of the present investigation in respect of nicotine, it can be postulated that general genetic mechanisms exist to determine the preference of individuals of a given line to the development of various drug addictions.

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