INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH AND STUDIES

VOLUME04ISSUE03

‘’OPERANT BEHAVIOUR OF LITHOGENIC FEED FOR EXPERIMENTAL PURPOSES’’

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ABSTRACT

In the present work, the influence of natural zeolites on the parameters of defensive behavior was analyzed in experiments with white laboratory rats and a modular device. The obtained data suggested that among the experimental individuals under conditions of tool stress, 76% preferred the food that contained a mineral additive within the kind of a crushed zeolite, while the symptoms of behavioral activity were optimized within the given category of animals.

KEYWORDS

Rats Defensive behavior , Zeolite,

INTRODUCTION

There are many contemporary hypotheses concerning the cause and effect geophagy instinct in mammals (Panichev, 1990). one among the theories that seek to elucidate this phenomenon is predicated on the idea that the geophagy phenomenon with its diverse manifestations is an instinctual drive of the organism to realize the vital constants of fabric composition and functions of the assorted physiological systems, which can diverge because of various adverse environmental stressors, with natural minerals (Panichev and Golokhvast, 2009).

Several studies reported that animals consume natural minerals in stressful situations involving psychophysiological disadaptation (Soloviev et al., 2004, Panichev, 1990, Panichev and Golokhvast, 2009, Golokhvast et al., 2014).

The purpose of this work was to review the behavioural parameters of laboratory animals (average of a typological group) that prefer feed with the addition of crushed zeolites of Sakhalin origin.

Materials and Methods

Experiments (second phase) were conducted for 48 h on white outbred male rats weighing 180–230 g that were kept under standard vivarium conditions.

The first experiment focused on the choice of animals in line with the typological characteristics through a previously established method (Golokhvast et al., 2014).

Content and every one procedures with experimental animals were allotted in compliance with the necessities of the WSPA. The experiment involved only those animals that preferred the feed with added ground zeolite (of Sakhalin origin). In total, such animals comprised 76% of the general number of the observed rats. All of the tested individuals belonged to the II (medium) behavioural type per our classification (Grigor'ev et al., 2007).

According to the previously established methods (Golokhvast et al., 2010), zeolites were milled using the ultrasonic homogenizer Bandelin Sonopuls 3400 (product of Bandelin, Italy) for 10 min, and therefore the particle size of the zeolite was approx. 10 μm. The studied zeolite was added to the feed to comprise 5% of the load of the dry feed.

To analyse the animals' abilities to realize the food reinforcement, a developed modular unit was employed (Batalova et al., 2009). An aversive water obstacle was placed in its entrance tunnel (Fig. 1).

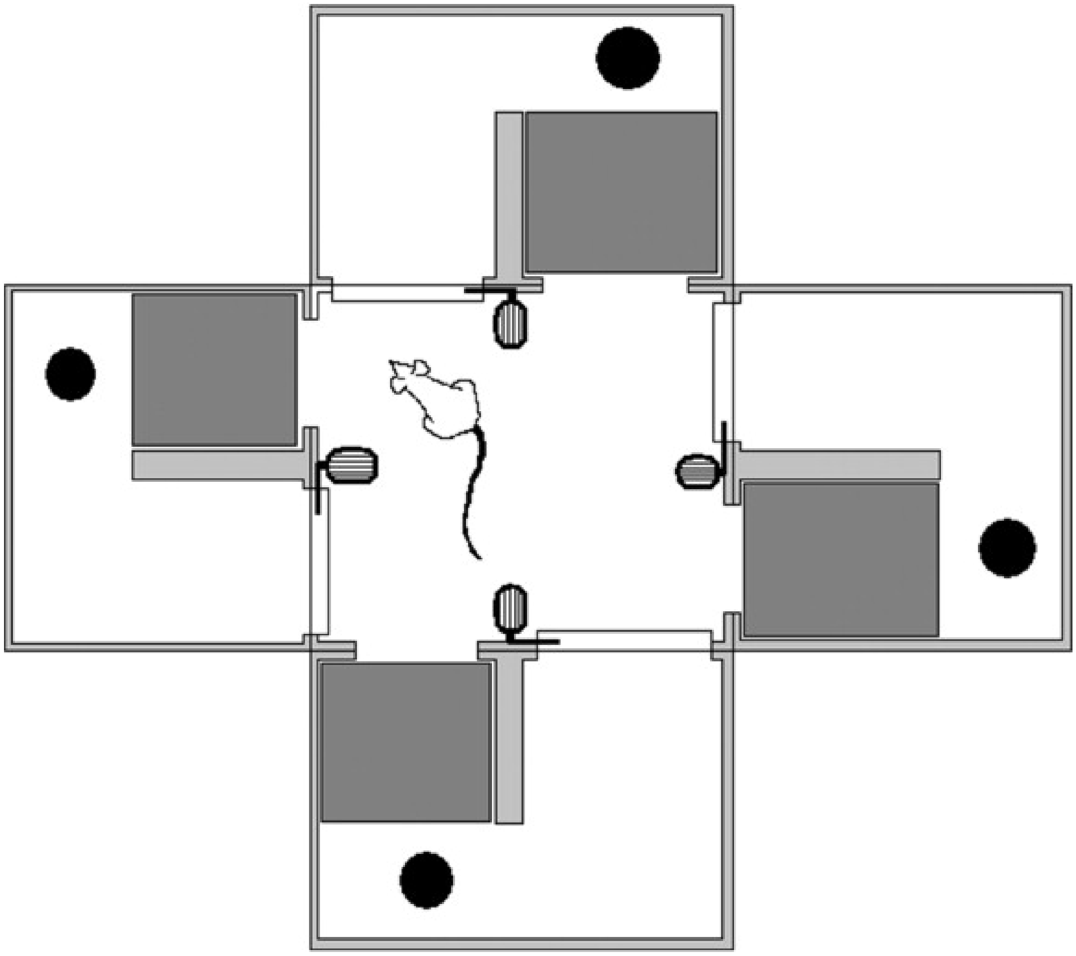

Fig. 1. Scheme of the modular device used for the defensive behavior study of the laboratory rats.

The floor of the starting compartment was covered by a trellis that was furnished an impulse threshold current of 0.1–0.2 Ma. Within the first phase of the survey, the experimental animals exhibited an instrumental active avoidance reflex (IAAR), and every one of the exits during this case was opened. After the IAAR of all laboratory rats was formed, the second stage of observation started. During this stage, to exit, the rats had to open the cell door by pushing the pedal or walking through the water, with an extra recording of motivation energy (seek time (ST), search intensity (SI), and cognitive characteristics (cognitive indicator (CI)). ST reflected the entire time that was spent to find all four compartments. SI described in quantitative terms the frequency of runs distributed for a specific period of your time, and CI named the ratio of error-free runs to the erroneous ones.

The feed preference was given to animals after the primary phase of testing on a back-ground of differentiation formed by reactive situational stress.

Statistical processing of the research results was administrated by methods of variation statistics that assessed the statistical values and differences of samples examined by Student's t-test using the Biostat software (version 5.1) (Glants, 1999). Differ-ences within the two groups were considered plausible at a significance level of 95% ($p < 0.05$).

RESULTS AND DISCUSSION

Indicators of the motivation energy (ST and SI) displayed a gradual decrease during the three days of testing (Table 1).

Table 1. Defensive behaviour of the laboratory animals with a preferred choice of mineral component (zeolite).

Indicators	Group	First day	Second day	Third day
ST (s)	Control	234.7 ± 48.3	215.8 ± 25.0	193.3 ± 14.8
	Zeolite	215.4 ± 29.5	187.8 ± 31.3	$115.7 \pm 14.7^{+*}$
SI (Units)	Control	37.4 ± 2.1	28.4 ± 1.7	25.7 ± 3.1
	Zeolite	34.8 ± 5.7	30.2 ± 2.4	$21.9 \pm 4.3^{+}$
CI (%)	Control	34.5 ± 18.3	39.9 ± 12.8	47.7 ± 8.4
	Zeolite	51.8 ± 10.2	67.3 ± 10.0*	73.0 ± 11.3*

Note: * — values at $p < 0.05$ compared to control; $^{+}$ — values at $p < 0.05$ compared to the first testing day.

Table 1. Defensive behaviour of the laboratory animals with a preferred choice of mineral component (zeolite).

Indicators Group First day Second day Third day
ST
(s) Control 234.7 ± 48.3 215.8 ± 25.0 193.3 ± 14.8
Zeolite 215.4 ± 29.5 187.8 ± 31.3 115.7 ± 14.7+*
SI
(Units) Control 37.4 ± 2.1 28.4 ± 1.7 25.7 ± 3.1
Zeolite 34.8 ± 5.7 30.2 ± 2.4 21.9 ± 4.3+
CI
(%) Control 34.5 ± 18.3 39.9 ± 12.8 47.7 ± 8.4
Zeolite 51.8 ± 10.2 67.3 ± 10.0* 73.0 ± 11.3*
Note: * — values at p < 0.05 compared to control; + — values at p < 0.05 compared to the primary testing day.

The ST within the control group declined 1.2 times over 3 days of observation without a big difference, while within the experimental group, it decreased 1.9 times ($p < 0.05$). On the primary day of the experiment, the difference within the control indicators of ST amounted to 19.3 s and 28.0 s on the second day ($p > 0.05$). On the Last Judgement of testing, a big difference between the ST values was noted within the group that received zeolite, with similar values to the control sample. during this case, the decline of over 77.6 s of the ST was observed ($p < 0.05$).

By the tip of the test, the SI of the control sample decreased 1.5 times compared to the primary day ($p < 0.05$), while the SI of the experimental group decreased 1.6 times ($p < 0.05$). On the primary day of observation, the difference in obtained values of the experimental group compared to the control remained almost unchanged at 2.6 units, on the second day it absolutely was 1.8 units, and on the third day, it was 3.8 units ($p < 0.05$ all days). Despite the dearth of a big difference, in general, there was a bent toward optimization of this parameter, with a number one position within the group of animals that received the mineral supplement.

CI characterizing cognitive behavioral activity within the experimental group increased substantially, although it didn't always have a reliably significant difference. Thus, within the first day, it increased by 17.3% ($p > 0.05$), within the second day by 27.4% ($p < 0.05$), and within the third day by 25.3% ($p < 0.05$). Comparing the ST values of the Day of Judgment with the primary testing day, accurate significant differences weren't observed within the control group or the test group (with a decrease of 1.4 in both cases, $p > 0.05$).

Changing stability of the observed parameters within the control and experimental laboratory rats can be explained by the peculiarities of the behavioral styles of these animals. The representatives of the II (middle) type are characterized by a comparatively stable parameter constancy of the motivation energy and cognitive spheres of behavioral activity and smooth changes under the influence of any internal and (or) external environmental factors. within the present case, initially high values of CI were observed within the control group (34.5%) and within the experimental group that received zeolite (51.8%).

Analyzing the picture, it should be noted that the animals on a mineral diet had the foremost ideal values that characterized defensive behavior. Complex indirect mechanisms of a zeolite's influence on the conditioned response activity are impossible to elucidate clearly today. Exposure to adverse environmental factors (including psycho-emotional factors) is probably going to cause problems of adaptation, while the flexibility to behaviorally resolve the vital constants contributes to the regulation of physiological, information and energy processes in living organisms (Panichev and Golokhvast, 2009, Golokhvast et al., 2014). Minerals that have pronounced regulating-stabilizing properties for living systems include smectite minerals of the kaolinite group and a few forms of zeolites, and their favourite activity for the body has been shown by numerous experiments (Golohvast, 2009, Soloviev et al., 2004).

Therefore, the voluntary choice by the laboratory animals (medium behavioural type) to eat a diet that included zeolite additives demonstrates its influence over the energy motivation and cognitive indicators of the behavioural activity under the conditions of the instrumental environment with artificially created problematic situations. The demand to use natural zeolites is probably going to be instinctive and is geared toward preserving the lifetime of the organism within the constantly changing environment.

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