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Detection of aggressiveness in immature rats and study of partly modified passive avoidance reaction based on negative emotion according to Buresh method and neurochemical correlates

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ABSTRACT

Based on these facts, noradrenalin must be considered the main endogenous inductor of aggressive behavior. It takes part in behavior genesis and at the same time it synthesis increasesright when aggressive behavior is essential in order to adapt to environmental factors. Thus Noradrenalin could be the stimulating factor for aggressive behavior , although we should note that specific aggressive agent is not discovered yet. And it seems that the component carrying only this function is not produced in organism.

Hence, anatomical, behavioral and pharmacological studies showed, that CNS structures such as almond-shapes structure , hippocampus, prefrontal cortex influence on the decrease of memory based on negative emotions that was more shown in less aggressive animals, than is non-aggressive. We can conclude that the difference in both aggressive animals is very little than in non aggressive. That suggests the high quality of memory and consolidation of aggressive animal.

***Keywords*:** Aggressive and non-aggressive rats, behavior, passive avoidance and neurochemical correlates.

I. INTRODUCTION

Animal's aggressive behavior is the manifestation of one of the activity of central nervous system. It is motivated behavior that is directed in a certain direction [2]-[8], [11]. There are various forms of aggressive behavior: predatory aggressiveness, aggression among males, aggression caused by fear and aggression caused by irritation etc [3]-[4], [10]. The literature knows dominnat aggressive as well as subordinate less aggressive animals' and humans' behavior, also bio- and neurochemical properties of their bodies. It is also known that aggressive behavior has a role in the formation of dominant hierarchy, at the same time memory and learning skills should help these animals to gain higher hierarchic rank [1]-[5], [9]. Thus, in order to detalize the above mentioned information we have decided to study rats, that have not got social relationship experience in the group. That is they are relatively young immature and selected them by Yumatov method as more aggressive and less aggressive rats [6] and studied them passive avoidance method designed by Buresh in order to determine how the aggressive rats differ from non-aggressive ones and whether they have skills characterized for the present hierarchy in even immature age: learning skills, rate of aggressiveness etc [1], [12].

II. MATERIALS AND METHODS

Passive avoidance reaction is based on Negative reinforcement event and is the assessment of prolonged memory and the process of emotional learning. During the performance of this test the rat studies the abstinence from the movement towards the safe dark place. Although according to the previous experience it was punished exactly in this part of the cell. During the test the time when the rat still enters into this punishable part is measured. The magnitude of the latent period is the time how well the animal is able to remember the condition it should avoid. The apparatus has two cells. The square large cell (50cmX50cm) with 35 cm wooden walls, a roof which could be made of transparent plexiglass or it could be in open condition. In one of the walls there is a 6cm X 6cm hole that connects this cell with a small dark cell. The floor of the small cell is electrified. The height of walls is 15 cm. the hole connecting these two cells could be closed by plexiglass rolling door. The large cell is illuminated by 100 w bulb Which is located at the center of a 150 cm. height.

The experiment consists of three parts: 1) study stage 2) learning stage 3) reproduction stage . We place the animal in the center of the light back to door and we were observing its behavior for 3 minutes. In particular we registered the latent period of entering in small dark cell, the period

spent there and the amount of movement from one cell into another.

After the study we took the animal out of the experimental cage and returned it in living cage. After 30 minutes we places it again in the light cell and when it moved into the small cell, we closed windows and for a minute with 5 second interval we irritated the animal with electricity (1,5 mA, impulse length 1 sec). Then we returned the animal into the living cage.

3) Reproduction stage. After learning in 24 hours we placed the rat aging in the light cell, opened the doors connecting doors and during 3 minutes we were registering the amount of movement between cells and the time spent in the small cell. The absence of movement into the dark cell suggested about good reproduction of the animal [1]-[6], [12].

III. RESULTS AND DISCUSSION

According to the figure1 and table 1, the rates that are distinctive with less aggressiveness entered in a dark cell (99,16±9,00) than more aggressive ones (75,72±1,95). Consequently the difference between them is 1.3, which is statistically reliable. Even at browsing the amount of boluses and urination in a dark cell is more (5,91±0,79) than at removing the more aggressive arts (3,00±0,63). The difference is 1.97 and is statistically reliable P<0.05. less aggressive leave the dark cell relatively later after (99,16±9,0) secs and move into a light cell and stay there for (70,08±3,6) secs. While more aggressive leave the dark cell relatively soon 75,72±1,9) and move into the light cell an stay there (90,09±5,9). The difference is 1.28 fold, that is statistically reliable P<0.05 Regarding the putting out the head the less aggressive rat do it more often (12,00±0,8), than more aggressive (10,36±1,1), the difference is 1.15 fold P<0.05. after 3 minutes we removed more from the dark cell than from the light. Concerning more aggressive ones, they browse the light cell relatively longer (figure 2). Approximately 10 sec they do not enter , it takes them a lot of time to groom in a light cell (8,81±0,7) than less aggressive (7,16±1,1), . the difference is 1.23 fold P<0.05. As if the try to make a right decision in grooming process.

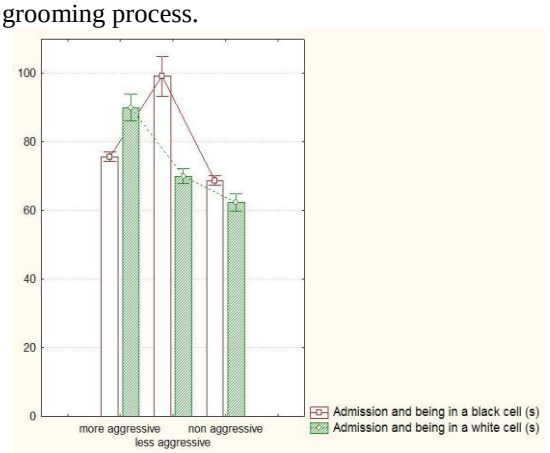
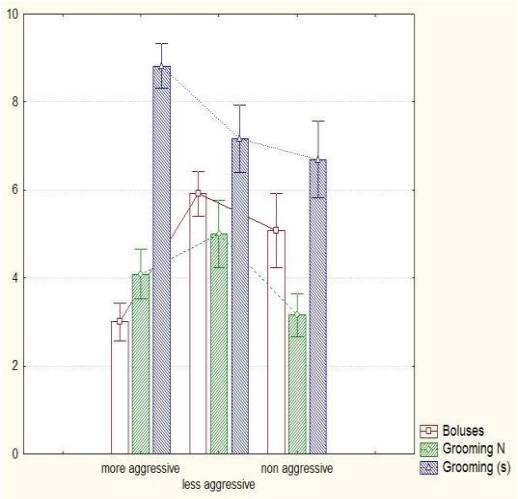


Figure1. 1) The time of entering in a dark cell. 2) The time of entering in a light cell.

As it is known from the literature grooming length reveals its dominance.



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Entering and stay in a dark cell	Entering and stay in a light cell	Bolus	Amount of grooming	Time of grooming	Movement from the light cell into a dark one.	Movement from the dark cell into a light	Head replacement from a dark cell into a light one	The replacement after 24 hours from a lighr cell into a dark one	The amount of boluses after 24 hours.	The time of grooming after 24 hours.	
75,72±1,9	90,09±5,9	3,00±0,6	4,09±0,8	8,81±0,7	3,16±0,8	9,09±0,9	10,36±1,1	1,09±0,7	1,18±0,4	7,90±0,9	Highly aggressive
99,16±9,0 P<0.05	70,08±3,6 P<0.05	5,91±0,7 P<0.05	5,00±1,2 P<0.05	7,16±1,1 P<0.05	10,0±1,4 P<0.001	9,00±1,4 P<0.05	12,00±0,8 P<0.05	3,00±0,6 P< P<0.05	3,16±0,7 P<0.05	5,00±1,9 P<0.05	Less aggressive
68,76±2,3 P<0.05	62,38±4,2P <0.05	5,07±1,3 P<0.05	3,15±0,8 P<0.05	6,69±1,4 P<0.05	2,84±2,3 P<0.05	5,46±1,7 P<0.05	10,00±1,2 P<0.05	6,53±2,4 P<0.001	6,61±1,9 P<0.001	2,53±0,1 P<0.001	Non-aggressive

After 24 hours we again place the rat in a light cell and open the door, during 3 minutes we determine the amount of replacements and the time spent in a dark cell. The absence of replacement into a dark cell suggests about the quality of memory good reproduction of memory.

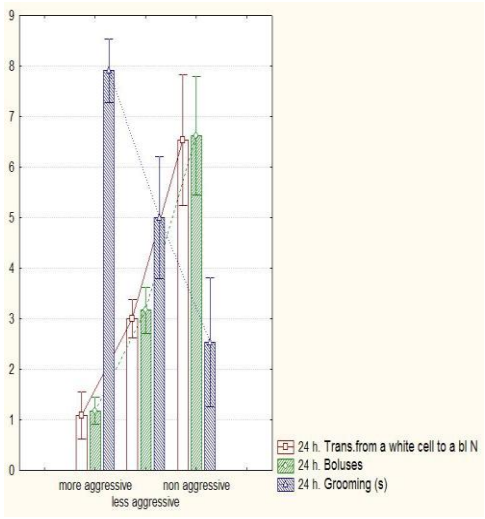

Figure3. 1. Replacement from light into dark. 2. Amount of boluses after 24 hours. 3. Time of grooming after 24 hours.

The inspection after 24 hours indicated (figure 3, table 1) that more aggressive rats sit in a light cell , have more time spent on grooming (7,90±0,9) than less aggressive ones (5,00±1,9),. The difference is 1.58-fold, that is statistically reliable P<0.05, as if they want to relieve from stress and make a correct decision.

Thus, we can conclude, that less aggressive animals have more boluses and urination , less replacement from light into dark cell, more head replacement from dark into a light cell and the time spent on grooming is also less than in aggressive rats. At the stage of learning the amount of v\boluses is more and the amount of grooming is less but more than in non aggressive. Regarding reproduction stage, out of 14 rats 3 rats moved into a dark cell. While out of more aggressive rats only 1 removed. Vassal neurochemical profiles of dominants and non-dominants in neurochemical predictors. Hence we decided to study quantitative changes of noradrenalin, dophamine and serotonin in different sites of the brain (hypothalamus, striatum and amygdala) ,

The purpose of biochemical study is to prove a leading role of noradrenalin and the secondary role of testosterone in the process of aggression and domination. In order to cope with the task we identify dominant profile using the statistical data analysis derived from the initial testing and determination of hierarchy and then identify neurochemical profile by animals' decapitation. Quantitative changes of biogenic amines are given in the figure 4.

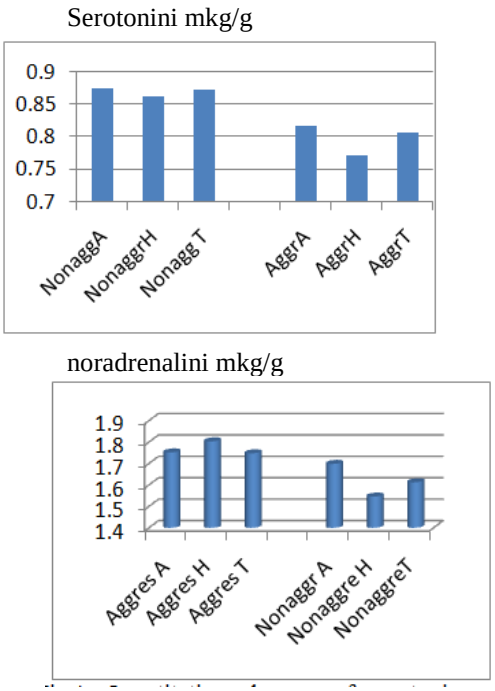

Fig.4. Quantitative changes of serotonin and noradrenalin in rat brain. (amygdala A, hypothalamus H, striatum T).

In aggressive animals the quantity of noradrenalin compared with serotonin is increased in three sites of the brain. As it is known from the literature, aggressive behavior is energy-dependent behavior that is also proved by our data. In particular, during the study of working capacity and endurance in aggressive animals working capacity increases in aggressive animals, while it is known from the literature that endurance and working ability increase by activation of glucose transport which is carried out by GLUT4 translocation that is followed by the translocation of glucose to the cell surface and glucagon metabolism synthesis that is manifested by the increase in working ability endurance and adaptation to new environment. All these require rapid mobilization of energy resources, while symphatetic nervous system and central noradrenergic mechanisms are involved in struggle/escape reactions. Consequently, maintenance of rapid motor reactions necessary for aggressive behavior is completely provided by symphatetic mechanisms. Moreover, the proximity of the regions of hypothalamus and coverage the regions that are involved in defensive reactions, it is clear, that even if noradrenalin does not have another function, the function of metabolic

readiness to aggressive attack it still would have. Thus it should be considered the main component participated in aggressive behavior. Due to the above mentioned the role of serotonin in aggressive behavior should not be lost. Hence based on the literature as well as on our earlier data, right the ratio of serotonin concentration to noradrenalin represents the organism aggression level and hierarchy rank.

Table2 ratio of serotonin concentration to noradrenalin represents the organism aggression level and hierarchy rank.

Animals	Aggressive rats	Aggressive rats	Aggressive rats
brain Structures	Amygdales	Hypothalamus	Striatum
Noradrenalin /Serotonin ratio	2,69+0,25	2,38+0,21	2,0+0,16

Note: Difference between amygdale and hypothalamus is reliable ($p<0.05$). Difference between amygdale and striatum is reliable ($p<0.05$) . Difference between hypothalamus and striatum is reliable ($p<0.05$)

Based on these facts, noradrenalin must be considered the main endogenous inductor of aggressive behavior. It takes part in behavior genesis and at the same time it synthesis increasesright when aggressive behavior is essential in order to adapt to environmental factors. Thus Noradrenalin could be the stimulating factor for aggressive behavior , although we should note that specific aggressive agent is not discovered yet.

And it seems that the component carrying only this function is not produced in organism [16]-[17],[18].

Hence, anatomical, behavioral and pharmacological studies showed, that CNS structures such as almond-shapes structure , hippocampus, prefrontal cortex influence on the decrease of memory based on negative emotions [13]-[14], [15] that was more shown in less aggressive animals, than is non-aggressive. We can conclude that the difference in both aggressive animals is very little than in non aggressive. That suggests the high quality of memory and consolidation of aggressive animal.

IV. SAMMARY

Detection of aggressiveness in immature rats and study of partly modified passive avoidance reaction based on negative emotion according to Buresh method and neurochemical correlates

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