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STUDY REGARDING THE ADAPTATION STRESS IMPACT ON THE NUTRITIONAL BEHAVIOR IN DOMESTIC CATS

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Abstract

The adaptation stress activates the hypothalamic-pituitary-adrenal axis, which can lead to the modification of some behavioral manifestations. This paper highlights the adaptation stress effect on nutritional behavior, in direct correlation with plasma cortisol levels' changes as main physiological parameter involved in stress and adaptation mechanisms. The study was carried out on a group of 10 clinically healthy cats, housed in identical environmental conditions, each individual's behavior being studied performing ethograms on days 1, 5, 9 and 10 of accommodation, simultaneously with the evaluation of the serum cortisol levels. On the first day, significant changes in nutritional behavior were observed, resulting in the absence of watering in all individuals and the absence of feeding in 50%. Towards the end of the study (days 5 and 9) no significant variations of the nutritional behavior were observed anymore, data associated with the accommodation to the new living environment. The serological levels of cortisol variations were in accordance with the behavioral changes, registering significantly increased values ($p<0.05$) in 50% of the studied individuals, values that gradually decreased towards the end of the study period.

Key words*: nutritional behavior, adaptation stress, domestic cats.*

INTRODUCTION

Stress is an important phenomenon and its effects on domestic cats are being studied in detail today as it indicates a syndrome resulting from exposure of an individual to the influences of an unfavorable environment, hostile to its welfare.

The main object of study of this paper refers to the association of stress with the changes produced by it, both physiologically and behaviorally that have a direct impact on the nutritional behavior in domestic cats.

The stress factor can be emotional, but it has the effect of activating the hypothalamic-pituitary-adrenal axis, which determines a series of physiological consequences corelated with the increase secretion of certain hormones, especially cortisol (Amat, M. et al., 2016).

The central component of the stress response is the activation of the autonomic sympathetic nervous system, which causes the release of catecholamines from the medullary adrenal glands into the bloodstream (Beaver, B.V., 1976). Corticotropin-releasing factor (CRF) produced by the hypothalamus stimulates the pituitary gland to release many other hormones, such as ADH, oxytocin, prolactin, growth hormone and adrenocorticotropic hormone (ACTH). ACTH stimulates adrenal cortex function, resulting in the release into circulation of an increased amount of cortisol.

The complete absence of stressors is impossible, and a certain level of stress is even necessary for the cat to develop a malleability of neuroendocrine and behavioral responses. (Codreanu, I. et al., 2021; Simion, V. et al., 2019)

MATERIALS AND METHODS

The study was conducted on a sample of 10 cats aged 1-10 years, clinically healthy, vaccinated and dewormed according to age and without a medical history likely to generate an exaggerated response to the stress factors applied inevitably during this study.

The cats were accommodated at the Catshop Hotel, Bucharest, with the consent of the owners, a hotel dedicated to cats where 24/24 hour video recordings were made with the help

of surveillance cameras installed in each accommodation room.
The blood samples were collected in test tubes containing blood activator cloth used to extract serum for serum cortisol dosing, at set time intervals, respectively on days 1, 5 and 10.
The cats studied benefited from identical accommodation conditions, so there was no differentiating factor in terms of the organization or size of the rooms. The room temperature was maintained between 21°C - 23°C, and the humidity was around an average of 62%.
With the help of the recordings obtained through the surveillance cameras, individual daily ethograms were made, in which the exact recording of the nutritional behavior manifestations were followed.
The feeding of the cats was done by administering the types of food recommended by the owner. The amount of food offered was in line with the recommendations proposed by the manufacturer and ranged from 50 to 70 g of dry food per day divided into two meals, in the morning between 10:00 and 11:00 and in the evening between 19:00 and 20:00.
The watering was achieved by administering plain water Aqua Carpatica, at room temperature, in an amount of 70-100 ml, refreshed twice daily.

RESULTS AND DISCUSSIONS

Regarding the feeding behavior, the results obtained are presented in Figures 1-4 and synthetic Table 1.

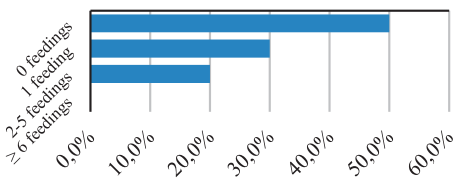

Figure 1. The feeding behavior on 1st day of the study

The feeding behavior - Day 1 results:
- The absence of feeding: 5 individuals (50%)
- One feeding: 3 individuals (30%)
- 2 - 5 feedings: 2 individuals (20%)
- ≥ 6 feedings: 0 individuals (0%)

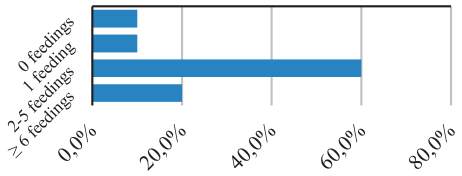

Figure 2. The feeding behavior on 2nd day of the study

The feeding behavior - Day 2 results:
- The absence of feeding: 1 individual (10%)
- One feeding: 1 individual (10%)
- 2 - 5 feedings: 6 individuals (60%)
- ≥ 6 feedings: 2 individuals (20%)

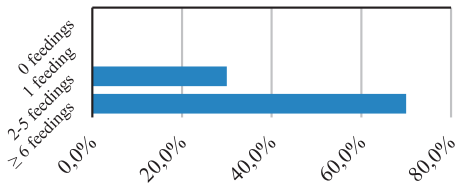

Figure 3. The feeding behavior on 5th day of the study

The feeding behavior - Day 5 results:
- The absence of feeding: 0 individuals (0%)
- One feeding: 0 individuals (0%)
- 2 - 5 feedings: 3 individuals (30%)
- ≥ 6 feedings: 7 individuals (70%)

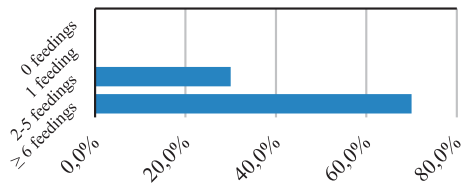

Figure 4. The feeding behavior on 9th day of the study

The feeding behavior - Day 9 results:
- The absence of feeding: 0 individuals (0%)
- One feeding: 0 individuals (0%)
- 2 - 5 feedings: 3 individuals (30%)
- ≥ 6 feedings: 7 individuals (70%)

Table 1. Synthetic table with the results regarding the feeding behavior of the studied group

No. of feedings / Day	0 feedings (%)	1 feeding (%)	2-5 feedings (%)	≥ 6 feedings (%)
Day 1	50 ***	30	20*	0
Day 2	10**	10	60	20
Day 5	0	0	30*	70***
Day 9	0	0	30*	70***

** p>0.01 – not significant differences*
*** p<0.05 - significant differences*
**** p<0.01 - distinctly significant differences*

Following the analysis of feeding ethograms in the studied group, it is observed that on the first day (day of accommodation), 50% of the animals did feed, representing statistically significant differences (*p <0.01*), compared to the other days on which the ethograms were performed. On the second day, the number of individuals that did not accept food decreased significantly to 10% (*p <0.05*), as on days 5 and 9 of the study, all individuals in the studied group fed, most of them more than 6 times.
Regarding the drinking behavior, the results obtained are presented in Figures 5-8 and synthetic Table 2.

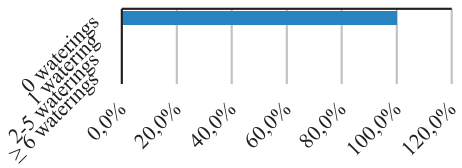

Figure 5. The drinking behavior on 1st day of the study

The drinking behavior - Day 1 results:
- The absence of watering: 10 individuals (100%)
- One watering: 0 individuals (0%)
- 2 - 5 waterings: 6 individuals (0%)
- ≥ 6 waterings: 2 individuals (0%)

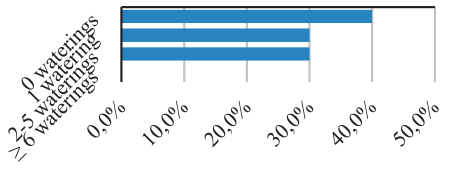

Figure 6. The drinking behavior on 2nd day of the study

The drinking behavior - Day 2 results:
- The absence of watering: 4 individuals (40%)
- One watering: 3 individuals (30%)
- 2 - 5 waterings: 3 individuals (30%)
- ≥ 6 waterings: 0 individuals (0%)

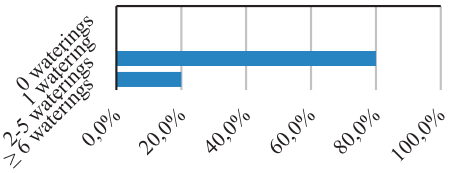

Figure 7. The drinking behavior on 5th day of the study

The drinking behavior - Day 5 results:
- The absence of watering: 0 individuals (0%)
- One watering: 0 individuals (0%)
- 2 - 5 waterings: 8 individuals (80%)
- ≥ 6 waterings: 2 individuals (20%)

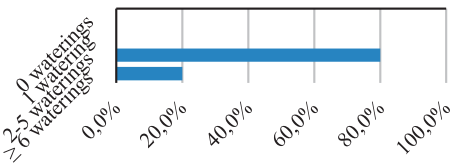

Figure 8. The drinking behavior on 9th day of the study

The drinking behavior - Day 9 results:
- The absence of watering: 0 individuals (0%)
- One watering: 0 individuals (0%)
- 2 - 5 waterings: 8 individuals (80%)
- ≥ 6 waterings: 2 individuals (20%)

Table 2. Synthetic table with the results regarding the drinking behavior of the studied group

No. of waterings / Day	0 waterings (%)	1 watering (%)	2-5 waterings (%)	≥ 6 waterings (%)
Day 1	100***	0	0	0
Day 2	40**	30	30	0
Day 5	0	0	80***	20*
Day 9	0	0	80***	20*

** p>0.01 – not significant differences*
*** p<0.05 - significant differences*
**** p<0.01 - distinctly significant differences*

Following the analysis of the ethograms in the studied group, it is observed that on the first day (day of accommodation), watering could not be observed in any of the subjects (0%) representing statistically significant differences (*p <0.01*), compared to the other days on which the ethograms were performed. On the second day, the number of individuals that did not accept water decreased significantly to 40% (*p<0.05*), as on days 5 and 9 of the study, all individuals in the studied group presented drinking behavior manifestations, most of them 2-5 times a day. As concerning the drinking behavior, water consumption is directly correlated with age, weight, activity level, but also with the type and amount of food that the cat consumes. (Codreanu, I., 2016; Stelow, E., 2020)

The serum cortisol levels were determined in 3 moments of the experiment: 1st day, 5th day and 10th day. The variations of the cortisol level in the studied group are presented in the synthetic graph bellow (Figure 9).

Cortisol dosing demonstrates significant changes in physiological values ranging from 1.5 to 5 µg/dL of blood serum. The results obtained can be summarized as follows: 5 individuals (50%) from the studied group showed serum cortisol values within physiological limits during the 3 dosing moments, while 5 individuals (50%) from the studied group showed significantly increased values of serum cortisol levels, predominantly on days 1 and 5.

These results demonstrate the validity of H. Selye's theory regarding the involvement of the adrenal cortex in stress response, through the hypersecretion of glucocorticoid hormones - mainly cortisol. (Tan, S. Y., & Yip, A., 2018)

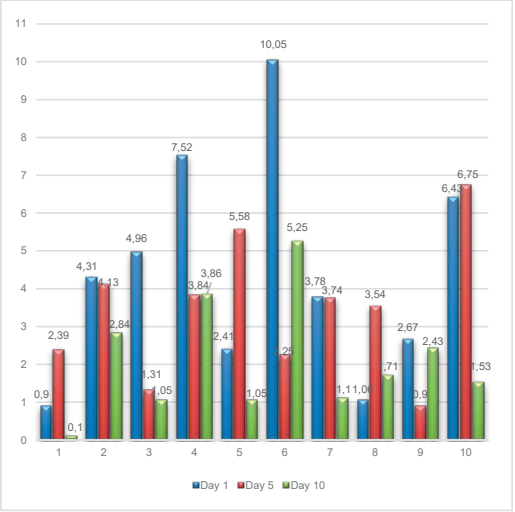

Figure 9. Dynamics of the cortisol variations in the studied group on day 1, 5 and 10 of the study (µg/dL)

CONCLUSIONS

During the experiment the stress caused by the environmental changes was manifested by the absence of feeding and drinking behaviors manifestations in the first days of the study and by increased values of serum cortisol, exceeding the physiological values in 50% of the individuals. Towards the end of the experiment, as the adaptation phenomenon occurred, the feeding and drinking behaviors were normal in all studied individuals, as well as the cortisol values dropped to normal physiological values, indicating a reduction of the stress effects on both behavioral and physiological parameters.

The experiment also highlights the importance of maintaining a suitable habitat, free of stressors, for domestic cats, this species being particularly responsive to stress.

By understanding the harmful effects of stress on cats, we can find more effective ways to prevent them. An essential component of preventive medicine is the interpretation of harmful stress and the clear expression of ways in which it can be reduced in intensity.

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