ZAGAZIG JOURNAL OF

MEDICAL PHYSIOLOGY

Z. J. Med. Physiol. 195 Vol. 3 (3) 1994

# EFFECT OF ULTRAVIOLET RAYS ON AGGRESSIVE BEHAVIOR AND HORMONAL CHANGES IN ALBINO RATS

BY

Mohamed M. Karousa*; Ibrahim S. Meneeh**; Hassan A. Abd El-Rahman,*** and Samy A. Hussein***

FROM

*Department of Hygiene, Preventive Medicine and Feeding, Faculty of Veterinary Medicine, Moshtohor (Benha branch) Zagazig University, Egypt.

**Department of Animal Husbandry, Faculty of Veterinary Medicine, Alexandria, University, Egypt.

***Department of Physiology, Biochemistry and Pharmacology, Faculty of Veterinary Medicine, Moshtohor, (Benha branch) Zagazig University, Egypt.

## ABSTRACT

Ultraviolet rays is one of radiation which is widely used in sterilization and therapy. Forty adult albino rats of both sexes were used to investigate the effect of ultraviolet rays (U.V.R.) on the hormonal changes and their relations to aggressive behavior. The obtained results revealed that there were significant increase in the frequencies of tooth-chattering, threat-posture, leaping and biting, and boxing between the control and treated groups during the exposure periods. On the other hand, there were no significant differences in the frequencies of all aggressive behavior categories between the exposure and post-exposure periods in the treated groups. The exposed groups had higher ($P \leq 0.01$) serum concentrations of cortisone than that of control ones. These results indicate that rats exposed to ultraviolet rays can be physiologically, biochemically and behaviorally altered, such alterations may have an adverse effects on their welfare.

## INTRODUCTION

Social behavior is a fundamental attribute of all rodents and primate species and is diagnostic tool of central nervous system (CNS) activity. Moreover, social behavior and physiology are components in a feed-back-loop (**Selye, 1950; Cooper, 1984 and Rosch, 1988**). Changes in social behavior reflect changes in the CNS through subtle alteration in biochemical and physiological mechanisms (**Ursine et al., 1978; Herd and Weiss, 1983**). Aggression is not a unitary phenomenon, but serves a variety of functions in an animal's life. It was reported that the aggressive behaviour has been correlated with testosterone and corticosterone. This relationship may be apparent when individuals are exposed to stressors or placed in unfavorable situations by which social competition has been stimulated (**Bronson, 1973; Sapolsky, 1982 and Kaplan, 1985**). **Harding and Leshner** (1972) found that adrenalectomy decreased the aggressiveness of male mice, in the same manner, **Walker and Leshner** (1972) found that administration of corticosterone restored the aggressiveness of adrenalectomized mice.

The aim of the present study is to investigate the effect of

ultraviolet rays for a period of 4 weeks on aggressive behavior and some hormonal changes in albino rats.

## MATERIALS AND METHODS

In the present work, 40 adult albino rats of both sexes (20 each) were used, they were housed in groups of 10 rats in 60 x 50 x 25 cm wire cages, feed and water were available ad-libitum.

A 20 watts filtered ultraviolet lamp was used to provide 365 nm intensity of 460 uw/Cm$^2$ ultraviolet rays.

Rats were randomly divided into four equal groups. One group of females and one group of males were exposed to 460 uw/cm$^2$ at 365 nm U.V.R. for two hours per day during 4 weeks period. The other remained groups were utilized as control and were housed in a similar cages and were received the same management with the absence of U.V.R. exposure.

Throughout the experiment the frequencies of aggression in each group were recorded during two 10-min. observation sessions daily (during and post-exposure) for 4 weeks period.

Blood samples were collected periodically and serum was separated for determination of cortisone concentrations. Radioimmunoassay with a commercially available kits used for human was performed (Diagnostic Products Corporation, Los Angeles, Catalog number : TKCOL).

Statistical analysis was carried out according to **Snedecor and Cochran (1976).**

## RESULTS AND DISCUSSION

Table (1) shows the mean value of serum cortisone concentration of the exposed and control rats. The exposed animals of both sexes had significantly higher ($P \leq 0.01$) serum concentration of cortisone than that of control groups. Long term stress is generally associated with an increase in pituitary-adrenal activity **(Selye, 1950; Friend et al., 1979; Moberg et al., 1980 and Dantzer and Mormede, 1985).** Corticosteroids produced by the adrenal cortex allow animals to resist some of the adverse effects of noxious stimuli and environmental change **(Gilman et al., 1990).** Under condition of stress with absence of glucocorticoids, there is vascular collapse which leads usually to death **(Hadley, 1984).**

Table (2) shows the average aggressive behaviour frequencies given by the control and exposed animals to U.V.R. during and post-exposure periods. The frequencies of tooth-chattering, threat-posture, leaping and biting, and boxing in the exposed groups during the exposure were significantly increased ($P \leq 0.01$) than that of the control ones. Moreover, the exposed rats exhibited marked decrement in the aggressive behaviour frequencies from the exposure periods to post-exposure ones. However, the difference between the exposure and post-exposure periods was not significant.

During the post-exposure period, the averages of aggressive behaviour frequencies given by the exposed groups were significantly higher ($P \leq 0.01$) than those of the control ones. Similarly, significant differences ($P \leq 0.05$) between females and males were observed in the exposed groups.

The observed differences in the frequencies of aggressive behaviour may be due to a stress response to the rays with a parallel elevation of serum cortisone level as shown in Table (1). Similarly, **Walker and Leshner (1972)** found that administration of corticosterone restore the aggressiveness of adrenalectomized mice. Aggressive behaviour has been reported to be correlated with testosterone and corticosterone **(Bronson, 1975; Sapolsky, 1982 and Kaplan, 1985).**

These results indicate that rats exposed to ultraviolet rays can be physiologically, biochemically and behaviourally altered. Such alterations may have adverse effects on their welfare.

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**Table (1): The mean value of serum cortisone concentration of control and exposed rats to U.V. Rays.**

| Groups | | cortisone (ug/dl) |
|---|---|---|
| Male | Control | 0.64 ± 0.03 |
| | Treated | 0.98 ± 0.03 ** |
| Female | Control | 0.59 ± 0.02 |
| | Treated | 0.90 ± 0.01** |

** Significant at P ≤ 0.01

Data are presented as mean ± S.E.
S.E. = Standard error.

**Table (2): Average of aggressive behaviour frequencies given by control and exposed rats to U.V. rays.**

| Groups / Behaviour | Control | | Treated | | | |
|---|---|---|---|---|---|---|
| | | | During Exposure | | Post-Exposure | |
| | Male | Female | Male | Female | Male | Female |
| Tooth-chattering | 0.94 ± 0.15 | 0.71 ± 0.14 | 3.67 ± 0.41** | 2.41± 0.52** | 2.81 ± 0.27* | 1.66 ± 0.34* |
| Threat posture | 1.24 ± 0.18 | 0.97 ± 0.14 | 3.91 ± 0.45** | 2.78 ± 0.23** | 3.11 ± 0.15* | 2.33 ± 0.17* |
| Leaping & biting | 1.41 ± 0.41 | 1.10 ± 0.20 | 6.23 ± 0.72** | 3.49 ± 0.51** | 4.91 ± 0.83* | 2.60 ± 0.31* |
| Boxing | 2.16 ± 0.53 | 0.90 ± 0.19 | 6.61 ± 0.67** | 3.28 ± 0.42** | 5.09 ± 0.17* | 3.02 ± 0.25* |

* Significant at P ≤ 0.05
** Significant at P ≤ 0.01

# تأثير الأشعة فوق البنفسجية على السلوك العدوانى والتغيرات الهرمونية فى الفئران البيضاء

د. محمد مرسى قاروصة * ، د. إبراهيم منيع** ، حسن عبد الرحمن عبد الرحمن *** ، د. سامى على حسين***

* قسم الصحة والطب الوقائى والتغذية . كلية الطب البيطرى بمشتهر جامعة الزقازيق فرع بنها.

** قسم سلوكيات الحيوان – كلية الطب البيطرى – جامعة الإسكندرية

*** قسم الفسيولوجيا والكيمياء الحيويه والفارماكولوجيا – كلية الطب البيطرى بمشتهر – جامعة الزقازيق فرع بنها

تعتبر الأشعة فوق البنفسجية من الأشعة واسعة الإستخدام فى التعقيم والعلاج ولذلك تمت المعاملة بهذه الأشعة لإستبيان التأثير الجانبى الضار لهذه الأشعة وفى هذه الدراسة تم إستخدام ٤٠ فأر أبيض بالغ من كلا الجنسين (ذكور & إناث ) لدراسة مدى تأثير هذه الأشعة الضار على كل من السلوك وبعض الهرمونات ٠

**وأوضحت نتائج هذه الدراسة ما يلى :**

١– هناك أختلاف معنوى لهذه الأشعة أدى إلى زيادة السلوك العدوانى فى الفئران المعاملة بهذه الأشعة من كلا الجنسين وأن ذكور الفئران كانت أكثر تأثراً من الآناث بهذه الأشعة٠

٢– كما أوضحت الدراسة بأن هناك أختلاف معنوى بين المجموعات المعاملة بهذه الأشعة والمجموعات الغير معاملة فى تركيز الكورتيزون فى الدم.

من نتائج هذه الدراسة نستنتج أن تعرض الفئران للأشعة فوق البنفسجية ربما تؤدى إلى تغيرات فسيولوجية وبيوكيميائية فى عمليات الأيض وأيضا إلى تغيرات سلوكية وهذه التغيرات لها تأثيرات عكسية على رفاهية الحيوان.