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

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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 < 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, 1986). 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 behavior 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, fed and water were available ad-libitum.

A 20 watts filtered ultraviolet lamp was used to provide 365 nm intensity of 460 uv/cm² of ultraviolet rays.

Rats were randomly divided into four equal groups. One group of females and one group of males were exposed to 460 uv/cm² 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 < 0.01) serum concentration of cortisone than that of control groups. Long term stress is generally associated with an increase in pituitary-adrenal activity (Selvye, 1950; Friend et al., 1979; Hoberg et al., 1980 and Dentzer and Hornsby, 1985).

Corticosteroids produced by the adrenal cortex allow animals to resist some of the adverse effects of noxious stimuli and environmental change (Allman et al., 1970). Under condition of stress with absence of glucocorticoids, there is vascular collapse which leads usually to death (Bradley, 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 boxing in the exposed groups during the exposure were significantly increased (P < 0.01) than that of the control ones. Moreover, the exposed rats exhibited marked decrements 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 < 0.05) than those of the control ones. Similarly, significant differences (P < 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 (3). Similarly, Walker and Lesher (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.
REFERENCES
Table (1): The mean value of serum cortisone concentration of control and exposed rats to U.V. rays.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Cortisone (μg/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>0.64 ± 0.03</td>
</tr>
<tr>
<td>Treated</td>
<td>0.98 ± 0.03 **</td>
</tr>
<tr>
<td>Female</td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>0.59 ± 0.02</td>
</tr>
<tr>
<td>Treated</td>
<td>0.90 ± 0.01 **</td>
</tr>
</tbody>
</table>

** 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.

<table>
<thead>
<tr>
<th>Behaviour</th>
<th>Control</th>
<th>Treated</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Tooth-chattering</td>
<td>0.94 ± 0.15</td>
<td>0.71 ± 0.14</td>
</tr>
<tr>
<td>Threat posture</td>
<td>1.24 ± 0.18</td>
<td>0.97 ± 0.14</td>
</tr>
<tr>
<td>Leaping &amp; biting</td>
<td>1.41 ± 0.41</td>
<td>1.10 ± 0.20</td>
</tr>
<tr>
<td>Boxing</td>
<td>2.16 ± 0.53</td>
<td>0.90 ± 0.19</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>During Exposure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-Exposure</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Significant at P ≤ 0.05
** Significant at P ≤ 0.01
تأثير الأشعة فوق البنفسجية على السلوك العدوانى والتهيجات الهرمونية في الفئران البيضاء

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تعتبر الأشعة فوق البنفسجية من الأشعة واسعة الاستخدام في التعقيم والعلاج، ولذلك تستعمل هذه الدراسة لإثبات الأشعة فوق البنفسجية على كلا الجنسين (ذكور & إناث) لدراسة مدى تأثير هذه الأسعار على كل من السلوك وبعض الهرمونات.

وأوضح نتائج هذه الدراسة ما يلي:

١- هناك اختلاف معنوي لهذه الأشعة أدى إلى زيادة السلوك العدوانى في الفئران المعاملة بهذه الأشعة من كلا الجنسين، وأن ذكور الفئران كانت أكثر تأثراً من الإناث بهذه الأشعة.

٢- كما أوضحت الدراسة بأن هناك اختلاف معنوي بين المجموعات المعروفة بهذه الأشعة والمجموعات غير المعالمة في تركيز الكورتيزون في الدم. من نتائج هذه الدراسة نستنتج أن تعرض الفئران للأشعة فوق البنفسجية ربما تؤدي إلى تغيرات في الهرمونات، والكимиائية في عمليات الأيض أيضًا إلى تغيرات سلوكية وهذه التغييرات لها تأثيرات عكسية على واقعة الحيوان.