

Beyoglu Hospital, Department of Biochemistry,
Beyoglu, Istanbul, Türkiye

**THE EFFECTS OF CHRONIC ULTRAVIOLET B
(UVB) RADIATION ON SOME BIOCHEMICAL
PARAMETERS IN RATS***

(With 1 Table)

By

G. AKIN; M. ÖZCAN⁽¹⁾ and Z. TURAN

⁽¹⁾Department of Physiology, Istanbul, Türkiye
University of Istanbul, Faculty of Veterinary Medicine,
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SUMMARY

In this study the effect of UVB radiation on some biochemical parameters was investigated by applying UVB radiation at a dosage of 4 J/cm², 5 days a week on 120 (60 of female, 60 of male), 22 week-old Wistar Albino rats. Level of serum glucose, urea, uric acid and creatinine were measured in the blood samples taken before and after the ray application. It was determined that after the UVB application, there was no change in serum glucose level in male and female rats whereas the level of urea and uric acid decreased significantly (P<0.05) in male rats and the level of creatinine increased significantly (P<0.05) in male and female rats.

Key words: *Ultraviolet B Radiation, Rat, Glucose, Urea, Uric acid, Creatinin.*

INTRODUCTION

It has already been declared that the amount of UVB radiation coming from the Sun to the Earth increases due to the decrease of atmospheric ozone stratum (Jeevan and Kripke, 1993, Ambach et al., 1991). It has also been stated that little amount of UVB is necessary for

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health (Jeevan et al., 1993) while high doses of UVB has harmful effects on organism (Ponnonen et al., 1991, Tyreel, 1994). Ultraviolet radiation has been used for the purpose of treatment for long time both in human medicine and veterinary medicine (Fjellner and Hagermark, 1982, Forsander, 1995, Lakshmi pathi and Wilson, 1976). The effects of UVB radiation on nucleic acids, proteins and lipids of cell have been shown in different studies carried out on animals and tissue culture studies (Tyreel, 1994, Masaki et al., 1995, Siedel et al., 1984).

Although the effects of UVB on erythrocyter parameters, leukocyte number and imunoglobulins (Özcan, 1993), coagulation mechanism (Cötelioğlu et al., 1998), electrolytes (Özcan et al., 1999) and plasma proteins (Özcan et al., 1997) have been investigated in rats, the changes in biochemical parameters have not been studied.

Therefore, we aimed to investigate the effects of UVB radiation at a treatment dosage of 4 J/cm² which is used for the treatment of psoriasis in human (Lundin et al., 1990) on glucose, an important energy source of livings, and some metabolic product such as urea, uric acid and creatinin (Murray et al., 1991).

MATERIAL and METHODS

In this study a total of 120 (60 of female, 60 of male), 22 week-old Wistar Albino rats were used as research material. Male and female rats were separated to groups of 5 and placed in separate cages. The room temperature in which the animals were placed was 18±5°C and the humidity was 55±10%.

All animals were fed with special rat food from Istanbul Food Industry Company (Crude Protein minimum 24%, Fiber maximum 7%, Ash maximum 8%, HCl insoluble Ash maximum 2%, Ca minimum 1%, P minimum 0.50%, Na minimum 0.5% maximum 0.7%, NaCl maximum 1%, Lizin minimum 1%, Methionine minimum 0.6 %, Metabolic Energy minimum 2650 Kcal/kg) and water was given ad libitum.

UVB radiation was applied to animals at a dosage of 4 J/cm², 5 days a week during a 4 week period and they were rested for the following 2 days. The adjustment of the UVB Lamps (insensitivity 1.12mW/ cm², power 15 Watt) was fixed by using IL 1700 Research Radiometer.

Blood samples were collected from all animals grouped by 5-into sterile tubes by the same amount from each before and after the ray application by using the tail cutting method (Merdivenci, 1971) in the

form of pool system. Blood samples which were collected before the ray application were defined as control group and the ones which were collected after the application were defined as experimental group. Blood samples were centrifuged and the serum removed. Serum glucose, urea, uric acid and creatinine levels were measured by using Boehringer Mannheim Kits in Hitachi 911 autoanalyzer. The significance of the differences both between sexes and between the control and experimental groups were determined by using the 't test' (Snedecor and Cochran, 1976).

RESULTS

The effects of UVB radiation on glucose, urea, uric acid and creatinine levels in male and female rats are presented in Table 1.

No difference was determined at the mean of serum glucose level neither between the control and experimental groups nor between sexes. However the mean of urea and uric acid at experimental group male rats decreased statistically ($P < 0.05$) whereas the creatinine level increased in comparison to the control group. While urea and uric acid levels of female rats did not change after ray application, the amount of creatinine increased significantly from 0.7 ± 0.01 mg/dl to 0.9 ± 0.03 mg/dl ($P < 0.05$).

Urea and creatinine levels of male rats belonging to the experimental group were found to be lower than the female rats' as a result of the statistical analysis which were carried out to determine the differences between two sexes ($P < 0.05$). The amount of uric acid at male and female rats in control group were found as 2.8 ± 0.10 mg/dl and 1.9 ± 0.08 mg/dl respectively and the difference between two sexes was determined to be significant statistically ($P < 0.05$).

DISCUSSION

Serum glucose levels found as 142.8 ± 4.95 mg/dl at male rats and 149.2 ± 4.24 mg/dl at the females of the control group are in the range of 98-161 mg/dl as declared in the literature (Ringler and Dabich., 1979). Serum glucose levels of both sexes did not change statistically after the ray application.

Serum urea level of both male and female rats determined in control group are in the range of normal values declared for rats in the literature (Ringler and Dabich., 1979). While the serum urea level of experimental group male rats decreased significantly ($P < 0.05$), it did not change in females.

After surveying literature, we could not find any research concerning the effects of UVB whether on serum glucose, urea, uric acid and creatinine or sexes. Thus we could not discuss our results. However the declaration of Abramov (1990) on the increase of ammonia concentration and no change in CO₂ level after an application of UVB+Infrared ray on calves at a dosage of 120 mEr/h/m² for 6 hours each day during a 70 day period supports our finding that the urea level of female rats did not change after the ray application. Because it was informed that the source of serum urea level is exogen protein and amino acids and the urea synthesises in urea cyclus in liver and ammonia and CO₂ are necessary at the beginning of the reaction (Murray *et al.*, 1991).

In this study, we found a decrease in serum uric acid level of experimental group male and female rats in comparison to the control group. However this decrease was statistically significant only in the male rats (P<0.05). The reason of the decrease in serum uric acid may be the increase of free radicals which are bound by the uric acid. As a matter of fact, it is declared that the UVB radiation causes the formation of free radicals (Masaki *et al.*, 1995) and uric acid acts as a free radical binder (Erenel *et al.*, 1993 and Bast *et al.*, 1991).

Serum creatinine is formed as a result of creatine metabolism. Creatinine is a synthesis of glisin, arginine and methionine amino acids. The first step of synthesis starts in kidneys and it is completed in liver (Murray *et al.*, 1991). In this study serum creatinine levels of control group males and females were found to be 0.6±0.02 mg/dl and 0.7±0.01 mg/dl respectively. And these values are within the range of 0.4-1.5 mg/dl as declared in literature (Ringler and Dabich, 1979). Moreover creatinine level of both male and female rats in experimental group increased statistically (P<0.05).

As a result, it can be said that UVB radiation causes the urea and uric acid levels at males, to decrease, the creatinine level of both two sexes to increase and that the effect of UVB radiation differs according to the sex.

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Table 1 : Serum Glucose, Urea, Uric Acid and Creatinin Levels of

Male and Female Rats (n=12)

Propertie s	Sex	Control Group		Experimental Group		
		x	Sx	x	Sx	
Glucose (mg/dl)	Male	142.8 ^a ±4.95		144.3 ^a ±3.52		-
	Female	149.2 ^a ±4.24		139.2 ^a ±4.35		-
Urea (mg/dl)	Male	53.1 ^a ±2.42		41.3 ^b ±0.65		*
	Female	50.3 ^a ±2.71		50.7 ^a ±3.89		-
Uric Acid (mg/dl)	Male	2.8 ^a ±0.10		1.9 ^a ±0.64		*
	Female	1.9 ^b ±0.08		1.8 ^a ±0.11		-
Creatinin (mg/dl)	Male	0.6 ^a ±0.02		0.7 ^b ±0.01		*
	Female	0.7 ^a ±0.01		0.9 ^a ±0.03		*

a, b : In each column, the differences between the means having the different letters are significant (P<0.05).

* : P<0.05