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EFFECT OF ULTRAVIOLET RADIATION ON THE LYMPHOID SERIES OF THE HEMOPOETIC SYSTEM OF GUINEA PIG (*CAVUS PORCELLUS*)

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ABSTRACT
Guinea pigs (C. porcellus) were exposed to UV radiation for different durations and hematological parameters have been observed after exposure. The observation gives a clear indication that intermittent exposure (15min, 30min, 1h) of mild doses of UV radiation shows immune response in terms of increased leucocytic count specially lymphocytes and neutrophil.

INTRODUCTION

Ultraviolet Radiation is defined as the portion of electromagnetic spectrum between X-ray and visible light ranging from 40-400nm. UV radiations have both beneficial (synthesis of Vitamin D) as well as damaging effects. Ultraviolet wavelength shorter than 280nm (UVC) is absorbed by the ozone layer and do not reach the earth. UV wavelength longer than 320nm (UVA) is less efficient than UVB in causing any damage. The UV wavelength between 280 and 320nm (UVB) is the most destructive form of UV radiation and is the major cause of sunburn, erythema, corneal burn, cataract, DNA damage, mutations and cancers of the skin (Ole Baadsgaard MD, 1991; Lynch *et al.,* 1983). Since the ozone layer absorbs UVB ultraviolet light from the Sun, ozone layer depletion is expected to increase surface UVB levels, which could lead to damage, including increases in skin cancer (Haniszko *et al.,* 1963). Small amounts of UV however are beneficial for people and essential in the production of vitamin D. UV radiation is also used to treat several diseases, including rickets, psoriasis, eczema and jaundice. (Ultraviolet radiation and the INTERSUN program, WHO) (Hockberger, 2002). This study has been carried out to emulate upon the short term effects of UV radiation on the guinea pig (*C. porcellus*) (Morison *et al.,* 1985; Spellman and Daynes, 1977).

The research was carried out on the cells of the hemopoetic system (Kripke *et al.,* 1976; Morrison *et al.,* 1979) because the turnover rate of blood cells are very high and therefore any shift in the number and types of the cell can be observed even in a short span of time.

MATERIALS AND METHODS

Guinea pigs of approximately same weight (230-250g) were taken for experiment . After acclimatizing the animals in the laboratory, 3 of them were subjected to UV radiation at an interval of 2 days and one was kept as control. During exposure the animals were kept at a distance of 20cm from the source of UV radiation. The animals were exposed to UV radiation for 15min, 30min, and 1h.

After 24h from the time of each exposure, blood was collected by veini puncture method from the pinna. Blood smear was prepared and stained with Leishman stain. Haemocytometer was used for leucocyte count (Fischer, 1925). Hematological parameters observed are presented in (Table 1).

RESULTS

Observations of the blood smear showed a steady increase in the differential count of leucocytes as seen in (Table 1) The photograph of the blood smear showed a marked difference in treated and control animals. (Fig. 1a and 1d). Leucocyte count is increased considerably in 1h treated animals (Table 1).

A steady increase in the total leucocyte count of the irradiated animal is observed with increase in the duration of UV exposure (Fig. 2). A marked increase in the lymphocyte count with the increase in the time of exposure is evident (Fig. 3). The absolute neutrophil count of the irradiated animal is plotted against the absolute neutrophil count of the control animal (Fig 4). Apart from these, no significant changes were seen in other leucocytic cells.

Table 1: Differential count of Leucocyte

S. No.	Exposure time	Total Leucocyte count	% Lymphocyt-es	Absolute lymphoc-ytes	% Neutrop-hils	Absolute Neutrop-hils
1.	Control	6300	44	2772	54	2402
2.	After 15mins	7900	58	4582	41	3239
3.	After 30mins	8300	64	5312	35	2905
4.	After 1h	9300	66	6138	31	2883

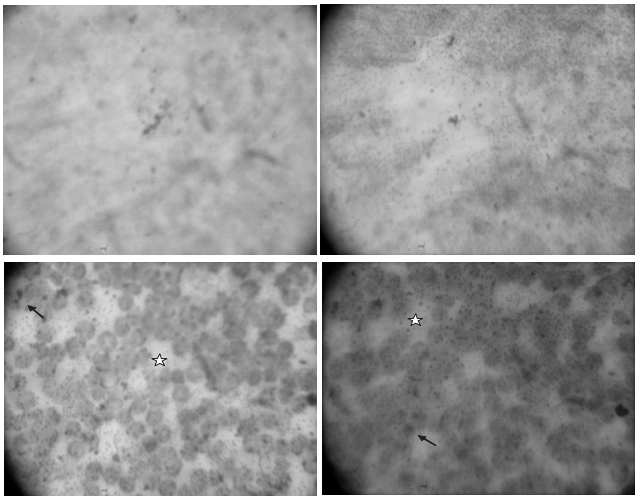

Figure 1(a): Blood smear before UV exposure 1(b) Blood smear after 15 mins of UV exposure 1(c) Blood smear after 30 mins of UV exposure (d) Blood smear after 1 hr of UV exposure, Leucocyte (↖); Lymphocyte (☆)

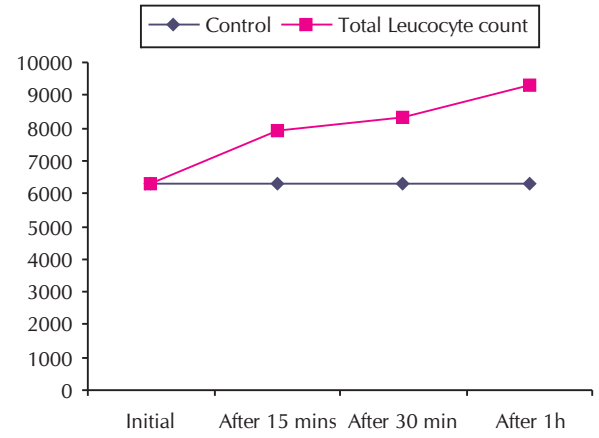

Figure 2: Change in number of Total Leucocyte count with increase in exposure time

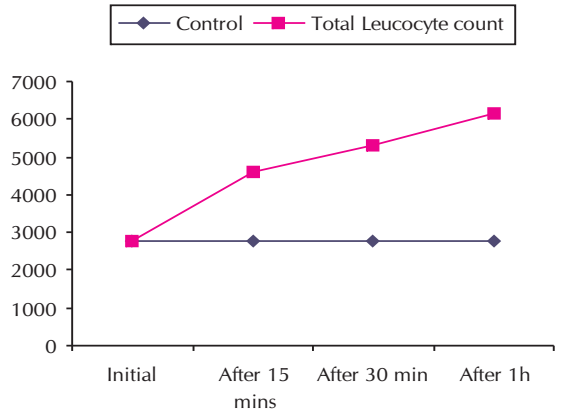

Figure 3: Change in Absolute Lymphocyte count with increase in exposure time

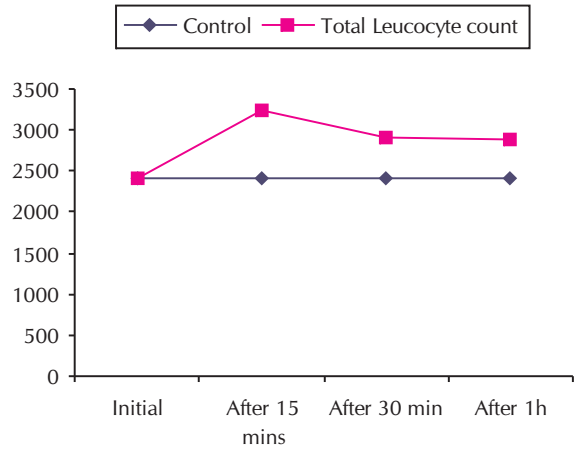

Figure 4: Change in Absolute Neutrophil count with increase in exposure time

DISCUSSION

It is apparently clear that intermittent exposure of mild doses of UV radiation of UVB range shows immune response in terms of increased leucocytic count specially lymphocytes (Fisher *et al.,* 1982; Morison and Parrish, 1979). Prolonged exposures of UV radiation in higher doses which causes sun burn to skin cancers shows effect on the organism's immune system in the form of neutrophilia (increase in the number of neutrophils) (Adele *et al.,* 2011). But when the animals were irradiated intermittently for a very small period of time with a mild dose of UVB radiation, leucocytosis in the form of increase in lymphocyte was observed.

Observation shows that the immune response is significantly changed from neutrophil to lymphocyte. (Kripke and Morison, 1985), As lymphocytes are responsible for long term immunity and if such small exposure can cause immune alteration in such a way research can be carried out on immunosuppressed organisms specially on persons suffering from AIDS where the immune system, particularly the lymphocytes are attacked by the HIV virus.

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