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Effect of Opium Addiction on Some Hematological Parameters in Rabbit

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Abstract: Addiction is one of the most important issues of the 21st century that received more attention all over the world. For evaluation of effects of opium on rabbits, 40 New Zealand white rabbits (20 males and 20 females) were randomly divided into two groups (control and addicted group). Addicted and control group received opium and distilled water, respectively, that was administrated by gavage separately. After 30 days blood samples were taken from ear veins at the beginning and at the end of the experiment. For determining hematologic parameters, complete blood cell count (CBC) for red and white blood cell number, hemoglobin level (Hb), hematocrit (Hct) and calculating cell indices including mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), was done by Cell Counter Sysmex. Opium was significantly effective on WBCS as total number of WBCs was increased in addicted group in both sexes in compare to non addicted group ($P<0.05$). But RBC count was not affected by opium and there was non significant change in RBC values in addicted group in compare to non addicted group ($P<0.05$).

Key words: Hematology · Opium · Rabbit

INTRODUCTION

Addiction is an increasing issue in all over the world. Synthetic addictives are most used in western societies and almost all of works focused on these components but in Iran opium is used frequently from past. Morphine is the major component of opium, but opium contains more than eighty alkaloids with different effects on homeostasis [1], so its effects could be different from pure morphine. Effects of opium on different organs had been reported but there is no enough information about hematological parameters [2]. So this study was done to evaluate hematological responses of rabbit to opium in controlled conditions as hematological parameters could be a base for other aspects of addiction biology.

MATERIALS AND METHODS

Forty New Zealand white rabbits (20 males and 20 females) were purchased from Pasture Institute, Tehran, Iran. All animals were housed in an animal care facility under controlled photoperiod (12h light/12 h dark, at 25±1°C temperature and 60±5% humidity), feed with standard chow diet and water was available *ad libitum*. Rabbits were randomly divided into two groups as control and addicted group. Addicted group were treated with pure opium (police office, Ilam, Iran) suspended in 1 ml of hot distilled water and administered by gavage starting with 250 mg/rabbit/day. Within a period of one week the dose was gradually increased to 1 g/rabbit/day and kept for 53 days. The control group received 1 ml of distilled water for 60 days [3]. After this period blood samples were taken with heparinized syringes from ear vein. All experiments were approved by the ethics committee of the Ilam University.

For determining hematologic parameters, complete blood cell count (CBC) for red and white blood cell number, hemoglobin level (Hb), hematocrit (Hct) and calculating cell indices including mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), was done by Cell Counter (KX-21N, Sysmex).

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Table 1: Compare hematologic parameters between addicted male rabbits and non addicted one

Hematologic Parameters	Addicted Male	Non Addicted Male	P value
RBC ($\times10^{-6}$/µl)	5.98±0.395	6.10±.3100	0.483
WBC ($\times10^{3}$/µl)	5.57±0.660	8.49±0.394	0.000
Hb (g/dl)	12.9±0.6000	13.3±0.3000	0.252
PCV (%)	42.75±1.706	43.71±0.927	0.135
MCV (fl)	71.53±2.330	72.25±1.260	0.399
MCH (pg)	21.43±0.850	21.77±0.656	0.333
MCHC (%)	29.96±0.492	30.12±0.319	0.400

Table 2: Compare hematologic parameters between addicted female rabbits and non addicted one

Hematologic parameters	Addicted Female	Non Addicted Female	P value
RBC ($\times10^{6}$/µl)	6.048±0.320	6.02±0.2970	0.864
WBC ($\times10^{3}$/µl)	5.500±0.533	8.100±0.323	0.000
Hb (g/dl)	12.95±0.3600	12.8±0.50000	0.144
PCV (%)	42.86±0.6530	44.87±2.0400	0.008
MCV (fl)	71.48±3.5060	71.89±1.5800	0.740
MCH (pg)	21.55±0.8720	21.76±0.5080	0.519
MCHC (g/dl)	29.95±0.0700	29.46±0.4500	0.000

Statistical Analysis: Data are presented as means± SE (standard error). The means were analyzed by one way analysis of variance (ANOVA) followed by Tukey's post hoc to compare the means with SPSS at $P< 0.05$ level.

RESULTS

Opium was significantly effective on WBCs as total number of WBCs was increased in addicted group in both sexes in compare to non addicted group ($P<0.05$). RBC counts were not affected by opium and there was a non significant change in RBC values in addicted group compared with control group ($P<0.05$). The same pattern was seen in Hb and Hct values as they did not show a significant difference in both groups ($P<0.05$). MCV, MCH and MCHC values were not significantly different in addicted and non addicted group in both male and female rabbits ($P<0.05$).

DISCUSSION

Opiates have been shown to affect immune function *In vivo* [4]. Clinical observations demonstrated increased susceptibility to infections in opiate addicts that could be related to deficits in immune function [5]. Our findings showed that WBCs decreased in both male and female addicted rabbit. WBCs have a primary role in immune function of animals but there is controversy about effects of addictives on WBCs [2, 6]. This might be due to differences in type of addictive used in studies, method of injection and period of study. WBC count had a non-significant increase in human heroin dependent group, while in subsequent withdrawal and control group did not have any significant difference [2].

The effects of opioids could be mediated through HPA axis and sympathetic nervous system [7]. Activation of HPA axis releases the glucocorticoids while increases the peripheral release of sympathetic activity of epinephrine, norepinephrine and dopamine from the adrenal center. Norepinephrine and glucocorticoids both act as suppressors of immune system via affecting WBCs [8, 9].

RBC count, Hct and Hb values did not show a significant change in addicted rabbit in compare to control group ($P<0.05$). This finding is in agree with findings of in human but there are some reports that addiction caused changes in RBC counts, Hct and Hb values in human [1, 10, 11]. These finding showed that opium addiction could affect immune response by decrease in WBC counts.

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