

Serum Triglyceride, Cholesterol and Fasting Blood Sugar in Male Rats Exposed to Oil Paint Vapor

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Abstract— Studies have shown that volatile emissions of chemicals may result in various disorders in our body. The main aim of this study was to determine the effects of oil paint vapor on Chol, TG and BS in male rats. In this experimental laboratory study, male Wistar rats were randomly divided into control and exposed to oil paint vapor for 1h/day and 8h/day. After 10 weeks blood samples were collected using cardiac puncture method. Serum levels of fasting blood sugar, triglyceride, cholesterol and HDL measurement were performed using routine methods. Data were statistically analyzed and compared between groups using ANOVA. The results indicated that serum cholesterol level significantly decreased in rats exposed to oil paint vapor for 8h/day compared with control animals ($p < 0.01$). Conclusively, exposure to oil paint vapor results in decreased serum cholesterol level that may result from a decrease in cholesterol metabolism.

Index Terms— Oil Paint Vapor, Chol, TG, BS, HDL, Male Rat.

I. INTRODUCTION

ALL animal cells manufacture cholesterol for their use, with relative production rates varying by cell type and organ function. About 20–25% of total daily cholesterol production occurs in the liver; other sites of higher synthesis rates include the intestines, adrenal glands, and reproductive organs. High density lipoprotein (HDL) synthesized in liver transfers cholesterol to tissues. Synthesis of cholesterol within the body starts with one molecule of acetyl CoA and one molecule of acetoacetyl-CoA, which are hydrated to form 3-hydroxy-3-methylglutaryl CoA (HMG-CoA). Cholesterol is the precursor molecule in several biochemical pathways. In the liver, cholesterol is converted to bile, which is then stored in the gallbladder. Bile contains bile salts, which solubilize fats in the digestive tract and aid in the intestinal absorption of fat molecules as well as the fat-soluble vitamins, A, D, E, and K. Cholesterol is an important precursor molecule for the synthesis of vitamin D and the steroid hormones, including the adrenal gland hormones cortisol and aldosterone, as well as the sex hormones progesterone, estrogens, and testosterone, and their derivatives[4]. Some research indicates cholesterol may act as an antioxidant. A triglyceride is an ester derived from glycerol and three fatty acids[1]. As a blood lipid, it helps enable the bidirectional transference of adipose fat and blood glucose from the liver[8]. Triglycerides, as major components of very-low-density lipoprotein (VLDL) and chylomicrons,

play an important role in metabolism as energy sources and transporters of dietary fat[6]. In the human body, high levels of triglycerides in the bloodstream have been linked to atherosclerosis and by extension, the risk of heart disease[7] and stroke[8].

The blood sugar concentration or blood glucose level is the amount of glucose (sugar) present in the blood of a human or animal. The body naturally tightly regulates blood glucose levels as a part of metabolic homeostasis. With some exceptions[2-3], glucose is the primary source of energy for the body's cells. Glucose levels are usually lowest in the morning, before the first meal of the day (termed "the fasting level"), and rise after meals for an hour or two by a few millimolar. Blood sugar levels outside the normal range may be an indicator of a medical condition.

Volatile organic compounds (VOCs) in paint are considered harmful to the environment and especially for people who work with them on a regular basis. Exposure to VOCs has been related to organic solvent syndrome, although this relation has been somewhat controversial [11]. Research indicates that the exposure to oil paint vapor results in decreased WBC numbers, therefore, can attenuate immune system[10]. The studies show that child and maternal household chemical exposure has a risk for acute leukemia in children with Down's syndrome [12]. The main aim of this study was to determine the effects of oil paint vapor on Cholesterol, Triglyceride and Blood Sugar in male rats.

II. MATERIAL AND METHODS

A. Animals

Adult male Wistar rats weighting 200 ± 30 g were purchased and raised in our colony from an original stock of Pasteur institute (Tehran, Iran). The temperature was at 23 ± 2 °C and animals kept under a schedule of 12h light: 12h darkness with free access to water and standard laboratory chow.

B. Protocol of Study

Male rats were randomly divided into control and exposed to oil paint vapor for 1h/day and 8h/day. After 10 weeks blood samples were collected using cardiac puncture method. Fasting blood sugar, triglyceride, cholesterol and HDL measurement were performed using routine methods.

C. Statistical Analysis

All values are presented as mean \pm SD. Statistical significance was evaluated by one-way analysis of variance (ANOVA) using SPSS 19 and Tukey HSD Test as post hoc test.

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III. RESULTS

Table I represents serum levels of fasting blood sugar, triglyceride, cholesterol and HDL in male control rats and rats exposed to oil paint vapor.

TABLE I
SERUM LEVELS OF FASTING BLOOD SUGAR, TRIGLYCERIDE, CHOLESTEROL AND HDL IN MALE CONTROL RATS AND RATS EXPOSED TO OIL PAINT VAPOR FOR 1H AND 8H/DAY.

Groups	BS (mg/dl)	TG (mg/dl)	CHOL (mg/dl)	HDL (mg/dl)
Control	128.2±43.5	139±28.8	102.2±6.6	61.4±2.9
1h/day	161.6±37.5	155.8±14.5	91.6±8.0	55.0±1.4
	NS	NS	NS	NS
8h/day	179.8±22.5	144.6±42.1	82.0±8.8	52.8±8.2
	NS	NS	<0.01	NS
	*NS	*NS	*NS	*NS

BS, TG, CHOL and HDL indicate fasting blood sugar, triglyceride, cholesterol, high density lipoprotein, respectively. NS (Non-significant difference) and P<0.01 are expressed compared to control rats and *NS (Non-significant difference) are expressed compared to rats exposed to paint oil vapor for 8h/day.

The results show that serum cholesterol level decreased significantly in rats exposed to oil paint vapor for 8h/day compared to control animals (P<0.01), however, fasting blood sugar, triglyceride and HDL did not significantly change in rats exposed to oil paint vapor for 1 and 8h/day compared to control rats.

IV. DISCUSSION

The results of current research show that exposure to paint odor results in decreased serum cholesterol level in male rats. Although odour pollution of air in small amount is not harmful to the health of man [10], the studies show that child and maternal household chemical exposure has a risk for health [12]. Studies also show that occupational and environmental exposures to lead, one of the toxic metal pollutants presented in gasoline derivatives such as oil paints, may affect cholesterol metabolism [13]. There is also study showing that exposure to diesel-water-methanol emissions were not associated with neurotoxicity, reproductive developmental toxicity, or in vivo genotoxicity and only small decreases in serum cholesterol were observed [14]. It has been also shown that gasoline derivatives have adverse effects, the most significant of which included depression in weight gain in the males, and increased liver weight and hepatic microsomal enzyme activities in both sexes.

V. CONCLUSION

We have shown that exposure to oil paint vapor results in exposure to oil paint vapor results in decreased serum cholesterol level that may result from a decrease in cholesterol metabolism.

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