
EVALUATION OF LIPID PROFILE AND SOME HEMATOLOGICAL PARAMETERS OF ALBINO RATS FED WITH HONEY

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Abstract: Honey is widely consumed in Nigeria. Its main uses include: wound healing, baking, and as addition to various beverages. This study was undertaken to investigate the effect of honey on lipid profile and some hematological parameters of adult albino rats. Sixteen adult albino rats were randomly divided into two groups. Group A (8 rats) served as control and received rat chow and water only. Group B (8 rats) received 1ml of honey per rat per day for three weeks. Thereafter, the animals were anaesthetized with chloroform. Blood samples were collected for analysis via cardiac puncture. The results showed that honey increased HDL and decreased LDL in group B. Increase in triglycerides in group B was not significant. It had no effect on cholesterol and VLDL in group B. Honey had no effect on PCV, monocytes, eosinophils, basophils. In group B, changes in lymphocytes and neutrophils were not significant. It increased total WBC. If applied to human, moderate intake of honey may help prevent the risk of atherosclerosis.

Keywords: Honey, lipid profile, hematological parameters.

INTRODUCTION

Honey is produced by bees as a food source. It has a lot of beneficial effects especially on wound healings (Molan, 1998; Efem, 1988; Bergman *et al.*, 1983), gastrointestinal disorders (Haffejee and Moosa, 1985; Salem, 1981) and as antibacterial agent (Molan, 1992). Honey is used as a natural sweetener. It consists of sugars such as monosaccharides (fructose and glucose), disaccharides, oligosaccharides, polysaccharides, and enzymes (glucose oxidase, diastase, invertase (Bogdanov *et al.*, 2008; Erejuwa *et al.*, 2012).

However, it must be noted that honey sometimes contains dormant endospores of the bacterium *clostridium botulinum*, which can be dangerous to infants as the endospores can transform into toxin producing bacteria in the infant's immature intestinal tract leading to illness and even death (Shapiro *et al.*, 1998).

Several chemical compounds in food and in the body are classified as lipids. They include (1) neutral fat, also known as triglycerides, (2) phospholipids, (3) cholesterol. Chemically, the basic lipid moiety of the triglycerides and phospholipids is fatty acids, which are long-chain hydrocarbon, organic acids. The glycerides are used in the body mainly to provide energy for the different metabolic processes, a function they share almost equally with the carbohydrate. However, some lipids especially cholesterol, the phospholipids, and small amounts of triglycerides are used to form the membrane of all cells of the body and to perform other cellular functions (Guyton and Hall, 2011).

Changes in hematological parameters may be as a result of disease or ingestion of substances that may increase or decrease them. This study, therefore, was undertaken to investigate the lipid profile and some hematological changes in adult albino rats administered with honey.

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MATERIALS AND METHOD

Animals: Sixteen adult albino rats of Wistar strain weighing between 153-230g were used in the study. The animals were housed under standard conditions of temperature and humidity and 12h light (7.00am – 7.00pm). They were acclimatized for one week before the commencement of the experiment. They were kept in wire meshed cages and fed with commercial rat pellets (UAC Vital Feed) and allowed water *ad libitum*. All animals were handled in this research according to institutional and international guidelines on animal experimentation.

Experimental Design: The animals were divided into two groups. Group A (control) consisted of 8 rats. They received rat feed and water only. Group B (test) contained 8 rats. They received 1ml of honey per rat per day mixed with the feed for three weeks.

Materials: Honey was bought from a local market, Afor-Egbo in Imo State. It was sourced from Nsukka in Enugu State. Other materials used were hand gloves, weighing scale (triple beam balance, MB-2610 capacity 2610g, Techmel and Techmel, USA), cotton wool, syringes, dissecting kit, chloroform, EDTA (ethylene diamine tetracetic acid) and plain bottles. The animals were weighed with a weighing scale at the end of one week acclimatization and at the end of the experiment (after 3 weeks of honey administration).

Sample Collection

The animals were anaesthetized with chloroform. Each rat was placed on a table and the thoracic cavity dissected to expose the heart. 2mls of blood was collected via cardiac puncture and put into a specimen bottle containing EDTA (for hematological analysis) and plain bottles (for lipid profile). Samples were taken to Chaste laboratory, Nnewi, Anambra State, for analysis.

Statistical Analysis: The data obtained were expressed as mean ± standard deviation and analyzed statistically using Excel.

RESULTS

Table 1: Effect of Honey on Lipid Profile of Albino Rats

	TC (mg/dl)	Triglyceride (mg/dl)	HDL (mg/dl)	LDL (mg/dl)	VLDL (mg/dl)
Group A	184±10.29	130.43±14.32	51.75±3.42	146.5±34.3	27.3±1.03
Group B	185.5±4.56	141.38±6.00	57.75±1.64*	99.03±4.88*	27.8±0.46

*Significant, p<0.05.

TC = Total Cholesterol
 HDL = High-Density Lipoprotein
 LDL = Low-Density Lipoprotein
 VLDL = Very Low-Density Lipoprotein.

Table 2: Effect of Honey on some Hematological Parameters of Albino Rats

	PCV	TWBC x 10 ⁹ /L	Neutrophil	Lymphocyte	Monocyte	Eosinophil	Basophil
Group A	40±1.87	12.78±1.66	37.5±8.65	60.5±8.65	1±0.71	0.82±0.71	0±0.00
Group B	40.5±2.29	15.4±0.45*	26.25±6.87	71.75±6.42	0.75±0.83	1±0.71	0.25±0.43

*Significant, p<0.05.

PCV = Packed cell volume.
 TWBC= Total white blood cell.

The results showed that total cholesterol in groups A and B were 184 ± 10.29 mg/dl, 185.5 ± 4.56 mg/dl respectively. The triglyceride values were 130.43 ± 14.32 mg/dl, 141.38 ± 6.00 mg/dl for groups A and B respectively. High-density lipoprotein (HDL) values showed 51.75 ± 3.42 mg/dl, 57.75 ± 1.64 mg/dl for groups A and B respectively. Low-density lipoprotein (LDL) showed 146.5 ± 34.3 mg/dl for group A, 99.03 ± 4.88 mg/dl for group B. Very low-density lipoprotein (VLDL) showed 27.3 ± 1.03 mg/dl for group A, 27.8 ± 0.46 mg/dl for group B. The results showed that packed cell volume (PCV) for group A was 40 ± 1.87 , group B 40.5 ± 2.29 . Total white blood cell (TWBC) count showed $12.78 \pm 1.66 \times 10^9$ /L for group A, $15.4 \pm 0.45 \times 10^9$ /L for group B. Neutrophil counts were 37.5 ± 8.65 for group A, 26.25 ± 6.87 for group B. Lymphocytes count showed 60.5 ± 8.65 for group A, 71.75 ± 6.42 for group B. Monocyte count showed 1 ± 0.71 for group A, 0.75 ± 0.83 for group B. Eosinophil counts were 0.82 ± 0.71 for group A, 1 ± 0.71 for group B. Basophil counts showed 0 ± 0.00 for group A, 0.25 ± 0.43 for group B.

DISCUSSION

In this present study we investigated changes in lipid profile (cholesterol, triglyceride TG), high-density lipoproteins (HDL), low-density lipoproteins (LDL), very low-density lipoproteins (VLDL) and some hematological parameters of adult albino rats fed with Nigerian grown honey. The results shown in table 1 revealed no significant change in total cholesterol ($P > 0.05$) in group B (test) compared with the control. Our findings agreed with some and differed from values reported by Aliyu *et al.*, (2012).

Honey significantly increased HDL and decreased LDL ($p < 0.05$). An important factor in the aetiology of atherosclerosis is a high blood plasma concentration of cholesterol in the form of LDL. LDL is referred to as “bad” cholesterol because it slowly builds up in the blood and eventually forms plaques in the walls of the arteries and HDL is “good” cholesterol because it carries cholesterol away from the arteries back to the liver for metabolism (Meyer 1997; Umar and Abdullahi, 2009). Therefore honey may have a beneficial effect in reducing the risk of atherosclerosis. Studies have shown that for each 1mg/dl decrease in LDL cholesterol in the plasma, there is about a 2 percent decrease in mortality from atherosclerotic heart disease. Therefore, appropriate preventive measures are valuable in decreasing heart attacks (Guyton and Hall, 2011).

The values obtained in this present study (cholesterol, VLDL) were different from those of Alagwu (2008) and Alagwu *et al.*, (2011). While these researchers reported increase level of VLDL and decrease level of cholesterol in the test, the present study did not observe any significant differences in the values of cholesterol and VLDL in both the control and test groups. It may be because the present work was acute experiment different from those of Alagwu, (2008) and Alagwu *et al.*, (2011), whose works were chronic experiments.

The mechanism by which honey increases HDL and lowers LDL in the body has not been fully elucidated. However, Ganji *et al.*, (2003); Kamanna and Kashyap, (2008); Kamanna *et al.*, (2009), reported that the mechanism to raise HDL in the body is by decreasing the fractional catabolic rate of HDL-APO-A1 without affecting the synthetic rate of HDL.

There were no significant changes in some of the hematological parameters such as the PCV, monocytes, eosinophils, basophils. There was a significant increase in total WBC in the test group. Increase in lymphocytes and decrease in neutrophils observed in group B were not significant ($p > 0.05$). This showed that in honey-induced hemopoiesis, the myeloid series was

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stimulated first into activity compared with other cell lineages. The leukocytes (WBC) are part of the body's protective system. Lymphocytes are responsible for acquired immunity. Interpretation of altered WBC count should be made with caution. Undetected viral or bacterial infection of the experimental rats can cause changes in WBC count.

The composition of honey include: vitamins, folic acids, nicotinic acid (niacin), vitamins B6 and 12, calcium, sodium, potassium, trace elements, sugar (White,1975;Amy and Carlos,1996; Abdulwahid *et al.*,(2012).Some of these constituents are hematinics and they help in hemopoiesis. Increase in WBC observed in this study can be said to be beneficial as WBCs constitute the first line of defense in bacterial and other infections of the body.

CONCLUSION

It is therefore concluded that acute honey intake decreased LDL and increased HDL and WBC count in adult albino rats. The overall effect of honey consumption on lipid profile and WBC indices in experimental rats generally suggest a potential reduction in the risk of atherosclerotic cardiovascular diseases with good body defense. If this is applicable to man, honey may be a good remedy for the prevention and management of atherosclerosis.

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