

BILE SECRETION IN ALBINO RAT FOLLOWING CHRONIC HONEY INTAKE

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Summary: This study was carried out to evaluate the effect of honey intake on bile secretion, bile electrolytes, bilirubin and cholesterol levels including plasma cholesterol in albino rats. 20 male albino rats (200-210g) were used in the study. The rats were assigned randomly into 2 groups (control and honey-fed groups), each group containing 10 rats. The control was fed on normal rat feed and water while the test group was fed on normal rat feed with honey added to its drinking water (1ml of honey to every initial 10ml of water) for 22 weeks. After 22 weeks the animals were starved for 12hrs before the experiment, weighed and anaesthetized with sodium thiopentone (6mg/100mg body weight) intraperitoneally. The common bile duct was cannulated and bile collected for 3hrs. The rate of bile flow was noted, the concentrations of bile electrolytes and bilirubin, bile and plasma cholesterol levels were determined in the control and test groups. The results obtained showed a significant ($P < 0.05$) decrease in the rate of bile flow in the test (0.30 ± 0.03 ml/hr) compared with the control groups (0.45 ± 0.04 ml/hr). There were no significant differences in the concentration of bile electrolytes and bilirubin in the two groups. However, there was a significant ($P < 0.05$) increase in the bile cholesterol and decrease in plasma cholesterol levels in the test rats compared with the control. It is therefore concluded that chronic consumption of unprocessed Nigerian honey resulted in decrease bile flow, increase bile cholesterol and decrease plasma cholesterol in albino rats.

Key words: *Chronic consumption, honey, bile secretion, cholesterol.*

Introduction

Honey, a unique viscous liquid produced by bees from nectars of various plant products, occupied important role in the traditional medicine over 4000 years ago (Postmes *et al*, 1993). It is widely consumed all over the world including Nigeria. The value was preached by Holy Prophet Mohammed and reported by Mohammed Marmaduke Pickthall in the Holy Qur'an, 16. Ayah 68-9 and documented by Khan (1974). Lau (1976) reported that honey was listed in the first medical handbook 2000 years ago to be used in burns, cuts and abscesses. Bergman *et al* (1983) reported that honey was used by Russian soldiers in the First World War, to accelerate wound healing. Therapeutic effects and potentials of honey in modern medicine suffered a set back due to lack of systematic scientific studies. However, scientific support for its therapeutic potentials in many clinical and experimental trials is beginning to emerge as its effectiveness has been reported particularly where conventional treatment has failed, (Molan & Allen 1996). Honey is used as gastric protection against acute and chronic gastric lesions in animals and treatment in gastrointestinal disorders in humans (Mobarok and Swayeh, 2003; Salem, 1981). Following wide reports on the beneficial effects of honey particularly on the wound healing and gastric protection effects, there is paucity of reports in literature on its effects on bile secretion/flow, bile electrolytes and bilirubin, bile cholesterol and plasma cholesterol levels. The aim of this study was to find out the effect of

chronic honey intake on the rate of bile flow, bile electrolytes and bilirubin concentrations, bile cholesterol and plasma cholesterol levels.

Materials and methods

Twenty adult male albino rats (weighing between 200-210g) were used in the study. They were randomly assigned into control and honey-fed (test) groups comprising 10 in each group. The control group was fed on normal rat feed and water while the test group was fed on normal rat feed with honey added to the drinking water (1ml of honey added to every 10ml of drinking water every day) for 22 weeks. After 22 weeks, the animals were starved for 12hrs before the experiments began. Thereafter, they were weighed and anaesthetized with sodium thiopentone (6mg/100g body weight) intraperitoneally and quickly pinned to a dissecting board. Tracheotomy and laparotomy were performed and liver lobes were deflected anterolaterally to expose the common bile duct. The common bile duct was cannulated with a portex cannula (0.5mm diameter) after a semitranssection was made on the bile duct. The cannula was held in place with thread tied over it and around the bile duct. The bile was collected for 3hrs from each rat studied. The rate of bile flow was noted, the concentrations of bile electrolytes, bilirubin, bile and plasma cholesterol levels were determined in the control and test groups. Analysis was carried out using student t-test. P values less than 0.05 were considered significant.

Results

Figures 1, 2, 3, 4, 5 and 6 represent mean values of bile sodium, chloride, potassium and bicarbonate ions, bile cholesterol and total plasma cholesterol levels, rate of bile secretion/flow and total, conjugated and unconjugated bilirubin levels in the control and test groups.

The concentrations of Na^+ , K^+ , HCO_3^- and Cl^- ions in the bile of both the control and the test groups were not significantly different ($P > 0.05$ figs 1 and 2). Bile cholesterol levels were significantly increased in the test group compared with the control group ($1.46 \pm 0.04 \text{ mmol/l}$ vs $1.23 \pm 0.03 \text{ mmol/l}$, ($P < 0.01$; figure 3). Total plasma cholesterol was however, decreased significantly in the test compared with the control group ($2.30 \pm 0.5 \text{ mmol/l}$ vs $27.3 \pm 0.54 \text{ mmol/l}$ ($P < 0.01$; figure 4). Rate of bile flow was significantly reduced in the test compared with the control ($0.30 \pm 0.03 \text{ ml/hr}$ vs $0.45 \pm \text{ml/hr}$ ($P < 0.05$; figure 5). Total bilirubin, conjugated and unconjugated bilirubin concentrations in both test and control groups were not significantly different. ($P > 0.05$; figure 6).

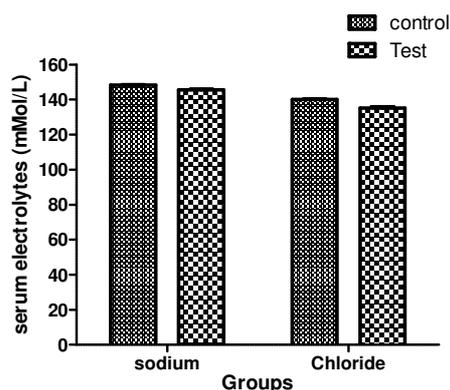


Fig. 1: Sodium and chloride ion concentration in the bile of control and test rats.

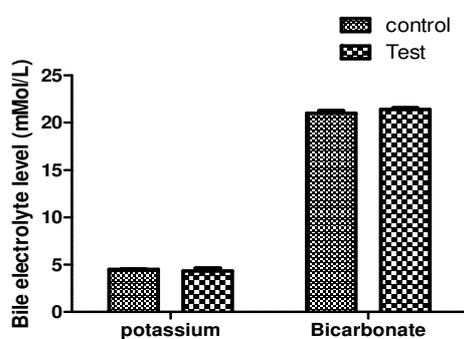


Fig. 2: Potassium and bicarbonate ions levels in bile of control and test rats.

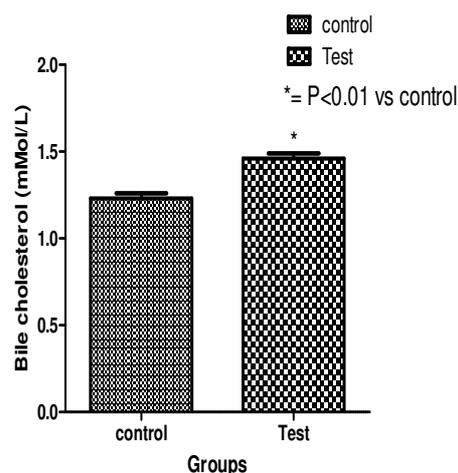


Fig. 3: Mean bile cholesterol levels in control and test rats.

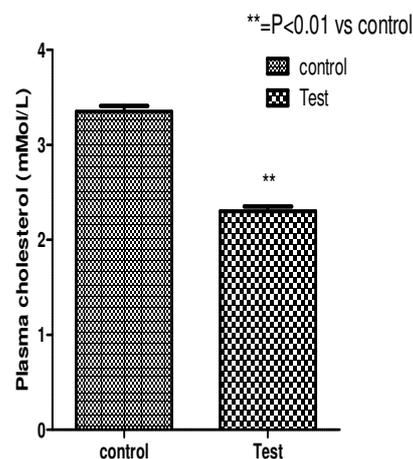


Fig. 4: Mean plasma cholesterol levels in control and test rats.

Discussion

The beneficial effects of honey on wound healings have been widely reported (Molan, 1999; Efem, 1988). There are paucity of reports in the literature on its effects on bile flow, bile electrolytes, bilirubin and bile cholesterol excretion including total plasma cholesterol levels. This study therefore, investigated the effect of honey on the above parameters using male albino rats as a model. The results obtained showed a significant decrease in the rate of bile flow in the honey-fed rats compared with the control rats. Bile electrolyte and bilirubin levels showed no significant difference in both the test and control groups. However, there was a significant increase in the bile cholesterol excretion and decrease in plasma cholesterol level in the test rats when compared with their control.

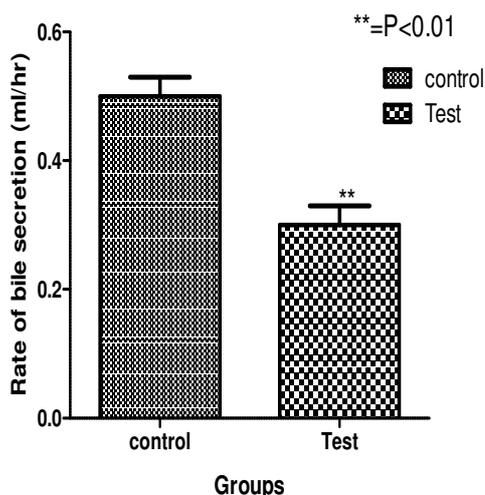


Fig. 5: Effect of honey on rate of bile secretion in rats

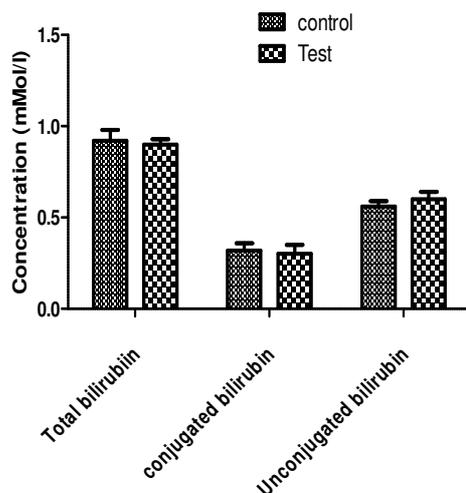


Fig. 6: Bilirubin concentrations in control and test rats

The mechanism by which honey decreased bile flow and increased bile cholesterol excretion with reduction in plasma cholesterol level in the rats is not clear. Alagwu (2008) reported that chronic honey intake caused intestinal smooth muscle relaxation and reduced intestinal transit as well as increased high density lipoproteins (HDL) in albino rats. The bile duct is composed of smooth muscle and honey intake may have caused relaxation of bile duct smooth muscles leading to a decrease rate of the bile flow. The mechanism whereby chronic

consumption of honey may lower plasma cholesterol is also unknown. However, increase plasma HDL may account for the increase bile cholesterol excretion with decrease plasma cholesterol level observed in the test group. Increased plasma HDL is reported to increase cholesterol transport from the plasma and peripheral tissues to the liver (Ganong, 2003). If the results obtained in rats are applicable to man, honey intake may be beneficial in preventing hypercholesterolemia which has been implicated in the etiology and pathogenesis of atherosclerosis, myocardial infarction and stroke (Ganong, 2003). However, further studies are necessary to confirm these beneficial effects of honey in higher animals including man. In conclusion, chronic consumption of Nigerian honey reduces the rate of bile secretion and lowers plasma cholesterol in rats.

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