# Effect of Honey Intake on Liver Enzymes and Functions

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## ABSTRACT

**Background and Objective:** honey is consumed both as food and medicine. It is used as alternative medicine to treat burns, cuts, and abscesses in ancient time. It suffered a setback in modern medicine as alternative medicine as it lacked systematic scientific studies. It gained acceptance following its effectiveness where conventional treatments failed. There is a paucity of reports on the effect of honey on liver enzymes and functions. This is aimed at investigating the effect of honey on liver enzymes and function.

**Methodology:** The animals were separated into 4 groups (n=5). Groups 1 and 2 served as control and were fed with normal rat chow and water. Groups 3 and 4 served as test groups and were fed with rat chow, water, and honey. The animals were sacrificed at the end of 20 weeks. Sera from groups 1and 3 were collected for enzymes determination while bile from groups 2 and 4 was collected after laparotomy and common bile duct cannulation under anesthesia for biochemical analyses

**Results:** showed that honey has no significant effects on liver enzymes and bile bilirubin levels (P>0.05). Bile secretion rate was significantly reduced in the test compared with control (P<0.05). Bile $Na^+$, $HCO_3$- were not significantly different while bile $K^+$, CL-were significantly reduced in the test compared with control (P<0.05). Bile cholesterol was significantly increased in the test compared with control(P<0.05) while plasma cholesterol was significantly reduced in the test compared with control(P<0.05).

**Conclusion:** It is therefore concluded that honey did not affect liver enzymes concentration, decreased rate of bile secretion, reduced bile potassium and chloride excretion, increased bile cholesterol excretion and reduced plasma cholesterol level.

## 1. Introduction:

Honey is consumed both as food and medicine all over the world including Nigeria. Its usage as an alternative medicine dates back over 4000 years ago (Postmes,1993). It was listed in the first-hand book of medicine 2000 years ago to be used in burns, cuts, and abscesses (Lau,1976). Honey was used to treat Russian soldiers during the first world war (Bergman et al., 1983). As an alternative medicine, it suffered a setback as it lacked systematic scientific studies. Its clinical and experimental trials emerged as its effectiveness was reported where conventional treatment failed. Its beneficial effects in wound healing, infantile gastroenteritis, gastric cytoprotection and others. There is a paucity of reports on its effect on liver enzymes and function. Therefore, is aimed at investigating the effect of honey intake on liver enzymes and function since the liver plays an important and essential role in everyday life.

## 2. Methodology:

20 male Albino rats weighing between 99 to 107g were assigned randomly into 4 groups of 5 rats each and housed in plastic cages. The control groups (1 and 2) were fed with rat chow and water ad libitum while the test groups (3 and 4) were fed with rat chow, water, and honey (1ml of honey added to initial 10ml of its drinking water daily) for 20 weeks. At the end of the study, the rats were starved overnight, groups 1and 3 were sacrificed by decapitation and blood (sera) collected in the test tubes and stored in a refrigerator at a temperature of 15 degrees Celsius. Rats in groups 2 (control) and 4 (test) were anesthetized with

thiopentone sodium intraperitoneal (6mg/mg body weight) and pinned to dissecting board, tracheostomy performed to ease breathing, followed by laparotomy. The liver was identified and its lobes deflected anterolaterally. The common bile duct was identified and cannulated using portex cannula (0.05mm diameter) after the small transverse incision was made on the bile duct. The cannula was held in place with a thread tied over and around the bile duct and bile collected at 3 hours interval. The rate of bile secretion was determined per hour. Sera and bile collected were sent to the Chemical Pathology laboratory of Imo State University Teaching Hospital, Orlu, Imo State, Nigeria for Liver enzymes estimation and biochemical analysis. Enzymes estimated include alkaline phosphatase (ALP), aspartate aminotransferase (AST) and alanine aminotransferase (ALP). Biochemical composition analyzed include bile electrolytes, total, conjugated and unconjugated bilirubin, bile and plasma cholesterols levels.

2.1. Statistical Analysis

Student's unpaired t-test was used to compare data. Chi-square test was used to test significance between the data. The data were presented as "Mean ± SEM". P-value < 0.05 was considered significant.

# 3. Results:

Table I: *Showed Liver Enzymes Concentrations in The Test (A3) and Control (A1) Groups (IU/L)*

| Parameters | Control (1) (n=5) | Test (3) (n=5) | p-value |
|---|---|---|---|
| ALP(IU/L) | 192.40±0.30 | 189.50±0.39 | NS |
| AST(IU/L) | 90.12±0.26 | 89.51±0.21 | NS |
| ALT(IU/L) | 84.25±0.12 | 83.15±0.26 | NS |

NS=not significant vs control

Table 1, showed the values of liver enzymes levels for the test (ALP = 189.50 ± 0.39, AST = 80.51 ± 0.21, ALT = 83.15 ± 0.26) and control group (ALP = 192.40 ± 0.30, AST = 90.12 ± 0.26, ALT = 84.25 ± 0.12). There is no significant difference between the test and control groups (P>0.05).

Table II Showed bile secretion in the test group (0.30±0.03ml/hr.) and the control group (0.40±0.04). The test was significantly reduced when compared with the control group (P<0.05). Sodium and bicarbonate ions concentrations in the control and test groups (159.99 and 148.60 respectively) were not statistically significant (P>0.05). Potassium and Chloride ions in the control and test groups were statistically significant (P<0.05).

Total, conjugated and unconjugated bilirubin were not statistically significant when the test and the control groups were compared. Bile cholesterol levels in the test were significantly higher compared to the control group (p<0.05) as the test was 1.46±0.04mmol/L and the control group was 1.25±0.03mmol/L. Plasma cholesterol levels in the test and control groups were 2.30±0.05 and 3.20±0.06

respectively. This was statistically significant when the test was compared with control (P<0.05).

Table II: *Showed Rate of Bile Secretion, Bile Electrolytes, Total Conjugated, and Unconjugated Bilirubin, Bile and Plasma Cholesterols Levels in The Control (2) and Test (4) Groups.*

| Parameters | Control (2) (n=5) | Test (4) (n=5) | p-value |
|---|---|---|---|
| Rate of bile secretion (ml/hr.) | 0.40±0.04 | 0.30±0.03 | ** |
| Na$^+$ (mmol/L) | 150.00±0.62 | 148.60±0.06 | NS |
| K$^+$ (mmol/L) | 6.50±0.23 | 5.90±0.06 | ** |
| Cl$^-$ (mmol/L) | 139.20±0.78 | 124.00±0.06 | ** |
| HCO$_3$ (mmol/L) | 22.10±0.50 | 23.60±0.35 | NS |
| Total Bilirubin (mmol/L) | 0.92±0.05 | 0.90±0.02 | NS |
| Bilirubin (conju) (mmol/L) | 0.32±0.01 | 0.30±0.02 | NS |
| Bilirubin (unconju) (mmol/L) | 0.56±0.06 | 0.60±0.03 | NS |
| Bile cholesterol (mmol/L) | 1.23±0.03 | 1.46±0.04 | ** |
| Plasma cholesterol) (mmol/L) | 3.20±0.06 | 2.20±0.05 | ** |

NS = not significant vs control, **=P<0.05,    Values are Mean ± SEM.

# 4. Discussions:

The study investigated the effect of unprocessed Nigerian honey on liver enzymes and functions, bile secretion and its biochemical compositions in albino rats. The result obtained showed no significant difference in the levels of liver enzymes and bilirubin in the test and control groups (P>0.05). This finding is anticipated since derangement in liver enzymes may potent danger to the body. There was a significant reduction in the rate of bile secretion in the test compared with control groups (P<0.05). This showed that honey has an inhibitory effect on the common bile duct as reported by Osim et al. (2009).

Alagwu et al. (2013, 2016) also reported that honey caused gastrointestinal tract inhibition as well as decreased intestinal transit in honey-fed rats. Since the walls of the small intestine and bile duct are made up of smooth muscles, this suggests that honey inhibited the common bile duct thereby caused a decreasing rate of bile flow. Analysis of the biochemical composition of bile showed that Na$^+$ and HCO$_3^-$ ions were not significantly different in the test and control groups (P>0.05), however, bile potassium and chloride ions were significantly reduced in the test when compared with control group (P<0.05). This showed that honey may reduce excretion of some electrolytes in the body. There was a significant increase in bile cholesterol in the test group compared with control group(P<0.05), however, plasma cholesterol in the test was significantly reduced when compared with control group(P<0.05). This agreed with the findings of Alagwu et

al. (2011a, 2011b), who reported that honey decreased plasma cholesterol in honey-fed rats. This suggests that honey helps in the excretion of cholesterol and through this way regulates body store of cholesterol.

Since hypercholesterolemia is implicated in the pathogenesis of atherosclerosis, which is a forerunner of stroke, honey intake may be beneficial in the prevention of hypercholesterolemia.

## 5. Conclusion:

It is therefore concluded that honey has no effect on the liver enzymes, decreased rate of bile secretion reduced excretion of some electrolytes in the body and increased cholesterol excretion. Since honey reduced plasma cholesterol, if this is applicable to man, it could be said that honey may be beneficial in the management and prevention of atherosclerosis in man.

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