Effect of green tea aqueous extract on body weight and biochemical parameters of male mice.

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Abstract

Green tea aqueous extract effects have been studied on body weight and some biochemical parameters of mice by using 24 adult male mice divided into three groups, one group received 0.1 ml of distilled water intraperitoneally as a control group while the two treated groups were (I.P) injected the green tea extract (1.25, 2.5 mg / gm respectively) as a treatment groups for four weeks.

Biochemical parameters (GOT, GPT, total serum cholesterol, LDL) showed significant decrease (P<0.01). while HDL showed significant increase when compared with control group.

The results indicated a significant decrease (P<0.01) in body weight of male mice treated with green tea compared with control group.
Introduction

Tea is one of the most widely consumed beverages in the world today. The tea plant (*Camellia sinensis*) is the member of the Theaceae family, native to eastern Asia with an evergreen shrub or tree and can grow to heights of 30 feet \(^1\). The leaves are dark green alternate oval and appear in clusters or singly shape, which produced from steaming fresh leaves at high temperatures in activating the oxidizing enzymes and leaving the polyphenol content intact \(^2\). Several chemical constituents of green tea have been identified, the most abundant components of green tea are polyphenols such as (gallic acid, catechin, gallocatechin, epicatechin, and epigallocatechin) while fresh leaves contain 3-4% caffeine, theobromine (0.15-20%) theophylline (0.02-0.04%) and other methylxanthine \(^3\).

Studies of green tea extract in vitro showed that green tea increased both LDL receptor binding and protein, and increased the conversion of the sterol-regulated elements binding protein \(^4\). While herbalists use green tea and extracts of its leaves for stomach problems, vomiting, diarrhea, and also to reduce blood pressure and cholesterol levels \(^5\). Some researchers believed that green tea may have protective effects against certain cancers because it contain antioxidants \(^6\).

In animals studies revealed that green tea may protect liver and brain cells from oxidative stress in rat \(^7\). Other study suggested that green tea extract lowered body weight significantly when compared with control groups \(^8\). Hesham (2005) showed that oral
administration of rats with green tea for four weeks caused a significant decrease in the levels of total serum cholesterol, GOT, GPT \(^{(9)}\). Epidemiological evidence and animal experiments suggest that green tea extract may help to reduce both total serum cholesterol, LDL, total triglycerol accumulation, and reducing blood glucose content during one month \(^{(10,11,12)}\).

Green tea also reduced oxidative stress including decreased oxidative DNA damage, lipid peroxidation, and reduced urine levels of free radicals, also it can lower the risk of the cardiovascular disease \(^{(13)}\), and pronounced anti platelet activity by reducing aggregation and decreasing blood pressure \(^{(14)}\). Also the activity of green tea as antioxidant was investigated by preventing lipid peroxidation and reducing cholesterol activity in animals after oral treatment for 28 days \(^{(15)}\).

The aim of this study is to investigate the effect of green tea aqueous extract on body weight and some biochemical parameters of male mice.

Materials and Methods

**Green tea extract** :-

The green tea extract was made by soaking 15 gm of green tea powder in 1 liter of boiling distilled water for five mints, the solution filtered to make an effective dose, then this solution was provided to mice intraperitonally \(^{(16)}\).

**Animals** :-

Twenty four adult male mice (\textit{Mus Musculus}) weighting (22-25 gm) were used as experimental animals in this study. The animals were brought from
the education collage (biology department , university of Basrah). They were kept in cages under standard 
libratory condition of 12 h / 12 h light / dark with free 
access to food and water.

Experimental protocol :-

The mice were divided randomly into three groups (8 for each group) and weighted before and after 
experiment with same sensitive balance . Control group 
injected intraperitonally with 0.1 ml distill water , while 
the two treated groups received green tea extract 
intraperitonally (1.25 , 2.5 mg/ gm respectively) for four 
weeks .
At the end of the experiment the results was recorded as 
a data to be analyzed , then animals are scarified and 
blood samples were collected from the heart to 
centrifuge tube and stored until assesed.

Biochemical parameters :-

Blood sample in a special tubs centrifuged for (15 
min at 3500 rpm) to obtain a serum , the serum was 
analyzed for measuring of total serum cholesterol , LDL 
, HDL , GOT , and GPT , by using a kit from (biocon 
Germany) and results were read by a different waves of 
a spectrophotometers (17).

Statistical analysis

Data are expressed as mean ± SD and analyzed by 
using SPSS version 9. The difference between control 
group and each of treatment groups were determined by 
revised least significant difference (RLSD) and the level
of (p<0.01) was used as the criterion of the statistically significant.

Results

In (table 1) the group treated with (2.5 mg green tea extract) shows a significant decrease in body weight (P < 0.01) relative to control group, while the treatment of male mice with green tea appeared no significant in biochemical parameters in group treated with (1.25 mg green tea extract) compared with control group and significant decrease (P < 0.01) in GOT,GPT,LDL and total serum cholesterol in animals treated (2.5 mg green tea extract) compared with control group, while HDL increased significantly (P < 0.01) in one treatments group relative to control group (table 2).

Table 1: The effect of green tea extract (1.25 and 2.5 mg/gm) on body weight.

<table>
<thead>
<tr>
<th>Treatment mg / gm</th>
<th>Body weight gm</th>
</tr>
</thead>
<tbody>
<tr>
<td>control</td>
<td>24.50 ±1.73</td>
</tr>
<tr>
<td>Extract 1.25 mg</td>
<td>21.21 ±0.88</td>
</tr>
<tr>
<td>Extract 2.5 mg</td>
<td>19.42 * ±1.62</td>
</tr>
</tbody>
</table>
Table 2: The effect of green tea extract (1.25 and 2.5 mg/gm) on biochemical parameters

<table>
<thead>
<tr>
<th>Treatment mg/gm</th>
<th>GOT IU/L</th>
<th>GPT IU/L</th>
<th>LDL Mg/dl</th>
<th>T.S. cholesterol Mg/dl</th>
<th>HDL Mg/dl</th>
</tr>
</thead>
<tbody>
<tr>
<td>control</td>
<td>48.41 ±0.4</td>
<td>16.84 ±0.65</td>
<td>66.29 ±0.87</td>
<td>168.5 ±1.80</td>
<td>85.11 ±0.11</td>
</tr>
<tr>
<td>Extract 1.25 mg</td>
<td>40.51 ±0.8</td>
<td>15.33 ±0.77</td>
<td>56.38 ±1.05</td>
<td>155.7 ±0.91</td>
<td>95.76 ±0.32</td>
</tr>
<tr>
<td>Extract 2.5 mg</td>
<td>31.75 ±1.8</td>
<td>12.92 ±0.55</td>
<td>50.24 ±1.36</td>
<td>139.9 ±1.09</td>
<td>105.81 ±0.22</td>
</tr>
</tbody>
</table>

* significant (P < 0.01) in (RLSD) tests.

Discussion:

The pharmacological action of green tea is modified by the interaction with polyphenols that promoting liver metabolism and gastro-intestinal secretion (18). The significant decrease in lipid profile may be due to presence of flavinoids in green tea extract that will inhibit the oxidation of LDL and cholesterol in vitro (19). Increased consumption of green tea was associated with...
decreased serum concentration of total cholesterol and triglyceride, and an increased proportion of high density lipoprotein together with a decreased proportion of lipoprotein cholesterol \(^{(20)}\). In addition green tea extract contains an active polyphenols oxidize which catalyze the aerobic oxidation of the catechins when the leaf cells structures is disrupted during green tea manufacture \(^{(21)}\). Other studies on mice showed after intraperitoneal injection of green tea extract, the total serum cholesterol and other lipid enzymes decreased by suppressed fatty accumulation and body weight \(^{(22)}\). The lower cholesterol and other lipid profiles affected on activities of lipid metabolizing enzymes by significant lower the serum cholesterol and bile acids \(^{(23)}\). Also green tea extract have ability to lowers cholesterol by increasing fecal lipid excretion and may reduce levels of GOT, GPT, LDL by oxidation of plasma lipid peroxidase \(^{(24,25)}\). Acute body weight loss occurs in male and female rats after injection green tea extract within four weeks and significantly reduced or prevented an increase was reversible that animals regained the lost body weight and affected on food intake reduction was independent of an intact leptin receptor may interact specifically with a component of the control pathway or healthy animals did not received green tea extract \(^{(26,27)}\). Other studies indicate that green tea extract can lowers serum cholesterol, LDL, GOT, GPT and increase HDL during treatment periods \(^{(28)}\). The long term consumption of green tea extract may decrease the incidence of obesity, serum lipid profile and fat oxidation \(^{(29)}\). Some studies suggested that green tea extract reducing activity of cholesterol and lipid oxidation in rats by significant hypolipidemic action of polyphenols and catechins that will be responsible for the observed effects and reducing
the cholesterol and LDL, and relative increase LDH \(^{(30,31)}\). The mechanism of action of green tea have been reviewed in several publication, some suggested effects on lipid profile enhances expression of intracellular endogenous antioxidant such as glutathione, glutathione reductase, glutathione peroxidase and quinine reductase \(^{(32)}\). Other researcher pointed that some of the catechins delivered to the gut can be glucuronidated by the glucuronosyl transferase in the mucosa of the intestine \(^{(33)}\). After absorption, the catechins are widely distributed in all body tissue with the highest concentration found in the intestine and colon, then high levels of green tea polyphenols can be reached in the body and losing gradually of body weight \(^{(34,35)}\). Some studies showed that polyphenols and catechins make process in the body leads to release of iron ions, these ions become more reactive in liver and participate in generation of hydroxyl radicals which are the most active reactive oxygen species and they react readily with most cellular component \(^{(36,37)}\).

In conclusion, green tea extract (polyphenols, catechins) have beneficial effects on lipid peroxidation and improve antioxidant activity and can lower body weight in male mice \((Mus musculus L.)\).
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Reference:-


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تأثير المستخلص المائي للشاي الأخضر في وزن الجسم وبعض المعايير الكيميائية لذكور الفئران المختبرية

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الخلاصة:
درس تأثير المستخلص المائي للشاي الأخضر في وزن الجسم وبعض المعايير الكيميائية لذكور الفئران المختبرية.
تم استخدام 24 من ذكور الفئران البيضاء قسمت إلى ثلاثة مجامع متساوية احتوت كل مجموعة على ثمانية فئران.
أعطيت المجموعة الأولى ما مقداره 0.1 مل من الماء المقطر في الخب لكل حيوان يوميا لمدة أربعة أسابيع واعتبرت مجموعة سيطرة. أما المجموعتين الثانية والثالثة فأعطيت جرع 1.25 و 2.5 ملغ/جم من وزن الجسم على التوالي من المستخلص المائي للشاي الأخضر في الخب لكل فار يوميا لنفس المدة أعلاه.
أظهرت النتائج انخفاض معنوي في المعايير الكيميائية للكولسترول الكلي، GOT، GPT، LDL، و HDL، بينما وجدت زيادة معنوية في قيمة مقارنة مجموعة السيطرة عند P<0.01. دللت النتائج أيضا على وجود انخفاضا معنوي في وزن الجسم للمجامع المعاملة بالشاي الأخضر مقارنة بمجموعة السيطرة.