



## Effect of aqueous extract of *Agaricus bisporus* on lipid profile of female albino mice treated with peroxide

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### Abstract

*Agaricus bisporus* is cultivated edible mushroom . This study is made to evaluate the activity of *A. bisporus* extract on lipid profile in mice treated with peroxide. 40 females albino mice were chosen and divided into 4 groups (ten mice per each group). The first group was treated with normal saline as a control, the second group received 2ml/kg body weight of peroxide , While the third set received 2ml/kg body weight of peroxide plus 25 mg/ml *A bisporus* .Besides, the last fourth group received 25 mg/ml of *A. bisporus*. The Results have showed a significant increase ( $p \leq 0.05$ ) in cholesterol(CH) in group 2 ( $250.01 \pm 1.05$ ) and group3 ( $204.25 \pm 1.80$ ), while there was no significant decrease in CH level of group 4 ( $170.01 \pm 2.01$ ) as compared with control group ( $184.00 \pm 1.02$ ). As well, there was a significant increase in Low Density Lipoprotein (LDL) in group 2 ( $159.23 \pm 0.9$ ) and group 3 ( $158.32 \pm 2.00$ ), while there was a significant decrease ( $110.95 \pm 1.3$ ) in the level of this parameter in group 4 as compared with the control group ( $115.98 \pm 2.2$ ). Moreover, there was a significant differences in the levels High Density Lipoprotein (HDL), Very Low Density Lipoprotein (VLDL) Triglyceride and in all treated groups compared with the control group.

**Keywords:** *Agaricus bisporus* .lipid profile ,mice ,peroxide

## تأثير المستخلص المائي ل *Agaricus bisporus* على بيانات الدهون الثلاثية في اناث الفئران البيض المعاملة بالبيروكسيد

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### الخلاصة

*Agaricus bisporus* من العرايين المزروعة الصالحة للأكل . صممت هذه الدراسة لتقييم فعالية مستخلص *A. bisporus* على بيانات الدهون الثلاثية في الفئران المعاملة بالبيروكسيد . في هذه الدراسة تم اختيار 40 انثى بالغه من الفئران البيض قسمت الى اربع مجاميع (10 فئران للمجموعة الواحدة)، المجموعة الاولى عوملت بالمحلول الفسيولوجي كسيطرة ،المجموعة الثانية اعطيت (2مل/ كغم من وزن الجسم) من البيروكسيد .فيما اعطيت المجموعة الثالثة 2مل/ كغم من وزن الجسم بيروكسيد و 25 ملغم /مل مستخلص فطري . والمجموعة الرابعة الاخيرة عوملت ب 25 ملغم /مل مستخلص فطري . اظهرت النتائج زيادة معنوية ( $p \leq 0.05$ ) في cholesterol (CH) في المجموعة الثانية ( $250.01 \pm 1.05$ ) والثالثة ( $204.25 \pm 1.80$ ) ،بينما لا يوجد انخفاض معنوي في مستوى cholesterol ( $170.01 \pm 2.01$ ) في المجموعة الرابعة مقارنة بمجموعة السيطرة . ( $184.00 \pm 1.02$ ). كذلك هناك زيادة معنوية في Low Density Lipoprotein (LDL) ( $159.23 \pm 0.9$ ) في المجموعة الثانية والمجموعة الثالثة

(158.32±2.00)، بينما هناك انخفاض معنوي في مستوى هذه المعاملات في المجموعة الرابعة (110.95±1.3) مقارنة بمجموعة السيطرة. (115.98±2.2)، وعلاوة على ذلك هناك اختلافات معنوية في مستوى Very Low Density Lipoprotein (VLDL) Triglyceride(TG) High Density Lipoprotein (HDL) في كل المعاملات مقارنة بمجموعة السيطرة.

## Introduction

One of most common toxicants used in vivo and in vitro studies is hydrogen Peroxide (CCl<sub>4</sub>) [1]. during the metabolism of CCl<sub>4</sub>, free radicals are produced which may be responsible for toxicity [2]. Hydrogen peroxide leads to increase in lipid profile due to decrease in amount of antioxidant enzymes and increase in Reactive oxygen species (ROS) production [3].

A research in 2013 showed the benefit of replacing mushrooms instead of red meat in daily meal which leads to weight loss, hypotension and decrease lipid [4]. One of most common button and edible mushrooms is *A. bisporus*, because of its nutritional and medical value, it becomes a common food in daily meals. *A. bisporus* extracts have a high amount of fibers, proteins, minerals and vitamins [5]. *Agaricus*, *Pleurotus* spp. and *Flammulina velutipes* contain good quality of moderate amount of protein and they are good sources of minerals, dietary fiber, vitamin, B, C and E vitamin. [6]

Aline *et al.*, 2017 revealed that mushrooms act as lipid-lowering agents in spite of that little is known about the mechanisms of action of *A. bisporus* [7]. This study aims to detect the lowering effects of *A. bisporus* in the serum lipid profiles and cholesterol.

## Material and methods:

### Preparation of aqueous extract of *Agaricus bisporus*

*Agaricus bisporus* was obtained from college of agriculture university of Tikrit. The aqueous extract of this mushroom was obtained as follows:

- \*Mushroom was dried by oven at 115 - 120 F° and grinded into powder
- \* 1 gm of the obtained powder had dissolved in 10 ml of water.
- \*The obtained solution boiled in 60C° for 30 min. and then let covered for other 30 min.
- \*Precipitant was discarded by filtration through gauze for 30min.
- \*Then, the supernatant had centrifuged at 4 C° for 10000 rpm..
- \*Next, supernatant was filtered through filter paper.
- \* using freeze dryer, a freeze dried extract powder had got and then, it stored at 4 C° [8].

### Experimental animal

Forty adult female albino mice weighted 30-35 gm. were used in this work. , All animals were housed at standard laboratory condition of a 12 h/12 h light-dark cycle and had free access *ad libitum* at room temperature (22 °C – 25 °C).

### Experimental design:

Animals were left for 10 days for acclimation ,then they divided in to four groups randomly (10 mice per each group) . The study lasted for 30 days. All groups were dosed as following

- \* **The first group** received a daily oral dose of Normal saline as a control group
- \* **The second group** Treated daily orally with 2ml/kg body weight of peroxide per day with drinking water
- \* **The third group** treated orally with aqueous extract of (25) mg/ml per day of *A. bisporus* by gavage tube plus 2ml/kg body weight of peroxide which was put in drinking water.
- \* **The fourth group** Treated orally with water aqueous extract (25) mg/ml per day of *A. bisporus*

After 30 days of treatment, Blood samples were taken by heart puncture, serum was obtained from each sample and laded in Eppendroffe tube for lipid profile tests

### Biochemical tests

By using standard kits of biomereieux kit, France. lipid profile was determined, which includes: total cholesterol (CH), triglyceride (TG), high density lipoprotein (HDL), low density lipoprotein (LDL), very low density lipoprotein ( VLDL ).

### Statistical analysis

By using SPSS software, data was analyzed with analysis of variance. The significant level was at (P 0.05). variables expressed as mean± SE [9]

## Results and discussion

Table-1 showed that there was a significant increase ( $p \leq 0.05$ ) in Cholesterol level in group 2 ( $250.01 \pm 1.05$ ) and group3 ( $204.25 \pm 1.80$ ) compared with the control group ( $184.00 \pm 1.02$ ). while there was no significant decrease in cholesterol level of group 4 ( $170.01 \pm 2.01$ ).

**Table 1-** Levels of lipid profile parameters in mice with different treatments

| parameters<br>Groups | CH                | TG               | HDL              | LDL               | VLDL           |
|----------------------|-------------------|------------------|------------------|-------------------|----------------|
| <b>Croup 1</b>       | 184.00± 1.02<br>c | 130.40±2.03<br>c | 40.20±0.98<br>c  | 115.98±2.2<br>c   | 25.20±0.6<br>d |
| <b>Group2</b>        | 250.01± 1.05<br>a | 244.02±0.1<br>a  | 50.33±0.95<br>a  | 159.23±0.9<br>a   | 49.25±0.1<br>a |
| <b>Group 3</b>       | 204.25±1.80<br>b  | 230.49±2.05<br>b | 42.01±1.11<br>b  | 158.32±2.00<br>bd | 42.82±0.3<br>b |
| Group 4              | 170.01±2.01<br>c  | 120.00±2.45<br>d | 32.00± 1.00<br>c | 110.95±1.3<br>d   | 26.30±0.5<br>c |

Differences a, b ,c are significant ( $p \leq 0.05$ ) to compare between columns while there was non significant ( $p \leq 0.05$ ) differences between the same letters.

Also there were significant differences in the High Density Lipoprotein ,Very Low Density Lipoprotein and Triglyceride and in all treated groups compared with the control group. While there was a significant increase in Low Density Lipoprotein (LDL) in group 2 compared with the control group in spite of there was a significant decrease in group 4 compared with the control group, but there were no significant differences between group 3 & group 4.

This study is trying to study the effect of *A. bisporus* on serum lipid profile after treatment with peroxide because of increasing fat consumption nowadays (obesity) is correlated to increased mortality cause by Cardiovascular diseases (CVD)[10]

The significant increase in Triglyceride ,Cholesterol, , HDL, LDL and VLDL in group 2 and group 3 is due to peroxide treatment which produces free radicals that are capable of making a damage in nucleus, cell membrane , and lipid profile including proteins, lipids and nucleic acids [11].

Lipid peroxidation is the essential molecular mechanisms involved in the toxicity process and oxidative damage that leads to cell death .Other studies define lipid peroxidation as the successive exposure to toxic metabolites (e.g.  $CCl_4$ ) that form reactive oxygen species (ROS) leads to cellular injury and disruption of the intracellular membranes [12]. Lipid peroxidation include three essential steps: initiation, propagation, and termination[13].

In the first step, a non stable molecule of a fatty acid radical formed. Then, it binds to molecular oxygen to form non stable peroxy-fatty acid radical which reacts with another free fatty acid, forming a different lipid peroxide and fatty acid radical in the second Step. While in the third step two radicals react and produce a non-radical species ,so the radical reaction is stopped [14].

The results also showed significant decreases in all types of serum lipid after treatment with *A. bisporus*, this may due to antioxidant activity which protects the cell from the damage of free radicals[15].

Palacios *et al.*, 2011demonstrated that *A. bisporus* contains high levels of dietary fibers and antioxidants including zinc, selenium ,copper ,vitamins (B12, C, D, and E), as well as polyphenols and folates which decrease the concentrations of cholesterol (C) ,low-density lipoprotein (LDL) and triglyceride (TG) [16] .Moreover, the phenolic compound in *Agaricus* inhibits lipid profile [17].

Vitamin C has protective role against lipid peroxidation because it has hydrophilic properties by neutralizing ROS before lipid peroxidation .Moreover, Flavonoids in *A bisporus* have the ability to get rid from free radicals since it protects LDL from being increased [18-19].

In the cell membrane, vit. E protects membrane fatty acids from lipid peroxidation, and LDL from oxidative attack because its capability to be soluble in lipid. Vitamin C can renew vit. E. And thus it functions as antioxidant [20-21].

Recent studies revealed that crude extracts of mushroom or isolated compounds that have potential anti-atherosclerotic effects through exhibited anti-oxidative, anti-inflammatory and hypolipidemic effects. Thus, it has the ability of decreasing the health hazards induced by obesity, hyperlipidemic and hypertension.[22].

**Conclusion:** *Agaricus bisporus* extract possesses the ability to decrease serum lipid profile in mice exposed to peroxidation.

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