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Potency of *Allium sativum* and *Allium cepa* Oils against *Schistosoma mansoni* Infection in Mice

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Abstract:

Introduction: It has been reported that garlic (*Allium sativum*) and onion (*Allium cepa*) are used all over the world in different diseases, such as infections, injuries, gastrointestinal dysfunctions and cardiovascular diseases. Therefore, our aim in this work was to study the ability of garlic and onion oils to offset the infectivity as well as the metabolic disturbances induced by *Schistosoma mansoni* parasitism.

Methods: The two current drugs were given in a dosage of 5ml / kg body weight/ day. Three aspects of drug action were investigated, the effect on *S. mansoni* infection, the effect on liver functions, and on liver metabolism. The parasitological investigation included worm burden and ova count.

Results: Serum biochemical analysis of infected mice revealed a significant increase in the levels of aspartate aminotransferase (AST), alanine aminotransferase (ALT) , γ – glutamyltransferase (GGT) , alkaline phosphatase (ALP), acid phosphatase (AP), while a decrease in glucose, total lipids total cholesterol, high - and low- density lipoproteins cholesterol (HDL and LDL), triglycerides, total proteins and albumin was observed. Liver tissue analysis of infected animals showed a marked increase in L- hydroxyproline (HP) concentration and xanthine oxidase (XO) activity accompanied with a reduction in total adenosinetriphosphatase (ATPase) and phosphofructokinase (PFK) enzymatic activities. Treatment with either garlic or onion oils greatly normalized liver function enzymes and variably improved the other parameters with a noticeable reduction in worm burden and ova count.

Conclusions: It could be concluded that garlic or onion may play a role against the metabolic disturbances caused by *S. mansoni* infection, owing to an effect which may be induced by improving the immunological host system and their antioxidant activities.

Key words*: A. sativum – A. cepa – S. mansoni* – Worm burden – Ova count – Serum analysis – liver analysis.

Introduction

Schistosoma mansoni, a helminthic parasite, that causes human bilharziasis, settles in the mesenteric veins of the gut, its eggs migrate to the liver where they induce a delayed hypersensitivity response. In schistosomiasis, morbidity and mortality are due to a unique form of liver fibrosis followed by portal hypertension as the main complication. The egg cuticle, composed of cross – linked proteins, encloses a larva that releases enzymes and antigens through multiple pores. The host reaction presumably involves reactive oxygen species (ROS) (Caulfield *et al*., 1985). The production of ROS initiates a fibrogenesis cascade in the liver (Casini *et al.*, 1997). In the chronic phase of infection, liver fibrosis and its confluences can eventually lead to death.

Current control of the disease by chemotherapeutic agents is impractical because of the common occurrence of re – infection after treatment due to relative resistance of the larval stages of *S.mansoni* to schistosomicide drugs (Silva *et al.*, 2003). Praziquantel, the currently used drug for chemotherapeutic control, was reported to induce hemorrhage in the lung tissue of the host (Flisser &Mclaren, 1989) as well as abdominal pain and diarrhea (Kabatereine *et al*., 2003). So for combating

schistosomiasis there is an urgent need to develop new drug alternative to praziquantel. The new trends nowadays are the use of natural plant extracts as new, safe and effective drugs.

Garlic (*A. sativum* Linn.) which is widely used as a food or condiment has been known since ancient times as a flavoring agent and for its medicinal properties. The major volatile compounds of garlic are sulfur- containing compounds (Yu *et al.*, 1989). In addition , it has been reported that garlic oils inhibit tumor promotion (Karasaki *et al* ., 2001) , it has different applications as antimicrobial (Yoshida *et al.*, 1998) antithrombotic , antiarthritic , hypolipidemic , and hypoglycemic agent (Duraka *et al*., 2002 ; Kumar *et al*., 2003) . Moreover, Ghazanfari *et al*. (2002) and Hassan *et al.* (2003) demonstrated that garlic enhanced T lymphocyte proliferation, delayed type hypersensitivity and natural killer (NK) cell activity. Recently, Ghazanfari *et al*. (2006) reported that garlic is used all over the world in different diseases, such as infections, cancers, injuries, gastrointestinal dysfunctions and cardiovascular diseases.

Onion (*A. cepa* Linn.) is a plant of particular medicinal importance; it is used as traditional remedy in the treatment of various disorders (Griffiths *et al*., 2002). Several authors have reported pharmaceutical effects of extracts of *A. cepa* including antitumor, antidiabetic, antioxidant, antimicrobial, antiallergic and molluscicidal activities (Belman , 1983 ; Kumari *et al* ., 1995 ; Helen *et al* ., 2000 ; Mantawy &Mahmoud, 2002). Saleheen *et al*.(2004) reported that aqueous onion extract has an antileishmanial activity, suggesting that onion has an antiparasitic activity.

In view of these findings, the present study was undertaken to determine the possible antischistosomal effects of the expressed oils of *A. sativum* and *A. cepa* in *S. mansoni* infected mice. This was conducted through measuring some biochemical parameters in both serum and liver tissues. Serum parameters include, AST, ALT, GGT, ALP, AP, glucose, total lipids, total cholesterol, HDL, LDL, triglycerides, total proteins and albumin. The effect on liver tissue was evaluated by measuring L– hydroxyproline concentration XO, total ATPase and PFK enzymatic activities. Parasitological studies namely, worm burden and ova count will be taken into consideration.

Material and Methods

Chemicals:

All chemicals used in the present study were of analytical grade, products of Sigma (USA), Merck (Germany) BDH (England).

Animals:

Sixty female Swiss albino mice aging 6-8 weeks and weighing 18-20 g were obtained from the Animal House of the National Research Center. Mice were provided with balanced commercial pellet diet and water ad libitum during the study.

Experimental design:

Animals were divided into six groups, each group of 10 mice. Group 1: served as healthy control. Group 2: served as a healthy control given garlic oil. Group 3: served as a healthy control given onion oil. Group 4: infected with *S. mansoni*. Group 5: infected with *S. mansoni* and treated with garlic oil after 24 hr post infection. Group 6: infected with *S. mansoni* and treated with onion oil after 24 hr post infection. Garlic or onion oils were given in a dosage of 5ml / Kg body weight orally for 8 weeks daily.

Infection:

Each mouse in the infected groups was exposed separately to 80 cercariae for 1h, using the partial immersion technique (Oliver & Stirewalt, 1952). Cercarial suspensions were obtained from at least 15 *Biomphalaria alexandrina* snails infected with the local strain of *S. mansoni* prevailing in Egypt. All groups were examined 8 weeks after infection.

Worm counting:

Worms were recovered from the hepatic portal system and liver by a perfusion technique previously described

by Smithers &Terry (1965). The percent of reduction in worm number after challenge was calculated by the method of Tendler *et al*. (1986) as follows : P = C – V/C × 100 where P = % of protection , C= mean number of parasites recovered from infected animals, V= mean number of parasites recovered from treated animals .

Ova count:

The number of ova / g tissue was counted by the method of Cheever &Anderson (1971), where:
Number of ova = Number of ova in 5 ml KOH / weight of liver in grams recorded before digestion in KOH

Preparation of tissue homogenates and blood samples:

Liver tissue was homogenized in bidistilled water in a ratio of 1:10 W/V for estimation of enzymes under investigation. Blood samples were collected from the reto –orbital venous pleux using capillary tubes. Serum samples were separated by centrifuging at 3000 rpm for 10 minutes. Non hemolysed sera were used for estimation of the relevant biochemical parameters.

Parameter assays:

A – Serum analyses:

AST and ALT were estimated according to the method described by Bergmeyer *et al*. (1986) , GGT was determined according to Schmidt & Schmidt (1981) , ALP was measured by using 4- nitrophenyl phosphate as substrate (Demetriou *et al* ., 1974), AP was determined according to Moss (1984) , glucose was estimated according to Trinder, (1969), total lipids was determined using the method of Knight *et al*. (1972) total cholesterol and HDL–cholesterol were determined enzymatically according to Stein, (1986), LDL-cholesterol was calculated using the Friedewalds formula (Friedewald *et al*., 1972), triglycerides were estimated in the presence of glycerol kinase enzyme (Wahlefeld, 1974), total proteins was determined according to Cannon *et al*. (1974) using bovine serum albumin as reference standard. Finally, albumin was determined using bromcresol green (Doumas *et al*., 1971).

B – Liver analyses:

L- hydroxyproline was determined using Erlich' reagent (Jamall *et al*., 1981) , xanthine oxidase was measured according to Bergmeyer , (1974) , total ATPase (Na^+, K^+ , Mg^+ dependent) was assayed through measuring the inorganic phosphorus release (Bodansky & Schwartz., 1963) , PFK was determined using fructose -6- phosphate as substrate (Wu &Racker , 1959) .

Statistical analysis:

Data were statistically computed and analyzed using One Way Analysis of Variance (ANOVA) followed by Least Signifcant Difference (LDS) post – hoc test (Snedecor &Cochron, 1980).

Results

1-Parasitological results:

Table (1) shows that garlic and onion oils significantly reduced the worm burden and egg count (G_2 and G_3) compared to the infected non – treated group (G_1).

2-Biochemical results:

A-Serum parameters:

Table (2) shows some serum liver function enzyme activities. The data show that a significant increase was obtained for liver function tests, namely ALT, AST, GGT, ALP, and AP in infected group (G_4) as compared to control uninfected group (G_1). Table (3) illustrates a significant decrease in glucose concentration, total lipids total , cholesterol, HDL and LDL – cholesterol, triglycerides, total proteins and albumin in *S. mansoni* infected animals (G_4) as compared to control one (G_1). Administration of garlic (G_5) or onion oils (G_6) after infection ameliorates most of these affected parameters. Healthy control mice administered with both drugs recorded non-significant change (G_2 and G_3) as compared to control group (G_1).

b- Liver parameters:

Table (4) shows a significant increase in L-hydroxyproline concentration and XO

enzymatic activity in infected group (G_4) as compared to control uninfected group (G_1), while significant decrease in the enzymatic activities of both total ATPases and PFK in *S. mansoni* infected group (G_4) as compared to control (G_1) was recorded.

Administration of garlic (G_5) or onion oils (G_6) after infection improved all measured parameters. Healthy control mice administered the two current drugs recorded non-significant change (G_2 and G_3) as compared to control group (G_1).

Table (1): Worm burden and egg count in infected and treated groups.

parameters	Infected	Infected+A. sativum	Infected +A.cepa	Reduction percent		ANOVA P <
	(1)	(2)	(3)	A.sativum	A.cepa	
Worm burden LSD	34.33 ±8.08 (2,3)	11.00 ±3.65 (1)	8.25 ±1.26 (1)	67.96	75.97	0.0001
Ova count LSD	5577.47 ±864.73 (2,3)	1427.62 ±70.06 (1)	995.75 ±90.53 (1)	74.40	82.15	0.0001

Data are means ±S.D of 5 independent experiments.
Numbers between brackets indicate significant correlation.

Table (2): Effect of *A. Sativum* and *A. cepa* oils on serum liver function enzymes in control, infected and treated mice groups.

Parameters	Control (1)	Control + A. sativum (2)	Control + A. cepa (3)	Infected (4)	Infected + A. sativum (5)	Infected + A. cepa (6)	Improvement percent		ANOVA P<
							A. Sativum	A. cepa	
AST (U/L) LSD	34.43± 2.29 (2,4,5,6)	28.41±1.67 (1,4,5,6)	32.18±1.46 (4,5,6)	125.91±3.93 (1,2,3,5,6)	56.63±3.13 (1,2,3,4,6)	68.34±3.22 (1,2,3,4,5)	201.00	167.10	0.0001
ALT(U/L) LSD	34.91±4.50 (4,5,6)	36.41±0.76 (4,5,6)	34.88±1.74 (4,5,6)	86.35±3.37 (1,2,3,5,6)	49.18±6.72 (1,2,3,4)	53.60±3.72 (1,2,3,4)	106.47	93.78	0.0001
GGT(U/L) LSD	14.54±1.99 (4,5,6)	16.07±0.59 (4,5,6)	15.81±1.89 (4,5,6)	47.45±3.22 (1,2,3,5,6)	24.40±1.78 (1,2,3,4,6)	30.94± 2.17 (1,2,3,4,5)	158.52	113.54	0.0001
ALP (U/L) LSD	78.63±2.30 (4,5,6)	73.97±2.74 (4,5,6)	75.10±1.27 (4,5,6)	174.77±3.35 (1,2,3,5,6)	96.71±1.83 (1,2,3,4,6)	109.86 ±4.99 (1,2,3,4,5)	99.28	82.55	0.0001
AP (U/L) LSD	9.65±1.36 (4,5,6)	10.67±1.23 (4,6)	10.52±2.01 (4,5,6)	30.98±1.99 (1,2,3,5,6)	16.207±6.54 (1,3,4)	21.48±2.25 (1,2,3,4)	153.09	98.44	0.0001

Data are means± S.D of 5 independent experiments
Numbers between brackets indicate significant correlation.

Discussion

Previous studies have shown that the interaction between schistosoma parasites and human host is extremely complex. Many parasitologists have focussed their studies on the epidemiology of schistosomiasis or the physiology of the parasites, neglecting to some extent the metabolic relationship between parasites and the host in consequence to infection or drug treatment (Soliman *et al.*, 2001). This study was performed to evaluate the antischistosomal efficacy of garlic (*A. sativum*) and onion (*A. cepa*) oils for controlling schistosomiasis and the associated metabolic disturbances in experimentally infected mice. .

The antischistosomal effect of either garlic or onion may be attributed to their effects on the host immune response. Previous studies showed that garlic enhances the protective immunity against parasitic infection by various mechanisms: 1- It increases the entrance of the parasite into macrophage because it contains mannose – binding lectins (Dam *et al* .,1998) which facilitates the attachment of the parasite to the receptor on the surface of the macrophage which then engulf the parasite (Ghazanfari *et al*., 2006). 2- By enhancing the production of nitric oxide (NO) from both blood platelets and macrophages as an important effector in the parasite destruction (Das *et al*., 1996). 3- It contains an immunomodulator fraction, which affects the course of infection and shifts the cytokine pattern from T helper 2-lymphocyte-mediated immune responses, responsible for granuloma formation, to T helper 1-lymphocyte-mediated immune responses, responsible for immune resistance (Ghazanfari, 2000).

However, the antischistosomal efficacy of onion may be suggested that it acts as immunomodulator which is important in limiting the immunopathological reaction against schistosome eggs trapped within the liver (Chisty *et al*., 1996).

Our data demonstrated that treatment with either garlic or onion oils were effective in reducing worm burden and ova count indicating their schistosomicidal activities. The reduction in egg count in our study may be attributed to the reduction in worm burden and / or these drugs may affect the ability of both male and female worms to couple and consequently affect egg output by female adult worms. These results are in harmony with other investigators who used plant extracts including garlic and onion for the treatment of parasitic infections (Abu-El-Ezz., 2005; El-lakkany *et al*., 2004., Ghazanfari *et al*., 2006; Hamed & Hetta, 2005; Mahmoud *et al*., 2002; Mohamed *et al*., 2005).

The main cause of mortality and morbidity in human schistosomiasis is hepatic fibrosis which is essentially dependent on granulomas (Warren,1978). Granulomatous inflammation in schistosomiasis is a cell mediated hypersensitivity to parasite egg antigens that are lodged in hepatic tissue (Warren *et al*.,1967). As granulomas evolve, collagen fibers deposit around the eggs, a process that lead to fibrosis (Lenzi *et al*., 1999). In the present work, the amount of collagen deposition was documented by measuring of hydroxyproline concentration in liver of infected mice. Our data showed a significant increase in hydroxyproline level in liver tissues of *S. mansoni* infected mice compared to control uninfected mice. These results are in accordance with some authors suggesting that *S. mansoni* egg granulomas contain a factor (s) which may be responsible for the elevation of free–L-hydroxyproline content in the fibrotic liver (Potter *et al*., 2003; Pyrrho *et al*., 2002; Adewusi *et al*., 1996).

An early event following infection with *S. mansoni* is the production of reactive oxygen species (ROS) which induces hepatic oxidative stress leading to destruction of hepatocytes (Abdallahi *et al*., 1999). These ROS may initiate lipid peroxidation, leading to membrane damage and the generation of further toxic products (Clark *et al*., 1985). Oxidases such as xanthine oxidase have been postulated as important

cellular sources of ROS that can produce oxidative stress, which inflicts tissue injury. Xanthine oxidase (XO) activity is reported to increase in several disorders concomitant with oxygen radical production (Ghezzi *et al.*, 1985). The main physiologic function of the enzyme is in purine catabolism, where it catayzes the oxidation of hypoxanthine to xanthine and the latter to uric acid (Fridovich, 1970). The enzyme exists in two interconvertible forms, a dehydrogenase and an oxidase form, both forms generate ROS, but under physiological conditions, XO exists predominantly in dehydrogenase form which is inhibited by NAD^+. Since the cells normally contain large amounts of NAD^+, dehydrogenase has no physiological significance (Corte & Stripe, 1972). The conversion of the dehydrogenase form to oxidase can occur by proteolysis or by reversible oxidation of sulfhydryl groups (Batelli *et al*., 1973). While oxidizing its substrate, XO uses oxygen as an electron acceptor and generates superoxide anion radical and hydrogen peroxide as by – product (Winterbourn & Sutton, 1986) . Moreover, XO – derived $O_2^{\cdot}$ can impair nitric oxide ($^{\cdot}NO$) signaling and concomitantly yield secondary oxidizing species , such as peroxynitrite ($ONOO^-$) that can further propagate tissue injury (Villa *et al*., 1994). In this work, XO is shown to increase in liver of infected mice compared to control (Table 4). These data are in agreement with Stripe *et al*. (2002) who reported that the percentage of oxidase activity seems to be correlated with tissue damage and consequent liver impairment.

ROS production under the stress of schistosomiasis not only alters the functional integrity of cell membranes, but also affects the activities of various membranes – bound enzymes including total ATPase ($Mg2^+$ and Na^+ K^+ ATPase). According to Shaheen & Ebeid (1992), the present study revealed a significant decrease in hepatic ATPase activity in *S. mansoni* infected group compared to control uninfected group. ATPases are lipid dependent membrane-bound enzymes involved in active transport process and have been implicated in the pathogenesis of liver –cell injury , further toxic insult of liver can promote a variety of chemical reactions including depletion of reduced glutathione (GSH) which affect membrane bound ATPases as they require SH group to maintain their structure and function (Kaplowitz, 2002) . In addition, Kako *et al*. (1988) reported that disruption of this enzyme may have occurred by oxidation of its vital sulfhydryl "SH" groups, present in the active sites leading to its inhibition. Decreased ATP production subsequent to inhibition of these enzymes could have profound effects on numerous cellular functions, including Ca^{2+} homeostasis and maintenance of membrane integrity. The author also reported that the membrane–bound ATPase is concerned with the maintenance of a low intracellular concentration of Na^+, so a decrease in activity of Na^+- K^+-ATPase can lead to a decrease in sodium efflux and thereby increase cell membrane permea-bility (Kako *et al*., 1988).

Impairment of cell membrane permiability leads to release of enzymes to circulation. In line with some authors, the present study revealed a significant increase in serum AST, ALT, GGT, ALP and AP activities in all infected mice in compared to control indicating cell damage induced by schistosome egg deposition (Giboda *et al*., 1994; El–Sokkary *et al*.,2002; Mahmoud *et al*., 2002).

The most striking effect of *S. mansoni* infection on host intermediary metabolism is reflected by dramatic reductions in tissue carbohydrate level. Depletion of blood glucose, for example, was reported by Shaheen *et al*. (1989) and Soliman *et al*. (2001) who found a significant depletion of glycogen in livers of infected mice. The significant decrease in serum glucose level observed in the present study is consistent with the elevated respiration observed in many host–trematode associations described earlier, as well as, many in vivo and in vitro studies that have firmly established that glucose is rapidly absorbed and forms the principal energy nutrient for trematode parasites during their development. This rapid utilization of glucose appears sufficient to also deplete carbohydrate reserves from tissues of infected mice and to increase the uptake of exogenous glucose

from the diet (Coles, 1973). The decrease in liver phosphofructokinase (PFK) enzyme activity presented in our study following infection, added further support to previous findings that might be explained by the alterations in carbohydrate metabolism. In contrast, Ahmed & Gad (1995) found a remarkable increase in the enzyme activity from the fourth week of infection and concluded that glycolysis is largely stimulated in the livers of infected mice on the expense of other metabolic pathways of glucose utilization.

Little is known about potential role of lipids in animals infected with *S. mansoni* parasite. Our results showed a significant decrease in all tested parameters in serum including, total lipids, total cholesterol, triglycerides, HDL and LDL of infected animals. These findings are in accordance with El- Marzouki &Amin (1997) and Doenhoff *et al*. (2002) who reported that these changes might be attributed to several metabolites released by schistosomes which affect the host hepatic tissue resulting in decreased synthesis of these parameters and their release into the circulation. In contrast, El–Sokkary *et al*. (2002) reported an increase in serum cholesterol level in *S. mansoni* infected mice. This decrease in lipid profiles in infected mice may be explained on the basis that adult schistosomes apparently have limited capacity to synthesize and metabolize lipids , but are known to require specific lipids for development and maturation. Consequently they may rapidly absorb their host lipid reserves i.e. mobilization and oxidation of lipid reserves increases during infection (Newport &Weller., 1982).

Reduction in total protein level in serum and tissues of animals during trematode infection have been reported on numerous occasions. The present work, showed a significant decrease in serum total proteins and serum albumin of infected mice compared to control uninfected mice. These data are in consistent with Mahmoud *et al*.(2002). This obtained decrease in total proteins may be attributed to that *S. mansoni* parasite has the usual nutritional requirement for essential amino acids , suggesting that amino acids may provide an alternative energy source to carbohydrate for host metabolism or contribute to glucose synthesis and carbohydrate repletion through gluconeogenesis in infected animals. This, in turn, indicates a high level of deamination or transamination. In addition, such decrease may also occur as a result of tissue damage and the action of hydrolytic enzymes released by developing parasites or host lysosomes.

The present results recorded amelioration of liver function enzymes and variabley improvement of other parameters after treatment of infected mice with either garlic or onion oils. This amelioration may be due to the presence of flavonoids and organosulfur compounds which are considered responsible for their beneficial effects (Sengupta *et al*., 2004, O'Reilly, 2001). Flavonoids include the flavonols, quercetin, kaempferol and myricetin found in garlic and onion, are polyphenolic compounds found in many foods of plant origin (Wiseman, 1999; Hollman, 1997). They have a protective effect against coronary heart disease; this effect was thought to be a result of their antioxidant action. Quercetin, which is present abundantlly in onion, displays potent antioxidant properties *in vitro*, mostly against oxidative damage to membrane lipids and lipoprotein particles (O'Reilly *et al* ., 1997) .

The most abundant organosulfur compound in garlic is S – allylcystein (SAC) which has antioxidant properties and could be one of the active compounds responsible for the protective effect of garlic in several experimental models associated with oxidative stress (Maldonado *et al*., 2003; Kim *et al*., 2001). SAC has antioxidant properties both *in vivo* and *in vitro*. *In vivo*, it reduces edema formation in the ischemic rat brain by inhibiting lipid peroxidation (Numagami & Ohnishi, 2001), and it reduces the histological damage in heart and liver of mice treated with doxorubicin, a carcenogenic drug (Mostafa *et al* ., 2000) . *In vitro*, SAC is able to scavange O_2^-, H_2O_2 and HO (Ide & Lau 2001; Kim et al., 2001). SAC also prevents H_2O_2–induced endothelial cell injury, lipid peroxidation and low density lipoprotein oxidation (Ide & Lau,

2001). Finally, SAC differentially regulates nitric oxide (NO) production by inhibiting inducible nitric oxide synthase expression in macrophages while increasing NO in endothelial cells that may contribute to its anti - inflammatory effect(Kim *et al*., 2001).

In conclusion, the oxidative processes that occur upon infection with *S. mansoni* seem to go uncontrolled; such events may be, at least, in part, responsible for the pathology associated with schistosomiasis. At the same time treatment with both garlic and onion oils may be beneficial for their immunomodulating and antioxidative actions. In addition, the current drugs have no side effects on normal healthy animals and succeeded to reduce the hazardous effects of *S. mansoni* through improvement of liver enzymes, reduction of worm burden and ova count. Our recommendation is to increase the treatment time of both drugs for complete eradication of worm and ova and also new researches should be undertaken to isolate the active ingredients of both drugs in order to become feasible to test.

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القوة الفعالة لزيوت الأليم ساتيفا والأليم سيبا ضد الاصابة بطفيل الشستوسوما مانسونى فى الفئران

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المقدمة : من المقرر على مستوى العالم ان الثوم (الأليم ساتيفا) والبصل (الأليم سيبا) يستخدمان فى علاج الكثير من الأمراض منها على سبيل المثال : الأمراض المعدية , الجروح, الاختلالات الوظيفية الخاصة بالمعدة والأمعاء , والأمراض القلبية الوعائية . من هذا المنطلق كان الهدف من هذا البحث والذى يهدف الى دراسة مقدرة زيت الثوم والبصل فى ابادة الطور المعدى لطفيل البلهارسيا وتثبيط الخلل فى الأيض الناتج عنه فى الفئران المصابة بالطفيل.

الطرق المستخدمة : قد تم اعطاء زيت الثوم والبصل عن طريق الفم بجرعة مقدارها 5 ملليليتر / كجم وزن جسم / يوم . وقد تم دراسة ثلاث محاور فى هذا البحث وهى كالآتى : تاثير العلاجين المستخدمين على الحيوانات المصابة بالطفيل, التاثير على انزيمات وظائف الكبد وعلى مستوىالأيض فى الكبد وايضا تم القيام بدراسات طفيلية وهى تشمل القيام بعد ديدان البلهارسيا فى الكبد والأمعاء وكذلك عد بيض البلهارسيا .

النتائج : ولقد اظهرت نتائج تحليل مصل الدم بأن الاصابة بالطفيل أدى الى زيادة ملحوظة فى نشاط انزيمات الكبد وهى :AST, ALT, GGT,ALP and AP مع ملاحظة النقص الواضح فى تركيز الجلوكوز , الدهون الكلية, الكلوستيرول, الليبوبروتينات العالية والمنخفضة الكثافة(HDL –LDL) , الترايجلسيريدات, البروتين الكلى والألبيومين . أما بالنسبة لتحليل أنسجة الكبد فى الحيوانات المصابة بالبلهارسيا فقد أظهرت النتائج زيادة واضحة فى تركيز الهيدروكسى برولين ونشاط انزيم الزانثين اوكسيديز وكانت هذه الزيادة مصحوبة بنقص واضح فى نشاط انزيم الأدينوسين ترای فوسفاتيز وكذلك انزيم الفسفوفراكتوكينيز. ولقد اثبتت النتائج أن المعالجة بزيت كل من الثوم والبصل أدت بدرجة كبيرة الى عودة انزيمات الكبد الى مستواها الطبيعى وأدت بدرجات متفاوتة الى تحسين القياسات الأخرى مع النقص الملحوظ فى عدد ديدان وبيض البلهارسيا.

الاستنتاج : نستخلص من هذه الدراسة أن زيوت الثوم والبصل لها دور فعال فى علاج الخلل الذى يحدث فى أيض الحيوانات المصابة بطفيل البلهارسيا ويرجع ذلك للتحسن الواضح فى الجهاز المناعى للحيوانات وايضا لاحتوائهم على مضادات الأكسدة.