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Effect on lipid profile in mice experimentally infected and vaccinated with Aspicularis tetraptera

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Abstract

Using somatic antigens injected into infected mice, the authors set out to determine the impact of Aspicularis tetraptera parasite (a nematode) infection on lipid profile levels (triglycerides, cholesterol, HDL, and LDL), and they found some interesting results. Infected mice had lower lipid profiles, but these levels returned to normal following somatic antigen immunization. Egg somatic antigens have been shown to be the most potent in experiments..

Keywords : Triglyceride, Cholesterol, HDL, LDL, Lipid Profile, Aspicularis tetraptera.

Introduction

Multicellular parasitic organisms, helminths have both medicinal and economic importance to their populations. The helminth parasite has infected a large number of people and animals across the globe. Interestingly, parasites (helminths) have been known to live for 1-2 years as adults [1]. In underdeveloped nations, helminths were a major cause of disease and death. More than 2.5 billion people have parasitic worm infections, according to a research by the World Health Organization [3]. Children are particularly susceptible to intestinal helminth infections [4]. An estimated 57 percent of the human population (developing nations) may be afflicted with helminths by the year 2025. Helminth-borne illnesses are a major contributor to decreased animal output. Death and decreased weight growth were the primary causes [7-8]. In tropical regions, where rainfall is plentiful, this issue is particularly acute [9-10]. The oxyurid nematode Aspicularis is found in rodent families on a regular basis. The existence of rodent pinworm, despite the use of control measures, suggests that the diagnostic and eradication processes are not up to par. As a result of problems with parasite detection, many institutions lack the knowledge necessary to provide an effective therapy for pinworm eradication. Syphcia muris, Syphcia obvelata, and Aspicularis tetraptera (Pinworms) are frequent parasites in laboratory mice, and they are all oxyurids. Pinworms have been shown to have a negative impact on weight and development, as well as on the intestines [12, 13, 14, 15, 16, 17]. Drug-resistant parasites in the gastrointestinal tract were found in people who had been using antihelminthic medicines for an extended period of time [18]. Given the significance of the issue, the current research examined the effect of somatic antigen on the lipid profile level in infected and vaccinated mice. It was shown to be effective.

Components and Procedures

Experimentation with animals in the laboratory

It was decided to use Mus musculusalbinus, the Swiss albino mouse, for this investigation. As a result, these animals were housed in an animal house with the usual conditions of light, ventilation, and temperature. For this study, only healthy male mice aged 7-8 weeks old and weighing 30-50 gms were used. Examining the feces of mice provided conclusive proof. In sterile cages, the mice were fed a well-balanced meal and given fresh water every day.

Ongoing care and upkeep of Aspicularis tetraptera

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From the Parasitology Laboratory of the Zoology Department, Govt. Holkar Science College, Indore, came the Aspicularis tetraptera strain (M.P). Serial passage in healthy mice after every 31st days following infection with a dosage of 100 varied embryonated eggs is frequently used in the laboratory to maintain Aspicularis tetraptera. As a result of the animals' infection, researchers were able to conduct parasite development studies. Wakelin [19] outlined the procedures used to keep Aspicularis tetraptera alive, infect it, and then recover from infection.

Incubation of egg-inoculums and infection with bacteria:

Second embryonated eggs were also counted.

c) Then, 100 eggs in a 2.0 ml solution was prepared.

c) A feeding needle-fitted syringe was used to provide the dose.

According to the experiment design, the mice were placed in various cages after they had been inoculated.

e) Standard diet was supplied to mice housed in cages.

Somatic antigen preparation:

A few of the methods in use include homogenization and lyophilization.

b) Distilled water was used to properly clean the eggs, larvae, and adults.

b) In a protein-free culture medium, the eggs, larvae, and adults were all homogenized individually.

d) After homogenization, each homogenate was lyophilized and kept cold (4°C).

The collection of blood and the separation of serum:

This was accomplished by dissecting experimental mice to reveal their hearts.
b) A 2ml glass syringe was used to draw blood from the ventricle.
c) Blood was withdrawn from the syringe and placed in a 15-ml centrifuge tube.
They were stored in a freezer.
f) Clotting was noticed in the tube.
g) Serum was drawn out of the tubes and kept at a temperature of 20°C.
Cholesterol profiling estimation
Estimation of the total cholesterol in the bloodstream
Allain's enzymatic approach was used to measure total cholesterol.
Plasma High Density Lipoprotein Concentration Estimation (HDL)
To assess HDL cholesterol, a spectrophotometer reading at 545 nm was used with a redox test kit [20] to compare the absorbance of the standard sample to that of the reagent blank.
Plasma triglyceride concentrations are measured.
Glycerol phosphate oxidase – Peroxidase technique [21] was used to evaluate plasma triglycerides, and the spectrophotometer detected the intensity of the colored chemical produced at 545 nm.

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Plasma Low Density Lipoprotein Concentration Estimation (LDL)

Phophor-tungstate magnesium chloride was used to purify the low density lipoprotein-cholesterol concentration (LDL).

Result

Aspicularis tetraptera-infected and vaccinated mice's lipid profiles were measured on the 31st day after infection and are summarized in tables (1, 2, and 3) and figures (1, 2 and 3).

In milligrams per deciliter of lipid (mg/dl)

NINVC1 and INVC2 had total lipid levels of 579 mg/dl and 438 mg/dl, respectively, in the current investigation. IVEgSoAg1, IVEgSoAg2, IVEgSoAg3, IVEgSoAg4, and IVEgSoAg5 infected and vaccinated mice had total lipid levels of 465 mg/dl, 510 mg/dl, 540 mg/dl, 545 mg/dl, and 552 mg/dl, respectively, of A. tetraptera somatic egg antigen.

450 mg/dl in IVLSoAg1 and 495 mg/dl in IVLSoAg2, 510 mg/dl in IVCSoAg3, 525 mg/dl in IVLSoAg4, and 532 mg/dl in IVLSoAg5 were the total lipid levels reported in A. tetraptera infected and vaccinated mice, respectively, with varied concentrations of somatic antigen of Larvae.

There were four different concentrations of somatic antigen of the Adult Worm in the IVASoAg1 group, four different concentrations of somatic antigen of the Adult Worm in the IVASoAg2 group, and four different concentrations of somatic antigen of the Adult Worm in the IVASoAg3 group.

In comparison to NINVC1, the total lipid levels in INVC2 were found to be lower. However, when the concentration of somatic antigen rose, we observed an increase in total lipid levels. It was discovered that the measured values were proportional to the amount of somatic antigen present (Tables 1, 2, and 3& figures 1, 2, and 3).

Blood Cholesterol Levels

NINVC1 had a cholesterol level of 123 mg/dl, whereas INVC2 had a level of 94 mg/dl. A. tetraptera-infected and vaccinated mice with varied concentrations of egg somatic antigen showed cholesterol levels of 101, 109, 116, 119, and 122 mg/dl, respectively, in the bloodstream.

There were significant differences in cholesterol levels between the IVLSoAg1 strain and the IVLSoAg2 strain, which were both infected and immunized with the larval somatic antigen IVLSoAg1.

There were 90, 97, and 103 mg/dl of cholesterol in Aspiacularis tetraptera infected with varying concentrations of adult worm somatic antigen, respectively, in IVASoAg1 and IVASoAg2.

When compared to NINVC1, the cholesterol levels in INVC2 were found to be lower. When the concentration of somatic antigens rose, cholesterol levels rose as well. Somatic antigen concentration had a clear correlation with cholesterol levels.

IVEgSoAg5 had the highest cholesterol level at 122 mg/dl, while IVASoAg1 had the lowest at 90 mg/dl. Maximum cholesterol value of egg somatic antigen.

LDL is a kind of low-density lipoprotein cholesterol in the blood.

NINVC1 had a low density lipoprotein concentration of 73.3 mg/dl, whereas INVC2 had a value of 51.45 mg/dl.

Low density lipoprotein (LDL) levels were found to be 58.4 mg/dl in IVEgSoAg1, 60.2 mg/dl in IVEgSoAg2, 65.5 mg/dl in IVEgSoAg3, 66.4 mg/dl in IVEgSoAg4, and 68.3 mg/dl in IVEgSoAG5 in mice that were infected with A. tetraptera and then vaccinated with different

A. tetraptera-infected and vaccinated mice with different concentrations of larval somatic antigen showed low-density lipoprotein levels of 54.3 mg/dl, 57.2 mg/dl, 60.2 mg/dl, 64.4 mg/dl, and 65.6 mg/dl, respectively, when compared to controls.

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A. tetraptera-infected and vaccinated animals with varied concentrations of adult worm somatic antigen showed low-density lipoprotein levels of 45.2 mg/dl in IVASoAg1.

There were 48.4 mg/dl in IVASoAg2, 52.8 mg/dl in IVASoAg3, 56.4 mg/dl in IVASoAg4, and 60.2 mg/dl in IVASoAg5, all in the range of normal.

As compared to NINVC1, the LDL value was observed to be lower in INVC2. However, the concentration of somatic antigen was observed to raise LDL readings. The results were proportionate to the amount of somatic antigen present in the sample (tables1, 2, and 3and figures 1, 2, and 3).

The highest LDL levels were found in the IVEgSoAg5 group, at 68.3 mg/dl, while the lowest levels were found in the IVASoAg1 group, at 45.2 mg/dl. Egg somatic antigen showed the highest possible LDL levels.

HDL (measured in milligrams per deciliter)
NINVC1 had a high density lipoprotein (HDL) value of 36 mg/dl, whereas INVC2 had an HDL value of 28.5 mg/dl.
There were 30 mg/dl, 32 mg/dl, 32 mg/dl, and 34 mg/dl HDL values in A. tetraptera-infected and vaccinated mice with varied concentrations of egg somatic antigen, respectively.

HDL levels were found to be 29 mg/dl in IVLSoAg1, 31 mg/dl in IVLSoAg2, 31 mg/dl in IVLSoAg3, 33 mg/dl in IVLSoAg4, and 34 mg/dl in IVLSoAg5 in mice infected with A. tetraptera and vaccinated with varied concentrations of larval somatic antigens.

A. tetraptera-infected and vaccinated mice with varying concentrations of adult worm somatic antigen had HDL values of 26 mg/dl in IVASoAg1, 28 mg/dl in IVASoAg2, 29 mg/dl in IVASoAg3, 30 mg/dl in IVASoAg4, and 30 mg/dl in IVASoAg5.

In INVC2, HDL levels were observed to be lower than in NINVC1. However, when the concentration of somatic antigen was raised, HDL levels rose. Antigen concentration directly correlated with the amount of HDL that was obtained (tables 1, 2, and 3 and figures 1, 2, and 3).

In IVEgSoAg5 and IVLSoAg5, the highest HDL value was 34 mg/dl and the lowest HDL value was 26 mg/dl in IVASoAg1.

Table-1

Lipid Profile values taken on 31st day post infection from mice infected with A. tetraptera and vaccinated with different concentrations of somatic antigen of eggs.

Group No.	Groups	Total lipid mg/dl	Cholesterol mg/dl	Low density lipoprotein (LDL) mg/dl	High density lipoprotein (HDL) mg/dl
1.	$NINVC_1$	579 ±3.834	128 ±2.280	73.3 ±0.698	36 ±2.828
2	$INVC_2$	438 ±4.295	94 ±2.828	51.45 ±0.664	28.5 ±1.612
3	IVEgSoAg	465	101	58.4	30

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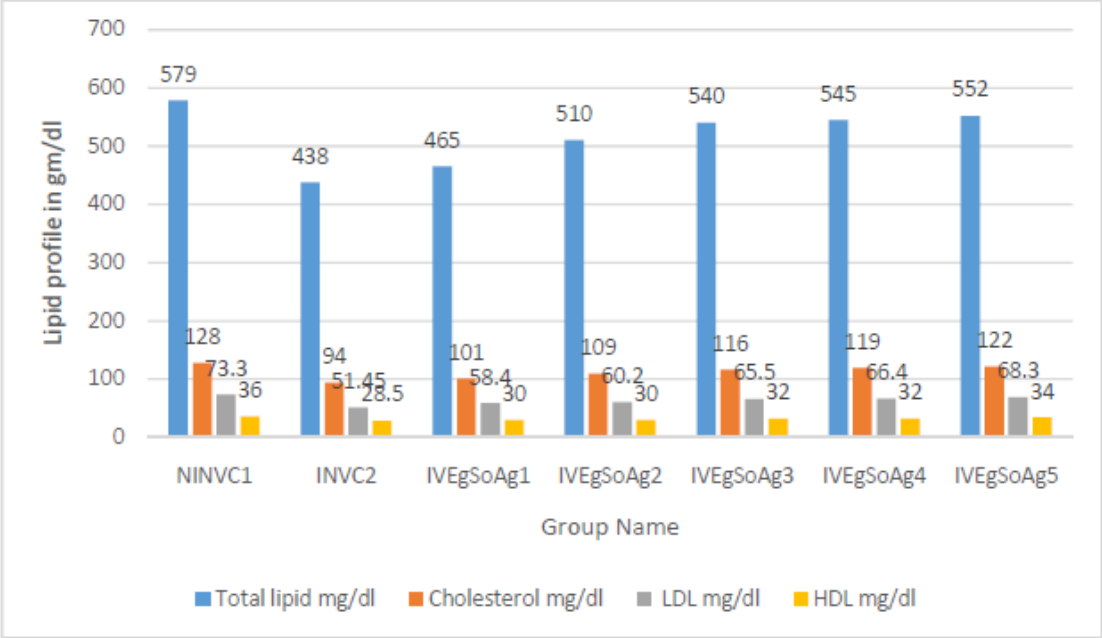
		±3.405	±2.828	±0.282	±0.7071
4	$IVEgSoAg_2$	510 ±0.894	109 ±2.607	60.2 ±0.070	30 ±0.368
5	$IVEgSoAg_3$	540 ±1.414	116 ±3.847	65.5 ±3.479	32 ±1.581
6	$IVEgSoAg_4$	545 ±4.939	119 ±3.84	66.4 ±0.2	32 ±0.894
7	$IVEgSoAg_5$	552 ±1.414	122 ±1.414	68.3 ±0.2	34 ±1.414

$NINVC_1$	Non infected non vaccinated control-1
$INVC_2$	Infected non vaccinated control-2
$IVEgSoAg_1$	Infected vaccinated with 20µg eggs somatic antigen.
$IVEgSoAg_2$	Infected vaccinated with 40µg eggs somatic antigen.
$IVEgSoAg_3$	Infected vaccinated with 50µg eggs somatic antigen.
$IVEgSoAg_4$	Infected vaccinated with 80µg eggs somatic antigen.
$IVEgSoAg_5$	Infected vaccinated with 100µg eggs somatic antigen.

Figure-1
ShowingLipid Profile values taken on 31st day post infection from mice infected with A. tetraptera and vaccinated with different concentrations of somatic antigen of eggs.



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$NINVC_1$	Non infected non vaccinated control-1
$INVC_2$	Infected non vaccinated control -2
$IVEgSoAg_1$	Infected vaccinated with 20µg eggs somatic antigen.
$IVEgSoAg_2$	Infected vaccinated with 40µg eggs somatic antigen.
$IVEgSoAg_3$	Infected vaccinated with 60µg eggs somatic antigen.
$IVEgSoAg_4$	Infected vaccinated with 80µg eggs somatic antigen.
$IVEgSoAg_5$	Infected vaccinated with 100µg eggs somatic antigen.

Table-2

Lipid Profile values taken on 31st day post infection from mice infected with A. tetraptera and vaccinated with different concentrations of somatic antigen of larvae.

Group No.	Groups	Total lipid mg/dl	Cholesterol mg/dl	Low density lipoprotein (LDL) mg/dl	High density lipoprotein (HDL) mg/dl
1.	$NINVC_1$	579 ±3.405	128 ±1.414	73.3 ±0.698	36 ±2.366
2	$INVC_2$	438 ±4.73	94 ±2.828	51.45 ±0.664	28.5 ±1.673
3	$IVLSoAg_1$	450 ±3.405	98 ±1.414	54.3 ±0.384	29 ±0.824
4	$IVLSoAg_2$	495 ±3.687	108 ±4.472	58.2 ±0.469	31 ±3.847
5	$IVLSoAg_3$	510 ±1.266	115 ±2.607	60.2 ±3.289	31 ±1.414
6	$IVLSoAg_4$	525 ±0.282	116 ±3.687	64.4 ±0.316	33 ±1.41
7	$IVLSoAg_5$	532 ±0.635	120 ±2	65.5 ±0.352	34 ±3.687

$NINVC_1$	Non infected non vaccinated control-1
$INVC_2$	Infected non vaccinated control-2
$IVLSoAg_1$	Infected vaccinated with 20µg larvae somatic antigen.
$IVLSoAg_2$	Infected vaccinated with 40µg larvae somatic antigen.
$IVLSoAg_3$	Infected vaccinated with 50µg larvae somatic antigen.

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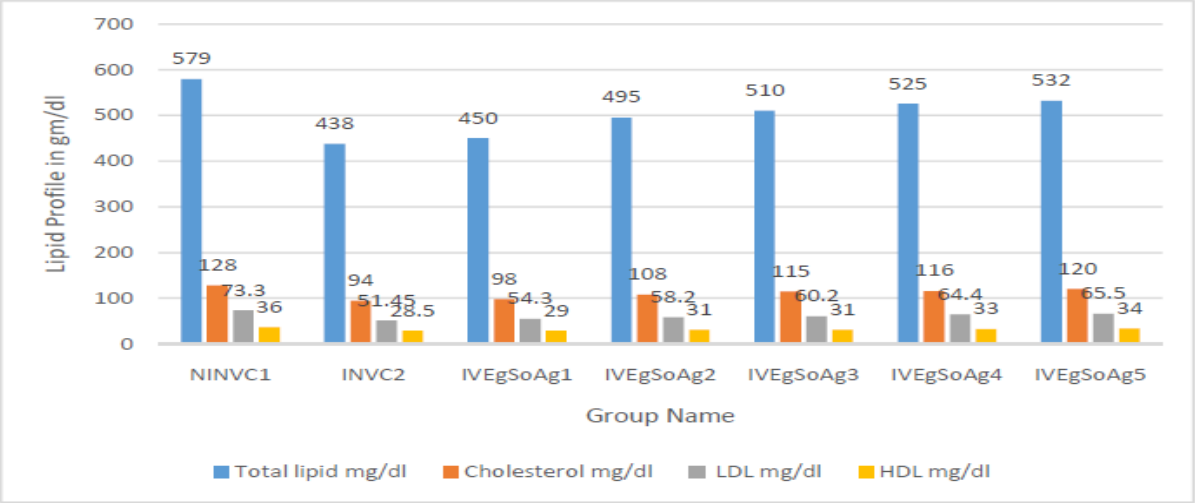
$IVLSoAg_4$	Infected vaccinated with 80µg larvae somatic antigen.
$IVLSoAg_5$	Infected vaccinated with 100µg larvae somatic antigen.

Figure-2
ShowingLipid Profile values taken on 31st day post infection from mice infected with A. tetraptera and vaccinated with different concentrations of somatic antigen of larvae



$NINVC_1$	Non infected non vaccinated control-1
$INVC_2$	Infected non vaccinated control -2
$IVEgSoAg_1$	Infected vaccinated with 20µg eggs somatic antigen.
$IVEgSoAg_2$	Infected vaccinated with 40µg eggs somatic antigen.
$IVEgSoAg_3$	Infected vaccinated with 60µg eggs somatic antigen.
$IVEgSoAg_4$	Infected vaccinated with 80µg eggs somatic antigen.
$IVEgSoAg_5$	Infected vaccinated with 100µg eggs somatic antigen.

Discussion

Somatic antigen concentrations are reported in tables 1, 2 and 3 and displayed in figures for the lipid profiles of infected and vaccinated mice (1, 2 and 3). Mice infected with A. tetraptera had lower levels of total lipids, cholesterol, LDL, and HDL than those that were not infected. Lipid content was used as food by parasites in the gastrointestinal system, which is one possibility for why the lipid profile value dropped. However, higher levels of total lipid cholesterol, LDL cholesterol, and HDL cholesterol were reported in infected and vaccinated mice (i.e. experimental mice treated with varying concentrations of somatic antigen). This might be because parasites were killed and expelled from the host in these studies. According to this study, the host's gastrointestinal system was free of parasites after immunization with a somatic antigen (somatic antigen). The results obtained imply that the lipid profile levels were lowered as a result of infection. This might be the result of hepatic dysfunction, in my view. These mice may be showing signs that they are beginning to recuperate from their vaccinations by

increasing their cholesterol levels. The presence of parasites has been linked to increased hormone production and liver dysfunction in the past [22, 23]. B. malayi-infected livers showed a reduction in lipid content, according to Joshi [24]. The Shipibo community (Peru), which is infested with Hookworm, Strongyloides, and Trichuris, was likewise shown to have lower serum lipid levels by Wiedermann [25]. In camels afflicted with nematodes, Mohamed [26] examined the total cholesterol, triglycerides, HDL, LDL, and VLDL levels (Strongyloides, Trichuris, Tichostrogylidae). A considerable drop in lipid levels was also discovered by him. According to these scientists, a decrease in lipid levels might be the result of parasites feeding on the lipids in the host's bloodstream.

Conclusion

There was a reduction in mice with Aspicularis tetraptera infection in lipid profile values such as total lipids, cholesterol levels, LDL and HDL; however, same values were markedly elevated in experimental mice immunized with somatic antigens of egg/larvae/adult worms (at different concentrations).

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