Changes that take place in some biochemical parameters (ALT, LDH, total protein, albumin, cholesterol, triglyceride, glucose) in dogs with ascariasis

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Abstract. Ascariasis is a disease in dogs that is caused by the nematodes *Toxocara canis* and *Toxascaris leonina*. In this study, 20 female stray dogs naturally infected with *T. canis* and *T. leonina* and 10 healthy owned female dogs (control) were used as material. Blood and faecal samples were collected from infected and control groups. Coprological samples were examined by routine flotation technique. Serum samples were separated and analysed for biochemical parameters with autoanalyser. Glucose, serum triglyceride, cholesterol, total protein, albumin, ALT (SGPT = Serum Glutamic Pyruvic Transaminase) and LDH (Lactate Dehydrogenase) determinations were made from the dogs’ blood serum. As a result, concentrations of total protein, albumin, triglyceride and glucose were lower (p<0.05) and alanine aminotransferase (ALT), lactate dehydrogenase (LDH) and cholesterol were higher (p<0.01) in infected dogs than in the controls. These results suggest that the increase and decreases of some biochemical parameters may result from the pathophysiological effects of the parasitic infections.

Keywords: Total Protein; Albumin; Cholesterol; Triglyceride; Glucose; Ascariasis.

Received 03/03/2015. Accepted 13/03/2015.

Introduction

Ascariasis is a disease in dogs caused by the nematodes *Toxocara canis* and *Toxascaris leonina*. *T. canis* and *T. leonina* are very similar and both are nematodes of the small intestine. Definitive hosts for *T. canis* include: dog (*Canis familiaris*), jackal (*C. aureus*), dingo (*C. dingo*), wolf (*C. lupus*), coyote (*C. latrans*), red fox (*Vulpes vulpes*), arctic fox (*V. lagopus*), fennec (*Megalotis zerda*), rarely feline species. The definitive hosts of *T. leonina* are both feline and canine species. Several studies indicate cooccurrence of both *T. canis* and *T. leonina* in domestic and wild canids as well as *T. cati* and *T. leonina* in felids (Labarthe et al., 2004; Dalimi et al., 2006; Dubná et al., 2007; Reperant et al., 2007; Itoh et al., 2011). Studies into the frequency of *T. canis* egg shedding in canine faecal samples have been reported from different areas of the world with variable results. For example, Haridy et al. (2009) found
9.83% positivity in 3000 pet dogs in Cairo, Egypt. In the United States several reports have shown figures varying from 2% to 79% (Overgaauw, 1997). In Brazil, Scaini et al. (2003), Labruna et al. (2006) and Chieffi and Muller (1976) found positivities of 9.3%, 18.9% and 44.3%, respectively. Also prevalence rates of *T. leonina* reported from dogs of several countries of the Balkan peninsula were lower than those of *T. canis* (Olteanu, 2000; Papazahariadou et al., 2007) with the latest report on the rates of infection of 0.9% and 75.7%, respectively (Xhaxhiu et al., 2011). In studies conducted in different cities of Turkey, it was determined that *T. canis* was found approximately between 4.2-47.8% in dogs while *T. leonina* was found at the rates of 1-60.9% (Aydenizöz, 1999; Orhun and Ayaz, 2006; Kozan et al., 2007; Aydenizöz-Özkayhan et al., 2008; Balkaya and Avcioglu, 2011).

The nematode *Toxocara canis*, a small intestine parasite in dogs, is the etiological agent most commonly associated with this zoonosis. In dogs, the zoonotic profile is maintained by transplacental and transmammary infection (Burke and Roberson, 1985), in which the young animals are more susceptible and also the main disseminators of eggs in the environment (Galina et al., 2011; Oliveira-Sequeira et al., 2002; Villela et al., 2009). People get infection by eating food contaminated with *Toxocara* eggs such as unwashed vegetables and fruits. The larvae of *T. canis* may invade the human body and cause the ‘larva migrans’ such as ocular larva migrans (OLM), visceral larva migrans (VLM) and/or covert toxocariasis (CT) (Despommier, 2003; Vidal et al., 2003), while there are rarely reports of human infected with *T. leonina* (Kim et al., 2008). *T. leonina* can be differentiated from *T. canis* by the cephalic alae, but this requires professional expertise and specialized skill. Ascariasis trigger the changes in the blood tables and biochemical parameters of dogs and humans. In addition, it is reported that abdominal distension, diarrhea, dehydration, mattness of hair and growth retardation are seen in infected animals (Orhun and Ayaz, 2006; Aydenizöz-Özkayhan et al., 2008; Özel, 2013).

This study aimed at determining the levels of some biochemical parameters on the *T. canis* and *T. leonina* infected and clinically healthy dogs (uninfected) and compared the data acquired.

**Material and methods**

In the present study, blood and faecal samples were taken from 20 female stray dogs brought to the Faculty of Veterinary Science from the campus area and nearby villages. Their ages weren’t known. In addition, faecal and blood samples were also taken from 10 owned female dogs, determined to be clinically healthy and treated with antiparasitic drugs, in order to constitute the control group. The owned dogs aged between 6 months and 1 years. A total of 10 clinically healthy, owned dogs (female) were used as a control group. Eprinomectin with 100 μg/kg dose was orally used in control group. Ten milliliter of blood were collected from the cephalic vein of each dog using a plain test tube and those containing Ethylenediaminetetraacetic acid (EDTA) to obtain serum and uncoagulated blood respectively. Glucose, serum triglyceride, cholesterol, total protein, albumin, ALT (SGPT) and LDH determinations were made from the dogs’ blood serum. Measurements were carried out in a Technicon RA-XT auto-analyzer. For sampling, gloves and sampling container were used. Faecal samples were collected per rectum by spatula/ faecal swabs or from roadside/public parks just after their defecation. The faecal samples of all dogs were examined for determining ascarid eggs presence through the use of flotation method with saturated zinc sulphate solution in parasitology laboratory. Obtained findings were compared with Minitab Two Sample statistical analysis.

**Results**

In the examination of parasitological faecal analyses, from 20 stray dogs examined, 14 (70%) dogs were found positive for ascarid eggs. Out of 20 examined stray dogs, *T. canis* was detected in 12 animals (60%). In addition,
*T. leonina* was found in 10% of stray dogs investigated (2/20).

For biochemical analyses, some biochemical parameters in naturally infected and control group are given in Table 1. Compared to the control group, the ALT, LDH and cholesterol levels of the dogs with ascariasis were found to be increased (p<0.01). However, the glucose, triglyceride, total protein and albumin of the infected dogs displayed statistically significant decreases, when compared to the control group (p<0.05).

**Table 1.** Some biochemical parameters in dogs infected with *T. canis* and *T. leonina* and control (healthy) group

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Reference Range</th>
<th>Infected Dogs</th>
<th>Healthy Group (control)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triglyceride</td>
<td>mg/dl</td>
<td>50-100</td>
<td>75±15 b</td>
<td>93±15 a</td>
<td>p&lt;0.05</td>
</tr>
<tr>
<td>Glucose</td>
<td>mg/dl</td>
<td>65-118</td>
<td>45±10 b</td>
<td>70±10 a</td>
<td>p&lt;0.05</td>
</tr>
<tr>
<td>Total Protein</td>
<td>g/dl</td>
<td>0.6-6.2</td>
<td>5.1±0.3 b</td>
<td>7.1±0.1 a</td>
<td>p&lt;0.05</td>
</tr>
<tr>
<td>Albumin</td>
<td>g/dl</td>
<td>2.6-3.3</td>
<td>2.9±1.4 b</td>
<td>3.4±1.2 a</td>
<td>p&lt;0.05</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>mg/dl</td>
<td>135-270</td>
<td>210±50 b</td>
<td>145±15 a</td>
<td>p&lt;0.01</td>
</tr>
<tr>
<td>ALT</td>
<td>I.U/L</td>
<td>21-102</td>
<td>225±25 b</td>
<td>180±30 a</td>
<td>p&lt;0.01</td>
</tr>
<tr>
<td>GLDH</td>
<td>I.U/L</td>
<td>43-233</td>
<td>215±20 b</td>
<td>140±60 a</td>
<td>p&lt;0.01</td>
</tr>
</tbody>
</table>

In this study, we aimed to evaluate the biochemical changes in *T. canis* and *T. leonina* infected dogs. Increased levels of cholesterol in the present study might be due to parasitic stress in infected animals which might have as result an increase in the output of epinephrine and corticosteroids. This increase of epinephrine and corticosteroids may be responsible for elevation of serum cholesterol in the infected animals. The increase in the enzyme activities may be attributed to complications caused by the extensive *T. canis* larval migration in the body of infected animals.

A significant drop (p<0.05) in the values of total protein and albumin in infected dogs was recorded. Similar trend has already been reported earlier by Hayden and Kruiningen (1975), Ash et al. (1985), Waghmare et al. (1993), Kaymaz et al. (1999), Kozan et al. (2010), Nwoha et al. (2013) and Kumar et al. (2014). The reduction in total protein and albumin may be due to chronic internal haemorrhage during severe infection and loss of serum, via exudation or leakage in the lumen of gut causing enteropathy. The altered rate of intestinal absorption of nutrients especially protein from the injured gut during infection might also have contributed to the drop in the total protein (Dargie and Allonby, 1975).

In infected dogs, the increase in the values of Serum Glutamic Oxalo-acetic Transaminase (SGOT) and Serum Glutamic Pyruvic Transaminase (SGPT) values were highly significant (p<0.01) (Hayden and Kruiningen, 1975; Nwoha et al, 2013; Kumar et al, 2014).

**Discussion**

Worldwide, several hundred million domestic dogs are infected with *T. canis*. The adult worms reside in the gastrointestinal tract and produce eggs which are subsequently covered with faeces and extruded into the environment. One *T. canis* adult female can produce 20,000 eggs per day, and since intestinal parasite burdens range from one to several hundred worms, infective animals contaminate the environment with millions of eggs every day (Lawrence and Schantz, 1981; Lynch et al., 1988; Van Knapen et al., 1992).

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Likewise, the increases in the ALT (SGPT) rates was determined in the present study. In advanced cases of infection, excessive liberation of enzyme may be correlated with the increased permeability of liver cells of ALT enzyme in to blood stream and their elevation in serum. This can be evaluated as the effects of *Toxocara canis* infection on the liver.

Although, there is a lot of study about effect on blood parameters of endoparasitic diseases in animals, changes in some biochemical parameters caused by especially ascarasis in dogs has not been examined thoroughly.

Consequently, alterations in some biochemical parameters in dogs infected with *Toxocara canis* and *Toxascaris leonina* were investigated and statistically evaluated. According to the results, concentrations of total protein, albumin, triglyceride, glucose were lower and concentrations of ALT, LDH and cholesterol were higher in naturally infected dogs than in the controls. The data obtained in this study might form an indicative basis for subsequent studies under natural and experimental field conditions, and it should be used as a useful tool for diagnosis, prognosis, and evaluation of the therapy applied.

References


