

Effect of Parasitic Infection on Glucose and Lipase of Host Pigeon (*Columba livia*) Tissues

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Abstract: The aim of the study was to observe parasitic effect on lipase and glucose content in the tissue of artificially infested host pigeon with cestode parasites. Gastro-intestinal tract associated organs were extracted from the body cavity of dissected animal. Gizzard, liver, spleen, pancreas were separated and preserved. Thereafter, Lipase and glucose determination was carried out from these organs.

It was observed that parasitic infection decreased lipase in liver and spleen while increased in pancreas. Higher lipase content was measured in infected animal's crop a lesser content was measured in gizzard. It was also observed that infection impaired glucose level in intestine and other organs as well. Parasitic infections enhanced the glucose level in intestine and crop, while decreased glucose level in spleen, pancreas and liver.

Keywords: Parasitic Infection effects, Glucose, Lipase, Pigeon *Columba livia*.

INTRODUCTION

Pigeon serves as host of large number of endo-parasites like cestodes, nematodes and unicellular protozoa [1, 2] helminth infection exhibits severe effect on host tissue [3]. More over infection could alter some of the enzymes level in tissue and while some other enzyme remain unchanged. Free glucose level in animal tissue is found generally low because it is stored in glycogen form. However, as a sensitive indicator [4], glucose indicated variation in metabolic condition [5]. Digested metabolites including glucose transportation ability of intestinal mucosa could be affected due to nematodes infection [6], also lipids have great importance in development and establishment of parasites [7] in the pancreas. Lipase and ribonuclease exist in concentration and acetylcholine stimulated secretion of amylase, lipase and ribonuclease. [8]. In comparison with other digestive enzymes, lipase contents reported to be elevated slowly [9]. When these enzymes come in contact with the parasites, an enzyme inhibition is occurred, therefore, [10] found pancreatic lipase inhibition in the presence of *Hymenolepis diminuta*. The aim of study was to observe parasitic effects on lipase and glucose contents on pigeon tissues.

MATERIALS AND METHODS

Control pigeons were procured from a certified animal supplier. The certified animal supplier mandatory maintain their animals proper vaccinated

and with regular treatment. High quality diseases free diet was provided to the birds. After procurement, birds were kept in captivity in the animal house for the close observation of any sign of disease. Artificially infested pigeons were obtained from the parasitology section department of Zoology University of Karachi. Ten birds were taken from control group and ten birds were taken from artificially infested group. From the infested animals, cestodes were collected after prescribed procedure of dissection. Pigeons were artificially infested with *Cotugnia digonopora*. 5-8 of worms of *C. digonopora* were collected from these artificially infested animals. These animals were dissected as: firstly, skin was cut of and reflected laterally to expose crop, then intestine associated organs were removed from the body cavity. Gizzard, liver, spleen, pancreas were separated and extracted out. Lipase and glucose determination was carried out from these organs. Homogenates preparation was done [4]. A tissue sample of 200mg was taken from each organ, i.e. intestine, liver, gizzard, crop, pancreas and spleen. Initially, samples were ground in 2ml bi-distilled water with the help of a mortar and pestle. Then samples were homogenized in taflonpyrex tissue grinder for 5min at 1000 rpm. The homogenates were centrifuged at 3500rpm in centrifugation machine "Labfuge 15000" for 15min. supernatants were taken in separate tubes and used for lipase and glucose estimation.

For glucose estimation, Randox kit gl (2586/s) was used. In this respect three test tubes were taken, 10 μ liter samples and 10 μ liter standard was taken in a test tube marked as sample and standard. 1000 μ liter of reagent was added in each marked test tube including reagent blank test tube. All test tubes were incubated at 15-25^oC for 25min. Again reagent blank readings

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were taken at 500nm. For the estimation of lipase Randox kit No: L1188 was used. Two test tubes were taken and marked as standard samples. 1.0ml of reagent was taken in both tubes 0.04ml of samples were taken in marked test tube and it was mixed. 0.04ml of standard was taken in standard marked test tube and it was mixed very well. Absorbance A_1 of standard and samples were taken after 4min and absorbance A_2 of standard and samples were taken after further 5min at 340nm against air. Calculation was made by following formulas.

$$\text{Glucose content (mg/dl)} = A \text{ samples} / A \text{ standard} \times 100$$

$$\text{Lipase content} = \text{factor} \times \Delta A \text{ sample}$$

$$\text{Factor} = \text{content samples} / \text{content standard}$$

After the calculation of statistical analysis was done by the following formulas [4]:

$$\text{Standard deviation (S.D.)} = \sqrt{\frac{\sum x^2 - n(x)^2}{n-1}}$$

$$\text{Standard error (S.E.)} = \frac{S.D.}{\sqrt{n}}$$

$$\text{Range} = \text{Mean} \pm \text{S.E.} \times 95\% \text{ confidence limit}$$

RESULTS

Parasitic infection affected the glucose level in different organs (Tables 1 and 2). In some organs infection caused elevation of glucose level and in some organs infection brought about the decreasing glucose level and in some organs there were minor or no effect at all. In intestine glucose level was found to be enhanced due to infection. In healthy host mean value of intestinal glucose was found to be 34.763 mg/dl and in infected host it was found 41.6mg/dl. In pancreas of the healthy host the mean value of glucose was found to be 28.772mg/dl, while in the infected hosts less decrease in glucose level was measured and average value of glucose level in the infected host was found to be 27.26mg/dl. Infection caused an increase in glucose level more than twice of healthy animals in crop. A mean value of glucose in infected host was found to be 61.636mg/dl and in healthy host's crop it was 28.253mg/dl. In the liver of healthy, glucose level was found to be 54.520mg/dl. In the liver of infected host glucose level was decreased as it was found to be 36.23mg/dl. No marked effect of parasitism was measured in gizzard. Glucose level was noted around 24.66mg/dl in infected and as well as in the healthy host.

Infection produced different effects on lipase in different organs (Tables 3 and 4). Great effect was

Table 1: Glucose Contents in Different Organs of Healthy Pigeon

Organs	Mean of Glucose mg/dl	S.D	S.E	Range
Intestine	34.763	11.17	6.45	47.4-22.12
Spleen	30.142	9.05	5.23	40.39-19.89
Crop	28.253	2.53	1.46	31.11-25.39
Gizzard	24.660	7.52	4.34	33.042-16.298
Pancreas	28.772	8.46	4.89	38.35-19.19
Liver	54.520	13.96	8.07	70.33-38.7

Table 2: Glucose Contents In Different Organs of Infected Pigeon

Organs	Mean of glucose mg/dl	S.D	S.E	Range
Intestine	41.60	8.164	4.719	50.847-32.36
Spleen	26.96	1.92	1.109	29.073-24.727
Crop	61.64	5.513	3.186	67.88-55.392
Gizzard	24.66	7.40	4.277	33.042-16.298
Pancreas	27.26	6.90	3.98	35.076-19.444
Liver	36.23	5.73	3.31	50.45-22.0

Table 3: Contents of Lipase In Different Organs of Healthy Pigeon

Organs	Mean of lipase U/L	S.D	S.E	Range
Intestine	0.346	0.198	0.114	0.569-0.123
Spleen	1.315	0.015	0.0086	1.331-1.299
Crop	0.270	0.01	0.005	0.279-0.261
Gizzard	0.700	0.115	0.066	0.829-0.571
Pancreas	0.320	0.052	0.030	0.378-0.262
Liver	1.461	0.528	0.305	2.058-0.864

measured in crop. In the crop of healthy host, lipase content was found to be 0.27U/l and in infected host it was 4.143 U/l. A decreased level of lipase content was measured in spleen and liver. In healthy host lipase content in spleen was 1.315 U/l and in liver it was 1.461 U/l and in infected host lipase content in spleen was found to be 0.422 U/l and in liver 0.453 U/l. Increase level of lipase content was measured in intestine and pancreas respectively. In healthy host, lipase content in intestine was found to be 0.346 U/l and in pancreas it was 0.32 U/l. In infected host lipase content in intestine was found to be 1.506 U/l, while in pancreas it was measured as 1.37 U/l. In gizzard very less decrease was measured in lipase activity. In gizzard lipase level in healthy host was found to be 0.70 U/l and in infected host it was measured as 0.517U/l.

DISCUSSION

Infection has found to cause alteration in glucose level and lipase enzyme level. Many authors observed alteration in enzymes of host tissues because of parasitic infection in different organs and different hosts. Findley *et al.*, observed that infection caused a decrease in carbohydrate levels in thoracic muscles of blue crab host infected with *microsporida* [11]. Sukhdeo and Mettrick, observed effect of nematode on glucose

level of rat intestine [6]. They found significantly impaired glucose absorption in all regions of small intestine at higher level of infection. It was also reported that low and moderate level of infection caused an enhanced glucose level in intestine.

Wu. *et al.*, observed muscle cells of mice infected with *Trichinella spirallis* or *Trichinella pseudospiralis* [12]. Histo-chemical results showed that during infection insulin signaling pathway related genes in infected muscle cells were up regulated and these expression changes co-related with glycogen accumulation, thus an accumulation of glycogen is found increasing in infected muscle cells. Therefore, an increase in glucose uptake by infected muscle cells during high accumulation of glycogen that caused glucose depletion. Allen and Denforth, observed the effect of *Eimeria acervulina* infection on the metabolism of chick duodenal tissues and observed that rate of oxidation of glucose in duodenal tissues were decreased because of infection [13]. During the study it was also observed that infection caused impaired glucose level in intestine and other organs as well. Infections caused an enhanced glucose level in intestine, crop and liver, while it decreased glucose level in spleen and pancreas. However; Gizzard was found remained unchanged. The most effected organ was crop. This is because most of the glucose consumed by the cestodes and excess volume of

Table 4: Lipase Contents In Different Organs of Infected Pigeon

Organs	Mean of lipase U/L	S.D	S.E	Range
Intestine	1.506	0.185	0.106	1.713-1.506
Spleen	0.422	0.146	0.084	0.586-0.258
Crop	4.143	0.533	0.308	4.746-3.542
Gizzard	0.517	0.109	0.063	0.64-0.39
Pancreas	1.370	0.262	0.151	1.665-1.075
Liver	0.453	0.05	0.028	0.507-0.399

glucose deposited in the form of glycogen so, parasitic infection effect the capability of glucose absorption and deposition in the host body, Fasting of host also effect the glucose level in host. Intensity of parasites also effect on the content of glucose. Seow *et al.*, observed the effect of *Giardia lamblia trophozoites* on trypsin [14], chymotrypsin and amylase invitro. In Giardiasis, pancreatic function becomes abnormal and trophozoites directly inhibited pancreatic lipase activity. Ruff and Read, also observed that in the presence of parasites [10], pancreatic lipase content was inhibited. Inhibition has been reported to depend on many factors like surface area of worms, contact of worms with enzymes pH and some other factor. At high pH, lipase content was enhanced in the presence of worms. Gurney *et al.*, observed effect of *Trypanorhynchus plerocercoids* (cestoda) on the digestive enzyme activity of *Carcinus maenas* [15]. Digestive glands were removed and counted the plerocercoids and observed digestive glands for trypsin, lipase and alpha Glucosidase. Parasitic infection decrease lipase and trypsin activity and no effect on alpha Glucosidase. All these reports are in agreement with the present findings with some minor difference. During the study it was observed that parasitic infection caused decreased lipase content in liver and spleen while in pancreas lipase content was found to be enhanced due to parasitic infection. Higher activity was measured in crop due to infection, less decreased measured in gizzard, because lipase content depend on number of parasites in host.

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Received on 10-08-2012

Accepted on 07-09-2012

Published on 15-09-2012

<http://dx.doi.org/10.6000/1927-5129.2012.08.02.37>

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