THE EFFECT OF L-THYROXINE ON PROTEIN CONTENTS OF MUSCLE, LIVER AND KIDNEY IN BROILER CHICKS (*Gallus gallus*) OF DIFFERENT AGES

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***ABSTRACT**: In present study the effect of a single dose (1.0 μg/g) of thyroxine (T_4) on total protein contents of muscle, liver and kidney in broilers (Hubbard) chicks of different age groups were monitored against time. In birds of all age groups muscle proteins were significantly elevated at 48 hours and the trend persisted till 96 hours of the post injection. Whereas, the liver proteins were found to be increased at 24 hours of the experiment in animals of all different age groups employed in the experiment. The increase in liver proteins in broilers of all these age groups persisted till the culmination of the experiment. The trend of kidney proteins in response to thyroidal administration in broilers belonging to different age groups was almost similar as has been reported above for liver. The results are discussed in the light of earlier reports on bio-chemical role of thyroid hormones in different groups of animals.*

Key words: L-Thyroxine, Proteins, Broiler chicks, Tissue.

INTRODUCTION

It is well established that thyroid hormones (TH) play key role in growth, development, metabolism and cellular proliferation [1,2]. TH are essential in brain development [3] and skeletal growth [4]. The general effect of thyroid hormone is to activate nuclear transcription of large numbers of genes [5]. Therefore all the cells of the body, great numbers of protein enzymes, structural proteins, transport proteins and other substances are synthesized. The net result is generalized increase in functional activity throughout the body. The thyroid hormones also activate nuclear receptors [6]. In addition to increase in general metabolic rate, thyroid hormone modulates the rates of many specific reactions involved in fuel metabolism [7-9]. One of the enzymes increases its activity in response to thyroid hormone is Na^+/K- ATPase [5]. Thyroid hormone act permissively or indirectly in concert with other hormones in stimulating the growth process thyroid hormone is required for growth hormone (GH) secretion in mammals and also in birds and promotes the effects of GH on the synthesis of new structural proteins and on the skeletal growth. Thyroid deficient animals have stunted growth that is reversible with thyroid replacement therapy. Unlike excess GH, however, excess thyroid hormone does not result in excessive growth [8-10].

The effect of thyroxine on growth and protein contents in tissues of various animals of different age groups have been studied previously by many researchers. It has been demonstrated the effect of thyroid hormones and their relation to age was observed in liver and muscle protein of *Sarotherodon mossambica* (Tilapia fish). Thyroid hormones required to increase the weight gain and protein synthesis of fish increased with increase in age. The results showed that thyroid hormones increase the protein synthesis in only young age in fish upto 40g, fish of 230 g showed no response in this respect [11]. The effects of thyroid hormone deficiency in male broiler chicken growing from 7 to 49 days of age indicated that thyroid state alter the liver size of birds [12]. It has been reported that dietary thyroid hormone supplementation inhibit the effect of dietary fat in male broiler chickens from 7 to 28 days of age [13]. Some studies has suggested that synthetic iodinated protein, possessing T_4 activity could be used as a feed additive to increase egg production or growth rate of domestic fowl. T_4 can be directly incorporated into the feed of broiler chicken which did not impair growth performance [14].

The present study on total protein contents in muscle, liver and kidney of broiler chicks in different age groups under the influence of thyroxine will contribute more to the understanding of its biochemical and physiological effects in the body as a whole and at the tissue level as well. The present communication deals with the effect of a single injection of T_4 with time on muscle, liver and kidney total protein contents in chicks of different age groups.

MATERIALS AND METHODS

Broiler chicks of 15, 25, and 35 days old were purchased from poultry form situated in District Sheikhupura, Punjab. The experimental animals of each age group were divided into two groups of 9 each, one control and one experimental. The laboratory was maintained at 24 ± 2 °C. The photoperiod was fixed at 12L: 12D. Humidity of laboratory remained 50 ± 10% during conditioning the birds as well as the experimental period. After grouping the broiler chicks were acclimatized in the laboratory for seven days. After that allocation of groups to control and experimental were made on random basis. During the acclimatization and experimental period the animals were fed on Feed No: 4 of National Company, Lahore. The animals fed *ad libitum* twice a day. The water was also available *ad libitum*. The chicks were fasted for two hours before the start of the experiment. Thyroxine (T_4) purchased from Sigma chemicals, Germany as its sodium salt and was dissolved (mg/ml) in the 50 % alkaline propylene glycol. Thyroxine was injected intraperitonially at a dose of 1.0 μg/g body weight to different age groups. Controls were injected with carrier only. Hormonal dilutions were adjusted in such a manner that the injection volume remained uniform in all groups.

Three broiler chicks were slaughtered from each experimental and control groups after 24, 48, and 96 hours of single injection of thyroxine. Their tissues of muscle, liver and kidney were freeze dried on dry ice and stored at -20 °C. From these tissues protein was extracted and estimated by

Lowry's Method [15]. Statistical analysis of the data was carried out by employing student's t test and graphs were plotted on computer in Microsoft Excel 2007 program.

RESULTS

In the present study the effect of intraperitoneal administration of a single dose (1µg/g) of T_4 after 24, 48 and 98 hours on total proteins contents in muscle, liver, and kidney has been investigated in broiler chicks (*Gallus gallus*) of 15, 25 and 35 days of age.

The effect on total protein in muscle of broiler chicks of different ages administrated with T_4 is represented in fig. 1. Thyroxine treatment resulted a significant decrease of plasma proteins after 96 hours of the experiment in 25 days old chicks and after 48 hours in birds of 35 days age. Whereas, in relatively younger chicks (15 days old) the values for plasma proteins remain comparable in control and experimental groups throughout the experimental period.

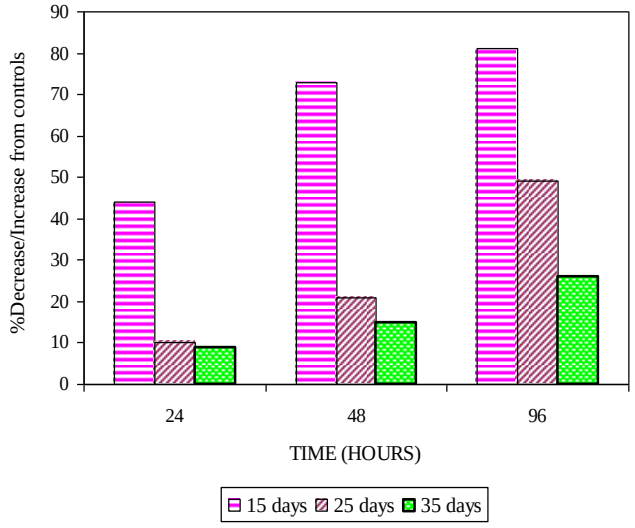

Fig. 1. Effect of single injection of thyroxine (T_4) on total protein contents in muscle of broiler chicks of different ages.

After 24 hours the higher concentrations of 44%, 10% and 9% of total protein contents in 15, 25 and 35 days old chicks respectively were observed in muscle of experimental chicks as compared to control. However, the differences were non-significant in all experimental groups. After 48 hours the greater concentrations of 73%, 21% and 15% of total protein contents in 15, 25 and 35 days old chicks were observed in muscle of experimental chicks as compared to control.

However, the differences were significant in all experimental groups. After 96 hours the higher concentrations of 81%, 49% and 26% of total protein contents in 15, 25 and 35 days old chicks respectively as compared to controls. However, the differences were highly significant in 15 days old experimental group but significant in 25 and 35 days old chicks.

The effect on total protein in liver of broiler chicks of different ages administrated with T_4 is represented in fig. 2. After 24 hours the greater concentrations of 146%, 105% and 117% of total protein contents in 15, 25 and 35 days old chicks respectively as compared to normal. The differences were highly significant in all experimental animals. After 48 hours the higher concentrations of 114%, 92% and 125% of total protein contents in all these 15, 25 and 35 days old chicks respectively were observed in liver of experimental chicks as compared to normal. The differences were highly

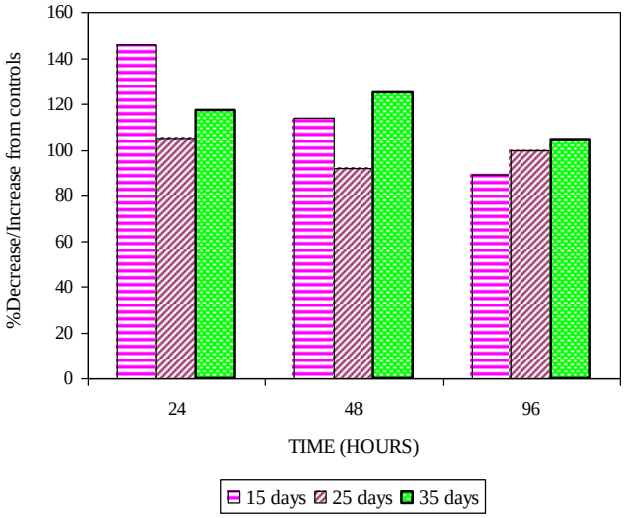

Fig. 2. Effect of single injection of thyroxine (T_4) on total protein contents in liver of broiler chicks of different ages.

significant in 15 days but significant in 25 and 35 days old experimental groups. After 96 hours the greater concentrations of 89%, 100%, and 104% of total protein contents in 15, 25 and 35 days old chicks respectively were observed in liver of experimental chicks as compared to control chicks. The differences were significant in 25 and 35 days old experimental groups.

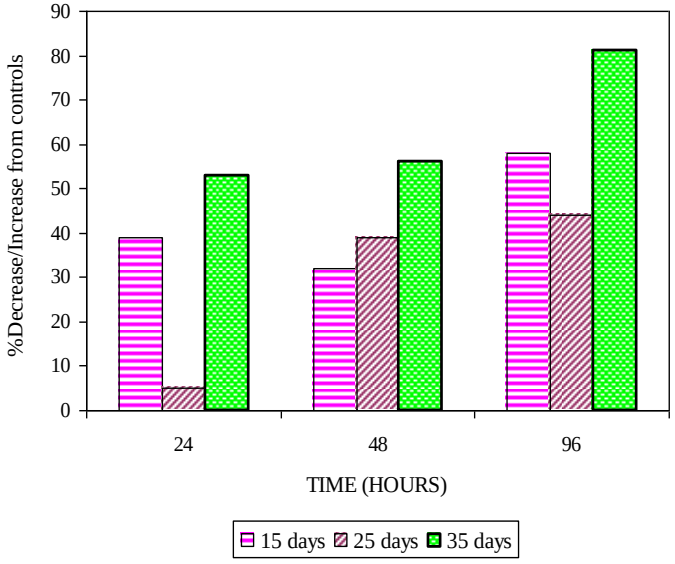

Fig. 3. Effect of single injection of thyroxine (T_4) on total protein contents in kidney of broiler chicks of different ages.

The effect on total protein in kidney of broiler chicks of

different ages administrated with T_4 is represented in fig. 3. After 24 hours the highrt concentration of 39%, 53% and 5% in 15, 25 and 35 days experimental chicks respectively were observed in kidney of experimental chicks as compared to control. The differences were significant in 15 and 35 days old experimental groups but non-significant in 25 days old chicks. After 48 hours the greater concentrations of 32%, 39% and 56% of total protein contents in 15, 25 and 35 days old experimental chicks respectively were observed in kidney of experimental chicks as compared to control chicks. However, the differences were significant in all experimental chicks. After 96 hours the higher concentrations of 58%, 44% and 81% of total protein contents were observed in kidney of experimental chicks of 15, 25 and 35 days old chicks respectively as compared to normal chicks. However, the differences were significant in 15 and 25 days old experimental chicks but highly significant in 35 days experimental animals.

DISCUSSION

The present study was carried out to know the physiological role of thyroxine on broilers (Hubbard) chicks of different age groups. In these studies birds of three different age groups were intraperitonealy injected with a single dose of thyroxine (1.0 µg/g) and total proteins of muscle, liver and kidney were monitored at 24, 48 and 96 hours of the post injection time. These studies have reflected that a single intraperitoneal injection of thyroxine (1.0 µg/g) is capable of inducing changes in total proteins of muscle, liver and kidney in birds of different ages. In comparatively younger birds (15 days old) the muscle protein contents were found to be increased after 24 hours only but the increase became significant ($p < 0.05$) at 48 hours ($p < 0.01$) at 96 hours of post injection time. Whereas, the response of liver and kidney to thyroxine administration was found to be more pronounced in terms of an increase in their protein contents as compared to muscle. Similar trends were observed in muscle, liver and kidney in experimental groups of comparatively advance age (25 and 35 days old).

These studies have indicated that thyroidal administration was equally effective to induce protein anabolic effect in muscle, liver and kidney of broilers of three different age groups. Studies pertaining to age related effect of thyroxine on birds and mammals does not seems to be available in literature. However, age related effect of thyroxine has been reported in teleost fish, tilapia. The optimum dose of thyroxine for one week old fry has been reported to 10 µg/100 ml of aquarium water but for 3 weeks old fry it was found to be 25 µg/100 ml [11]. It has further been reported that in larger fish, the effect of thyroid hormone was present only upto 42 g of weight and no effect in fish of an average weight of 230 g [11,16]. The broilers usually attain its optimum weight at the age ranging between 6-8 weeks. Whereas, in the present study birds of only three age groups (15, 25 and 35 days of age) were employed. It would have been much more interested to try the birds for their response to thyroxine at an age range between 42-56 days. At the same time testing of lower doses of thyroxine than that of 1.0 µg/g (employed in the present study) would have been more informative.

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