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LIVER THYROID AND BODY WEIGHT RELATIONSHIPS IN CARBONTETRACHLORIDE TREATED HYPO AND HYPERTHYROIDIC RATS

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ABSTRACT
Biological observations revealed that administration of carbontetrachloride to hyperthyroidic rats helped the rats in acquiring weight. Whereas, carbontetrachloride administration to hypothyroidic rats resulted into a non significant increase in body weight. Liver-body weight relationship also changed in hyper and hypothyroidic rats. It decreased in hyperthyroidic and carbontetrachloride treated rats but increased in hypothyroidic and carbontetrachloride treated rats.
Key words: Carbontetrachloride, L-thyroxine, thyroid, liver.

INTRODUCTION
Liver plays a central role in the metabolism of many drugs and chemicals.Drug induced hepatic injury is now one of the commonest forms of iatrogenic disease. Hepatotoxicity is the most sensitive and best studied toxic endpoint for carbon tetrachloride exposure (Recknagel, 1967). The thyroid gland produces three hormones thyroxine, tri-iodothyronine and calcitonin. T_3 and T_4 are essential for normal physical and mental development and in the metabolism of protein, carbohydrate and fat. Excessive secretion of these thyroid hormones causes the serious disorder known as hyperthyroidism while inadequate secretion results in hypothyroidism which also has severe pathological consequences. Earlier observations show that thyroid status can changes or modulate the hepatotoxic manifestations of a drug or chemical (Chaudhary and Rana, 2013; Chaudhary, 2013). Davis (1924) first of all studied the effect of diet on carbontetrachloride toxicity. With these perspectives a study on organ-body weight relationship was undertaken in laboratory rat *Rattusrattus* (albino).

MATERIALS AND METHODS
For the proposed investigations, the rats were divided into 6 groups, each containing 10 rats. The body weight of rats was recorded each day and the food intake was regularly monitored. A recordof the change in body weight was maintained. Experimental protocol followed in this study is described in table 1.

Table 1: Experimental protocol employed in present study

Group	Treatment	Dose administered/kg body weight	Vehicle/route	Duration of treatment
A	Control	0.2 ml/kg body weight	Olive oil only	Each alternate day for 30 days
B	Carbontetrachloride	0.2 ml/kg body weight of 2% carbontetrachloride	Olive oil/intramuscular	Each alternate day for 30 days
C	6-N-propyl-2-thiouracil (PTU)	6-N-propyl-2-thiouracil (2.5 µg/100 gm body weight)	Distilled water/intramuscular	Twice a week for 30 days
D	L-thyroxine	L-thyroxine (25-30 µg/100 gm body weight)	Distilled water/intramuscular	On each 4th day for 3 weeks
E	PTU + carbon tetrachloride	After 2.5 µg PTU/100 gm body weight for 30 days (twice a week). Intramuscular 0.2 ml/kg body weight of 2% carbon tetrachloride.	Distilled water/olive oil/intramuscular	30 days + 30 days
F	L-thyroxine + carbon tetrachloride	After L-thyroxine (25 - 30 µg/100 gm body weight) for 3 weeks. Intramuscular 0.2 ml/kg body weight of 2% carbon tetrachloride	Distilled water/olive oil/intramuscular	3 weeks + 30 days

After required days of treatment, the rats were starved for 24 hours and then sacrificed by decapitation in the morning hours.

OBSERVATIONS

Growth

Toxicological observations were divided in two groups i.e. those made during life and those made after sacrificing the experimental model. During present studies the observations made during life included only the biological observations. These observations showed that the weight of rats declined after carbontetrachloride treatment. An inhibition of about 10% in the body weight was recorded. When CCl_4 was administered to hyperthyroidic rats, a gain of about 16% in the body weight was observed. Whereas a non-significant decrease in the body weight of hypothyroidic and CCl4 treated rats was observed (table 2).

Table 2: Effect of hypo and hyperthyroidism on the growth of carbontetrachloride treated rats.

Group	Treatment	Initial body weight(g)	Final body weight(g)	Percent body weight change
A	Control	128	156	+21.88%
B	Carbontetrachloride	186	166	-10.75%
C	6-N-propyl-2-thiouracil (PTU)	142	152	+7.04%
D	L-thyroxine	152	148	-2.63%
E	PTU + carbon tetrachloride	138	146	+5.79%
F	L-thyroxine + carbon tetrachloride	124	144	+16.12%

Results are expressed as mean ± SE (n=5)
+ indicates increase in body weight
-indicates decrease in body weight

Organ-body weight relationship

Organ-body weight relationship have been used by many workers in toxicological investigations. Liver, thyroid and body weight relationships were studied during present observations.

(a) Hepatosomatic index

Hepatosomatic index increased in carbontetrachloride treated rats. However, a decrease was recorded in hyperthyroidic and carbontetrachloride treated rats. Hypothyroidic and carbontetrachloride treated rats regained the weight of the liver (table 3).

(b) Thyrosomatic index

A similar study was made to record the thyroid body weight relationship. Weight of thyroid gland decreased in carbontetrachloride treated rats. However, it increased in hyperthyroidic and carbontetrachloride treated rats (table4).

Table 3: Effect of thyroidal activity on liver-body weight relationship incarbontetrachloride
treated rats.

Group	Treatment	Hepatosomatic index
A	Control	4.0120 ± 0.0588
B	Carbontetrachloride	4.1320 ± 0.1436
C	Hypothyroidic	3.5520± 0.2956
D	Hypothyroidic + carbontetrachloride	4.4158 ± 0.1295
E	Hyperthyroidic	3.2360 ± 0.1913
F	Hyperthyroidic + carbontetrachloride	4.0614 ± 0.1120

Results are expressed as mean ± SE (n=5)

Table 4: Thyroidbody weight relationship in ratstreated with carbontetrachloride after experimental hypo and hyperthyroidism.

Group	Treatment	Thyrosomatic index
A	Control	0.2692 ± 0.0047
B	Carbon-tetrachloride	0.2390± 0.0108
C	Hypothyroidic	0.1536± 0.0120
D	Hypothyroidic + carbontetrachloride	0.3220± 0.0088
E	Hyperthyroidic	0.0876 ± 0.0022
F	Hyperthyroidic + carbontetrachloride	0.3516± 0.0110

Results are expressed as mean ± SE (n=5)

DISCUSSION

Present biological observations reveal that administration ofcarbontetrachloride to hyperthyroidic rats promotes gain in body weight. Whereas, carbontetrachloride administration to hypothyroidic rats causes a nonsignificant increase in body weight. Body weight increase or decrease can be considered a suitable marker of general health. Liver-body weight relationship also changed in hyper and hypothyroidic rats. It decreased in hyperthyroidic and carbontetrachloride treated rats but increased in hypothyroidic and carbontetrachloride treated rats.

Variations in overall growth of rats are probably the most general reflection of the effects of thyroid hormones on protein synthesis. In immature animals and young patients growth is retarted by hypothyroidism. It is restored by replacement doses and is inhibited by an excessive dose of hormone.

RESULT

Biological observations revealed that administration of carbontetrachloride to hyperthyroidic rats helped the rats in acquiring weight. Whereas, carbon tetrachloride administration to hypothyroidic rats resulted into a nonsignificant increase in body weight. Liver-body weight relationship also changed in hyper and hypothyroidic rats. It decreased in hyperthyroidic and carbontetrachloride treated rats but increased in hypothyroidic and carbontetrachloride treated rats.

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