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تأثير هرمون التيروكسين على استهلاك الاكسوجين لخلايا أنسجة الخصية في الأرانب

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تم قياس استهلاك الاكسوجين بواسطة انسجة الخصيه في الأرانب تحت التجريع الفمي لثلاث مستويات من التيروكسين وهي (٦ر٥ ، ١٣ ، ١٩ر٥ مجم/كجم من وزن الجسم) . ومدى علاقة استهلاك الأكسوجين والنسبه الخلويه السرتوليه للدورة الخلويه المنويه التي تشير لوظيفة الخصيه الخارجيه ومدى علاقته ايضا مع خلايا ليدج .

وقد أدت الجرعة الأولى ٦ر٥ مجم/كجم من وزن الجسم الى انخفاض مستوى استهلاك الاكسوجين . وانخفاض النسبه الخلويه السرتوليه للدورة الخلويه المنويه .

بينما أدت الجرعه الثانيه والثالثه (١٣ ، ١٩ر٥ مجم/كجم من وزن الجسم) الى زيادة استهلاك الاكسوجين . وهذه الزيادة في تناسب طردى مع زيادة النسبه الخلويه السارتولية للدورة الخلويه المنويه وزيادة عدد خلايا ليدج . وقد استنتج أن زيادة استهلاك الاكسوجين تحت تأثير هرمون الثيروكسين يرجع الى زيادة عدد خلايا الخصيه أكثر من زيادة النشاط الأنزيمي المؤكسد في عمليه التمثيل الغذائي .

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EFFECT OF THYROXINE ON THE OXYGEN CONSUMPTION OF TESTICULAR TISSUE IN RABBIT

(With One Table)

By
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SUMMARY

The oxygen consumption of testicular tissue of rabbit was measured under oral administration of three dose levels 6.5, 13 and 19.5 mg/Kg body weight of thyroxine therapy. The oxygen consumption was correlated with the Sertoli cell ratio of the spermatogenic cell cycle as an index of exogenous function of the testis and the status of Leydig cells. 6.5 mg thyroxine resulted in lowered oxygen consumption and lowered Sertoli cell ratio of spermatogenic cell cycle. The other two doses 13 and 19.5 mg/Kg body weight resulted in increased rate of oxygen consumption correlated with increased Sertoli cell ratio of spermatogenic cycle and hyperplasia of Leydig cells. The increase in the oxygen consumption was proportional to the increase in Sertoli cell ratio. It was concluded that the increase in oxygen consumption under thyroxine therapy is related to the increase in number of testicular cells rather than to the increase metabolic enzymatic activity of oxidative processes.

INTRODUCTION

The general action of thyroxine on tissue is to increase the metabolic activity of oxydative enzymes. For testicular tissue, the data presented in the literature were controversal.

Several workers have reported that testicular tissue did not exhibit an increased in vitro oxygen consumption following in vivo thyroxine treatment whether endogenous substrates or exogenous glucose supported respiration (BARKER and SCHWARTZ, 1953).

MASSIE, GOMES and VAN DEMARK (1969) found that thyroxine injection had no effect on oxygen consumption by the testis of rats, while thyroidectomy decreased oxygen consumption. QUASIER, KAMBOF, CHOWDHURY and CHOWDHURY, (1971), observed that thyroxine had no effect on oxygen consumption of testis in adult male rats, but in thyroidectomised one oxygen consumption of seminiferous tubules decresed which become again normal after thyroxine therapy.

OMKAR and AJIT (1979) showed that thyroxine increased utilization of oxygen by testis of poultry, while goitrogen treatment reduced the oxygen consumption. Thyroid hormone is believed to stimulate oxygen utilization through its action on mitachondria (Mc DONALD, 1969). However testicular tissue from thyroxine-treated rats consumed more oxygen in the presence of succinate in one study, but not in another (MASSIE, GOMES and VAN DEMARK,

1969).

The aim of this work is to correlate the oxygen consumption of testicular tissue to testicular function evaluated by Sertoli cell ratio of the spermatogenic cell cycle under three dose levels of oral thyroxine therapy.

MATERIALS and METHODS

Three doses of thyroxine 6.5, 13 and 19.5 mg/Kg body weight were given orally to three groups of Baladi male rabbits of body weight 11/2 : 2 Kg. Five rabbits were used as control. Each group was 10, 7 and 5 rabbits respectively. Thyroxine was given dialy up to 12 days. Animals were slaughtered, oxygen consumption of these animals were calculated using YSI Model Biological oxygen Mointer apparatus. The oxygen consumption was expressed as ULO/100 mg wet tissue/hour.

RESULTS and DISCUSSION

Oral administration of 6.5 mg/Kg body weight thyroxine for 12 days decreased oxygen consumption from 185 to 164.5 ULO/100 mg tissue/hour. The percent of decrease represented 11.1%. The other two doses of thyroxine vice versa raised the oxygen consumption of the testicular tissue. 13 mg/Kg body weight thyroxine increased the oxygen consumption from 185 to 194.4 ULO/100 mg tissue/hour. The percent of increase was 5.1%. The third dose of thyroxine 19.5 mg/Kg body weight raised the percent of oxygen consumption five time as that of the second dose. The percent increase was 28.2%. Oxygen consumption was raised from 185 of control to 237.2 ULO/100 mg tissue/hour (Table 2).

Interpreting the oxygen consumption as a function index to testicular tissue activity, a correlation was found between the oxygen consumption and the spermatogenic cell cycle under the three different levels of thyroxine administration (NASSAR, FAHMI, ABD EL-KADER, MABROUK, 1985).

With the first thyroxine dose 6.5 mg/Kg body weight, the oxygen consumption decresed to 11.1%. This finding was in correlation with decreased Sertoli cell ratio of total spermatocytes from (16.5 to 12.8) and Spermatids from (24.8 to 23.9). With the second dose of thyroxine 13.0 mg/Kg body weight, oxygen consumption was increased 5.1%. A correlation increase in the Sertoli cells from (13.6 to 4.6), Sertoli cell ratio of Spermatognia from (4.9 to 6.1) and spermatids from (24.8 to 27.8) was observed. The high percentage of oxygen consumption increased to 28.2% resulted from administration of 19.5 Umg/kg weight thyroxine. Also was correlated with high increase of Sertoli cell number from (3.6 to 4.9), the Sertoli cell ratio of spermatogonial production from (4.9 to 5.6) and the sertoli cell ratio of spermatids from (24.8 to 32.9).

It may be concluded that the increased oxygen consumption of testicular tissue is due to increased number of the cells rather than increased oxygen consumption as metabolic activity of the cell. The increased cell number was variable with the dose level. In the light of these two facts, we can explain the contradictory results presented in literature. MASSIE, COMES and VAN DEMARK, (1969) reported dcereased testicular oxygen consumption under thyroid therapy. Vice versal reports on increased oxygen consumption of testicular tissue under thyroxine administration were stated by MAQSOOD and REINEKE (1950), Mc DONALD, (1969) and OMIKAR

& AJIT SINGH (1979). While QUAISER, KAMBOY, CHOWDHURY and CHAWDHURY (1971) reported no effect of thyroxine therapy on testicular oxygen consumption.

In all the previous data only one level of thyroxine dose were used. Also they looked to the testicles as a tissue and determined per weight for oxygen consumption. In our work, the determined weight of testicular tissue was looked as a dynamic one and can only be evaluated by the spermatogenic cell cycle using Sertoli cell ratio as an index for this dynamic function. Different dose level is important in hormonal therapy as the first dose caused decrease in the oxygen consumption and other doses caused increase in the oxygen consumption.

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Table (1)

Average O consumption expressed in U L O/100 mg Wet tissue/hour and O consumption in percent to contral for rabbits treated wih different doses of thyroxine (6.5, 13 and 19.5 mg/Kg) daily for 12 days.

Dose. Case	Case number	1	2	3	4	5	6	7	8	9	10	Mean S.E.
Control	ULO_2	124.2	136.8	183.6	217.8	264.6	-	-	-	-	-	185 ±25.9
6.5 mg/kg	ULO_2	160.2	156.6	158.4	187.2	140.2	160.2	163.8	144.0	194.4	180.0	164.5± 5.6
	O_2 %	13.6*	15.5*	14.6*	1.0*	24.3*	13.6*	11.7*	22.3*	4.9**	2.9*	11.1
13.0 mg/kg	UL O_2	154.8	176.4	145.8	214.2	207.0	234.0	228.6	-	-	-	194.4±13.4
	O_2 %	16.5*	4.9*	21.7*	15.5**	11.7**	26.3**	32.2**	-	-	-	5.1
19.5 mg/kg	UL O_2	248.4	225.0	225.0	262.8	225.0	-	-	-	-	-	237.2± 7.8
	O_2 %	34.9**	21.4**	21.4**	41.7**	21.4**	-	-	-	-	-	28.2**

± : Standard Error.

* : decreased O Consumption.

**: increased O Consumption.