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COMPLICATIONS IN HEPATIC PROTEINS AND NUCLEIC ACIDS METABOLISM UNDER THE INFLUENCE OF BAYTHROID TOXICITY IN RATS AT DIFFERENT THYROID STATES

EL ELAIMY, I. A. [1] ABOU SINNA, G. [2] AND AL. SHERBINY, S. [3]

1- Faculty of Science, Taiz Univ., Taiz, Yemen.
2- Faculty of Science, Ain Shams Univ. Cairo. Egypt
3- Faculty of Science, Mansoura Univ. Mansoura, Egypt

ABSTRACT

The influence of different thyroid dysfunctions on the toxicity of pyrethroid insecticide (baythroid) was studied. Groups of experimental animals (Rattus rattus) were prepared to be in euthyroid, hypothyroid and hyperthyroid states. The effects of acute (LD50) as well as subchronic (1/10 LD50/ day ×10) of baythroid were investigated.

The data recorded revealed that oral injection of euthyroid rats with either acute or multiple doses of baythroid induced marked reduction in total serum and liver proteins. In contrast, the levels of amino acids in serum and liver were markedly increased. Moreover, there effects run in parallelism with reductions in hepatic nucleic acids (RNA & DNA) contents. The modifications in proteins; amino acids and nucleic acids metabolism under the stress of baythroid were also followed-up during different thyroid states. The results obtained were discussed.

INTRODUCTION

The problem of environmental pollution by pesticide has become one of the major problems which face developing countries. Numerous individuals, societies, public organizations, governmental agencies, have become involved in the evaluation of the benefits and risks of the use of pesticides specially the risks which the pesticides may pose to human beings and ecosystem.

The relationship of exposure to environmental pollutants related to pesticides and carcinogenesis is a second area of medical concern. There is an evidence that 80% of human neoplasms are directly or indirectly dependent upon environmental factors (Higginson, 1975). Thus, it is not surprising that in medical concern, the present and past pesticide management might pose a risk of cancer.

The interference of insecticides with nucleic acid and protein synthesis has been reported by many authors (Chung et al., 1967; Sharma et al., 1967; Gupta and Paul, 1978; Enan et al., 1982 c, d and El-Banhawy &El-Ganzuri, 1984, El.Elaimy et al, 1994).

In their study, Chung et al. (1967) cultured HeLa S cells in presence of various levels of p, p' DDT and dieldrin. Both agents caused inhibition of DNA, RNA and protein synthesis as assessed by the rates of incorporation of isotopic precursors of these macromolecules. However, these changes appeared to be, erratic in that the measured rates of incorporation were increased, decreased or virtually unchanged depending upon the concentration of DDT or diedrin.

Similarly, Walker et al. (1977) found that the effect of dieldrin on the de novo RNA purine synthesis from formate in vivo were slight, while mirex inhibited the synthesis of RNA purines. Moreover, the same authors reported that dieldrin inhibited the in vitro incorporation of thymidine, uridine and L-leucine into DNA, RNA and protein respectively, while mirex was virtually without effect. Also ducks fed various dietary levels of dieldrin showed reductions in liver protein, deoxyribonucleic and ribonucleic acid contents (Sharma et al., 1967).

The pattern of blood serum proteins of 129 workers was investigated after long term exposure to pesticides (Baresel' Yants, 1969). The author reported that the hypoproteinemia and elevation of α-globulin recorded in the serum of the workers were permanent with increasing the exposure time. Also a general decrease of plasma and skeletel muscle proteins was found after treating the rabbit with DDT, lindane, dipterex (Gabr and Abu Sinna, 1973).

Similar reduction of the plasma protein has been reported also in buffalo calves orally administered higher doses of malathion, however, lower doses of the same insecticide have no effect on plasma proteins (Gupta and Paul, 1978). The protein content of liver and other tissues of white rats was also affected due to exposure to different insecticides. Acute doses of malathion, dimethoate and dichlorvos

(organophosphates) increased liver protein in both sexes (Enan et al., 1982 a). Further, sublethal doses of the other organophosphates; profenofos, methyl parathion and sulprofos induced noeffect on liver protein of rats which were sacrificed at intervals of 6,24 and 48 hours post-treatment. On the other hand, Sanad (1989a) reported a decreased RNA and total proteins of the spinal ganglion neurons of the rat treated with dimethoate.

In a recent study, the administration of 1/10 LD_{50} of either aldicarb or decis to normal or bilharzial infected mice caused remarkable reductions in RNA and DNA content of the liver. However, such reductions were more pronounced in case of bilharzial infected micc (El-Elaimy, 1989). Similar reducions in liver nucleic acids were also reported by the same author after administration of rogor to mice at acute and chronic levels (El-Elaimy and El-Nabi, 1990b). Decreased DNA, RNA and total proteins of the liver after administration of permethrin to male rats have been reported also by Sanad (1989 b). The author indicated that such decreases were time and dose dependent.

Saleh et al. (1991 b), in their study on the effect of repeated oral administration of pirimiphos-methyl (organophosphate) to pigeons and chickens, reported a significant decrease of total serum protein of chickens while that of pigeons was not affected. Also total liver protein was significantly decreased in chickens while it was increased in pigeons. On using cypermethrin (Pyrethroid), the total serum protein of the pigeon was significantly decreased whereas total liver protein was significantly increased (Saleh et al., 1991 a). Investigations carried out on the effects of such pyrethroids are mostly restricted to the response of normal animals to different levels of intoxication. The hormonal state is not taken into consideration in most studies. As the thyroid hormones play a major role in the general metabolism of the body, the present investigation focuses on studies conducted to determine the responsiveness of rats during hypo- and hyperthyroid states to acute and subchronic baythroid poisoning. Studies of protein and nucleic acid metabolism served as a useful model for monitoring the toxicity of the pesticide used in the investigation.

MATERIALS AND MEIHODS

Insecticide and Treatments

Baytthroid is an insecticide belongs to pyrethroid group. It was purchased from Bayer Company. The desired concentrations were prepared by emulsification with water.

Male albino rats (Rattus rattus) weighing 200-250 gm were used as experimental animals- Normal health rats were considered euthyroid. Hypothyroid rats were prepared by oral administration of propylthuiouracil (PTU) 50mg 1kg 1day x20. Another group of rats were made hyperthyroid by injection with 3.5-triiodo-thyronine (T3) O. 15 mg /kg 1 day x6 i.p. The toxicity of baythroid was estimated for rats under different thyroid states in our Lab. before experimentation (The LD50 was 60 mg /kg. B.wt.; for euthyroid; LD50=45mg /kg b.wt.; for bypothyroid LD50=85 mg/kg b.wt. for hyperthyroid rats).

Acute treatments were made by oral injection with LD50 of insecticide and groups of animals were decapitated 12h and 24h after acute intoxication. In subchronic study; rats of different thyroid states were daily administered with 1/10 LD50 orally for 10 days. Batches of five rats were decapitated at intervals of 1,5,10,15,25 days after the last dose (folllow-up period).

Methods

The total protein contents in serum and liver tissue homogenate were determined using the method described by Lowry, et.al., (1951). Total free amino acids were determined according to Moore and Stein (1948). Nucleic acids contents in liver tissue were also determined according to methods of Dische and Schowrz (1937) for DNA and Mejbaum (1939) for RNA.

Statistical analysis of data was calculated according to student "t" test (Hill, 1971).

RESULTS AND DISCUSSION

The interference of different insecticides with different metabolic pathways was reported by numerous authors. Thus, the influence of many insecticides on carbohydrate metabolism (Kacew & Singhal, 1971, 1973; Gabr and Abu Sinna, 1973; Abdel Raheem et al., 1987), lipid metabolism (Buchet et al., 1977; Kaushal and Gupta, 1977; Dudeja & Mahmood, 1982 and El-Elaimy et al., 1988 c) as well as on protein metabolism (Chung et al., 1967; Gabr and Abu sinna, 1973;

Lin & Dorough, 1974; Surinder & Pawar, 1975) has been reported in many investigations. Nevertheless protein and amino acids as well as mucleic acid metabolism is superfically examined under influence of few pesticide representatives. The effects of these pesticides were studied only in normal (euthyroid) animals. However, in the present investigation, an attempt has to be carried out to study the effect of baythroid (Pyrethroid compound) on the previous parameters in rats at different thyroid states.

The data presented herein, revealed that treatment of normal (euthyroid) rats with either acute (LD_{50}) or multiple doses of baythroid induced a significant reduction in total hepatic protein content, accompanied by a similar reduction in the serum protein level. On the other hand, the free amino acids content of liver of the same animals and their serum levels were markedly increased. Moreover, these profound effects were in parallel with the reductions in the hepatic DNA content. (Fig. 1-3)

In this respect, Chung et al. (1967) showed that DDT and dieldrin were able to alter the rate of DNA, RNA and protein synthesis. In ducks fed on various dietary levels of dieldrin, reductions in liver protein, deoxyribonucleic and ribonucleic acid contents were recorded (Sharma et al., 1976). Moreover, the effects of dieldrin on de novo RNA purine synthesis from formate in vivo were slight, while mirex inhibited the synthesis of RNA purines (Walker et all., 1977). The same authors reported also that dieldrin inhibited the in vitro incorporation of thymidine, uridine and L-leucine into DNA, RNA and protein respectively, Sinilar results were also recorded in cultured HeLa S cells in presence of various levels of p.p DDT and dieldrin (Chung et al., 1967). Metasystox was able to induce a marked decrease in DNA in all brain regions, however, the RNA level was decreased only in the cerebellum (Tayyapa et al., 1981).

In their investigation, Shaker et al. (1988) reported that treating rabbits with dimethoate (organophosphate) and deltamethrin (pyrethroid) caused a significant decline in serum protein which was mainly due to the decline in serum globulin but not in albumin. Such decline was attributed to the decrease in nucleic acids and protein synthesis (El-Assar, 1982) and / or to the inhibition of several endogenous enzymes including transaminases (GOT & GPT) glutamyl transferase (GT) and lactate dehydrogenase (Enan et al., 1982 c).

Working on the herbicide; captan, Gale et al. (1971) and Martin & Lewis (1979) and the pesticide; rogor, El-Elaimy & El-Nabi (1990 b) reported that the reduction of hepatic nucleic acid content is attributed to the direct interaction of such compounds with the nucleic acid synthesizing system. Dillwith & Lewis (1980) recorded an inhibition of DNA polymerase β activity in isolated bovine liver nuclei by captan indicating that such compound inhibited DNA synthesis by acting directly on DNA polymerase catalyzed reactions rather than by causing a non-specific or indirect effect on the nuclear system.

The manifestation of hyperaminoacidemia was reported to be due to increased skeletal muscle protein catabolism which was a consistent finding in pesticide intoxicated animals (Prasad, 1986). However, the significant decrease in the activity levels of transaminases ("GOT & GPT) in liver (previously mentioned) may be furthermore suggestive of a reduced hepatic utilization of amino acids by hepatic cells (Rajendra et al., 1988).

In the present investigation, the protein metabolism was also examined during the states of both hypothyroidism and hyperthyroidism. Intoxication of the hypothyroid rats with baythroid (at both acute or subchronic levels) furthermore potentiated the previous effects. In hypothyroid rats subchronically treated with baythroid, the hepatic protein content as well as its serum concentration were exposed to remarkable decreases. These reductions in total proteins were accompanied by marked reductions in the nucleic acids (RNA & DNA) of the liver. Measurements of the total free amino acids, under the same condition, showed remarkable increases in their hepatic contents and their serum levels (Fig. 4-9).

In human as well as in experimental hypothyroidism, a general decrease in both synthesis (Crispell et al., 1965) and degradation (Hoberan & Graff, 1951) of proteins have been reported. Moreover, the rate of protein synthesis in vitro by both mitochondria (Roodyn et al., 1965) and microsomes (Sokoloff & Kaufman, 1961) from hypothyroid animals is substantially reduced and could be restored toward normal level by replacement of thyroid hormone in vivo. It was suggested also a major role of the thyroid hormones in mammals including an interaction with the cell nucleus. Such interaction brings about the induction of specific messenger RNA (Tata & Widnell, 1966) and subsequently protein synthesis.

Evidently, from the data obtained herein, the effects of baythroid on hyperthyroid rats were modified. So, the rats suffered from thyrotoxicosis exhibited remarkable increase in hepatic nucleic acid content. However amino acids in liver and serum exhibited a measurable reduction assuming their incorpotation into new proteins. It has been reported that thyrotoxicosis led to increased rates of synthesis of mitochondrial DNA (Gadaleta et al., 1986), RNA (Barsano et al., 1977; Gadaleta et al., 1986) and proteins (Ichikawa et al., 1985; Siehl et al., 1985; Gadateta et al., 1986). Furthermore, the induction of a cytosolic protein by thyroid hormone that may potentially modulate mitochondrial protein synthesis in the liver has been recorded (Ichikawa et al., 1985). In addition, high concentration of T_4 added directly to mitochondria in vitro can stimulate amino acid incorporation by these organelles (Bronk, 1963).

Despite much information on selected aspects of the action of thyroid hormones, a detailed understanding of the mechanism by which these hormones regulate the cellular processes has not been reached. However, at present, the hypothesis of nuclear thyroid hormone action appears to be gaining the strongest experimental support (Gallo et al., 1987). According to this model, the first significant interaction of thyroid hormones in the cell is with receptor proteins located in the nucleus. This interaction is thought to lead to specific alterations in the production of RNA and subsequently in protein synthesis. This view supported well the data obtained in the present investigation.

REFERENCES

Abdel Raheem, Kh., El-Elaimy, I. A., El-Mossallamy, N., and Sherief, N., 1987. Biochemical responses to induced intoxication with insecticides II. Effect of acute and repeated administration of pyrethroid (ripcord). Proc. Zool. Soc. A.R. Egypt, V.15, p. 141.

Baresel' Yants, G. B., 1969. Effect of toxic chemicals on human blood serum proteins. Gig. Tr. Prof. Zabol., p. 13-50.

Barsano, C. P., Degroot, L. J., and Getz, G. S., 1977. The effect of thyroid hormone on in vitro rat liver mitochondrial RNA. Synthesis. Endocrinology, 100: 52.

Bronk, J. R., 1963. The nature of the energy requirement for amino acid incorporation by isolated mitochondria and its significance for thyroid hormone action. Proc. Nat Acad. Sci. USA, 50:524.

Buchet, J. P., Lauwerys, R., and Roels, H., 1977. Long-term exposure to organophosphorus pesticides and lipid metaolism in the rat. Bull. Environ. Contam. Toxicol., 15:437.

Chung, R. A., Huang, I. L.O., and Brown R.W., 1967. Studies of DNA, RNA and protein synthesis in HeLa S cells exposed to DDT and dieldrin. J. Agr. Food Chem., 15:497.

Crispell, K. R, Parson, W., and Hollifield, G., 1956. A study of the rate of protein synthesis before and during the administration of L-triiodothyronine to patients with myxodema and healthy volunteers using N-15 glycine. J. Clin. Invest., 35:164.

Dillwith, J. W. and Lewis, R. A., 1980. Inhibition of DNA polymerase B activity in isolated bovine liver nuclei by captan and related compounds. Pestic. Biochem. Physiol., 14:208.

Dische, Z., and Schowrz, K., 1937. Cited inMikrochim. Acta, 2:13, Quoted from Abdel Salam, I.M., Ph. D. Thesis, Fac. Of Science, Ain Shams Univ., 1983.

Dudeja, P. K., and Mahomood, A., 1982. Effect of single oral dose of pp. DDT on the absorption of nutrients in vitro and on brush border enzymes in rat intestine. Arch. Toxicol., 49:131.

El-Assar, M. R. S., 1982. Interaction of insecticides with protein and RNA biosynthesis and activity of related enzyme in rabbit tissues. Ph. D. Thesis. Faculty of Agriculture, Alexandria Univ., Egypt.

El-Banhawy, M. A. and El-Ganzuri, M. A., 1984. Nucleic acids responses to treatment with insecticides: A histochemical study on the liver of the white rats. Ain Shams Sci. Bull., 24(B):293.

El-Elaimy, I. A., 1989. Interaction of hepatic Schistosomiasis mansoni and hepatotxic insecticides administration. IV Effect on liver nucleic acids contents. Sci. J. Fac. Sci. Menoufia Univ., 3:167.

El-Elaimy, I. A. Bayomy, M. F. F. and Al-Sharkawi, I. M., 1988 c. Intoxication potentialities of oral and dermal application of some insecticides. III. Influence on lipid metabolism. 13th Inter. Cong. Stat. Comp. Sci. Soc. And Demo. Res., p. 129.

El-Elaimy, I. A. and El-Nabi, S. E. H., 1990 b. Influence of thiola on pesticide induced intoxication. IV. Effect on nucleic acid metabolism. J. Egypt. Soc. Toxicol., 5:15.

El-Elaimy, I. A., Beshai, R. M., Elowa, Sh. E. and Hussein, A. B., 1994. Toxicological effects of dimethoate on proteins and nucleic acids metabolism in tissues of freshwater fish (Sarotherodon galilaeus). J. Egypt, Germ. Soc. Zool. V.14(A), p.473-494.

Enan, E. E., Berberian, I. G., Enan, O. H., El-Fiki, S., and El-Masry, M., 1982 a. Effect of some organophosphorus insecticides on certain biological functions in white rats. Proc. Second Egyptian. Hungarian Conf. Plant Prot., Alexandria, Egypt, p. 421.

Enan, E.E., El-Sebae, A.H., Enan, O.H. and El-Fiki, S. (1982 c): In vivo interaction of some organophosphorus insecticides with different biochemical targets in white rats. J. Environ. Sci. Health, B 17 (5): 549.

Enan, E. E., Enan, O. H. and El-Sebae, A. H., 1982 d. Biochemical targets affected by sublethal doses of organophosphorus insecticides. Int. Pest control, 24:120.

Gabr, M. E. A. and Abu Sinna, G. M. E., 1973. The effect of some chemical insecticides on the carbohydrate and nitrogenous substances in the rabbit; Oryctolagus cuniculus. Ain Shams Sci. Bull., 14:225.

Gadaleta, M. N., Minervini, G. R., Renis, M., De Giorgi, C., and Giovine, A., 1986. Mitohondrial DNA, RNA and protein

synthesis in normal and hypothyroid developing rat liver. Cell Differ., 19:43.

Gale, G. R., Smith, A. B., Atkins, L. M., Walker, jr. E. M. and Gadsden, R. H., 1971. Pharmacology of captan: Biochemical effects with special reference to macromlecular synthesis. Toxicol. Appl. Pharmacol., 18:426.

Gallo, G., Voci, A., Schwarze, P.E., and Fugassa, E., 1987. Effect of triiodothyronine on protein turnover in rat hepatocyte primary cultures. J. Endocro., 113:173.

Gupta, R.C., and Paul, B. S., 1978. No-effect level of malathion (o,o'-dimethyl dithiophosphate of diethyl mercaptosuccinate) in Bubalus bubalis. Bull. Environ. Contam. Toxicol., 20:819.

Higginson, J., 1975. cancer etiology and prevention, in persons at high risk of cancer-An approach to cancer etiology and control (Fraumeni, J.F. Jr., Ed.), Academic Press, New York.

Hoberman, H. D., and Graff, J., 1951. Influence of thyroxine on the metabolism of amino acids and proteins during fasting. Yale J. Biol. Med., 23:195.

Ichikawa, K., Hashizume, K., Kobayashi, M., and Yamada, T., 1985. Evidence for induction by thyroid hormone of cytosolic proteins which control mitochondrial protein synthesis. Endocrinoloygy, 117:174.

Kacew, S. and Singhal, R. L., 1971. Stimulation of renal gluconeogenesis by DDT. Proc. Canad. Fed. Biol. Soc., 14:67.

Kaushal, M., and Gupta, P. K., 1977. Endrin intoxication in normal and irradiated rats. II. Lipid, phospholipid and cholesterol content. Bull. Environ. Contam. Toxicol., 18(3): 355.

Lin, T., and Dorough, H. W., 1974. Infuence of insecticide exposure on the in vivo and in vitro metabolic activity of rats. Arch. Environ. Contam. Toxicol., 2(4):364.

Lowry, O. H., Rosebrough, N. J., Farr, A.L., and Randall, R. J., 1951. Protein measurement with the Folin phenol reagent. J. Biol. Chem., 193:265.

Martin, D. H. and Lewis, R. A., 1979. Alterations of mucleic acid and protein synthesis in vivo in the chick embryo mediated by captan. Xenobiotica, 9:523.

Mejbaum, W., 1939. Z. Physiol. Chem., 528:117. Quoted from, Hassouna, I.A. (1989): Biochemical & immunological studies on the effect of tranquillan on experimental animal (Rattus ratus) M.Sc. thesis, Fac. Sci., Mansoura Univ.

Moore, S., and Stein, W. H., 1948. Photometric ninhydrin method for use in the chromatography of amino acid. J. Biol. Chem., 176:367.

Prasad, G. B., 1986. Hexachlorophene neurotoxicity in mice: implications of altered nitrogen metabolism. Ph.D. thesis, S.V. University, Tirupati. India.

Rajendra, W., Prasad, G.V., and Indira, K., 1988. Deviations in hepatic amino acid profiles of mouse following repeated hexachlorophene administration. J. Environ. Sci. Health, B 23(4):409.

Roodyn, D. B., Freeman, K. B. and Tata, J. R., 1965. The stimulation by treatment in vivo with triiodothyronine of amino acid incorporation into protein by isolated rat-liver mitochondria. Biochem. J., 94:628.

Saleh, F., El-Hhater, A. A., and Nasr, E. N., 1991 a. Effect of synthetic pryethroid cypermethrin on protein metabolism in the pigeon, J. Egypt. Ger. Soc. Zool., 3:63.

Saleh, F., Saify, A. A., and El-Shater, A. A., 1991 b. Effect of the organophosphorus insecticide pirimiphos-methyl on protein metabolism in the pigeon and chicken. J. Egypt. Ger. Soc. Zool., 3: 51.

Sanad, S. M., 1989 a. Effects of the organophosphorous insecticide "dimethoate" on the ribonucleic acid and protein contents in rat spinal ganglion neurons. Bull. Fac. Sci., Zagazig Univ., 11:434.

Sanad, S. M., 1989 b. Histochemical studies on the effect of the pyrethroid insecticide "permethrin" on the rat liver cells. Bull. Fac. Sci., Zagazig Univ., 11:450.

Shaker, N., Hassan, G. a., El-Nouty, F. D., Abo-Elezz, A., and Abd-Allah, G. A., 1988. In vivo chronic effect of dimethoate and deltamethrin on rabbits. J. Envirom. Sci Health, B 23(4): 387.

Sharma, R. P., Winn, D. S., and Low, J. B., 1976. Toxic neurochemical and bchavioural effects of dieldrin exposure in mallard duck. Arch. Environ Contam. Toxicol., 5:43.

Siehl. D. L., Chua, B. H. L., Lautensach-Belser, N., and Morgan, H.E., 1985. Faster protein and ribosome synthesis in thyroxine-induced hypertrophy of rat heart. Am. J. Physiol., 248 (cell physiol. 17): c 309.

Sokoloff, L., and Kaufman, E., 1961. Thyroxine stimulation of amino acid incorporation into protein. J. Biol. Chem., 236:795.

Surinder, M. and Pawar, S. S., 1975. Hepatic drug metabolizing enzymes and lipid peroxidation in young growing male rats during treatment with an organophosphorus insecticide (0,0-dimethyl malathion). Indian J. Med. Res., 63(10): 140.

Tata, J. R. and Widnell, C. C., 1966. Ribonucleic acid synthesis during the early action of thyroid hormones. Biochem. J., 98:604.

Tayyapa, K., Hasan, M., Islam, F., and Khan, N. H., 1981. Organophosphate pesticide etasystox-induced regional alterations in brain nucleic acid metabolism. Indian J. Exp. Biol., 19:688.

Walker, JR. E. M., Gale, G. R., Atkins, L. M., and Gadsden, R. H., 1977. Some effects of dieldrin and mirex on Ehrlich Ascite tumor cells in vivo and in vitro. Arch. Environ. Contam. Toxicol., 5:333.

"الاختلالات في أيض البروتينات والأحماض النووية الكبدية تحت تأثير سمية مبيد البايثروويد في فئران التجارب أثناء الحالات المرضية المختلفة للدرقية"

إبراهيم العليمي ، جمال أبو سنة ، سعيد الشربيني

ملخـــــص البـــــحث

- تم دراسة مدى تأثير الإختلالات المحدثة في الغدة الدرقية لفئران التجارب في سمية مبيد حشري ((البايثروويد)).
- استخدم لذلك فئران التجارب من نوع الـــرات الأبيـــض والتـــي قسـمت علـــى مجموعات وأعـــدت المجموعـــات لتكـــون فـــي حـــالات الدرقيـــة المختلفـــة.

تم حقن مبيد ((البايثروويد)) على مستويين من الجرعات:

أ- الجرعة المفردة الحادة ... بحقن (2/1) الجرعة القاتلة للنصف عـــن طريـــق الفم.

ب- الجرعات تحت الحادة المتكررة... بحقن (10/1) الجرعة القاتلة عن طريـــق الفم يومياذ لمدة عشرة أيام

- تم دراسة مدى الإختلال في أيض البرويتينات والأحماض النووية تحت تأثير الجرعات السابقة من المبيد في حالات الدرقية المختلفة.
- سجلت النتائج نقص ملحوظ في تركيز بروتينات الدم والكبد أما الأحمـــاض الأمينية فقد أظهرت زيادة في تركيزها في كل مـــن مصـــل الـــدم والكبـــد وتلازمت هذه التغيرات مع نقص ملحوظ في محتوى الكبد مـــن الأحمـــاض النووية.
- تباينت هذه التغيرات تحت تأثير نفس الجرعات للمبيـــد أثنـــاء الإختـــلالات الدرقية المختلفة.
- نوقشت النتائج في ضوء الأبحاث السابقة.

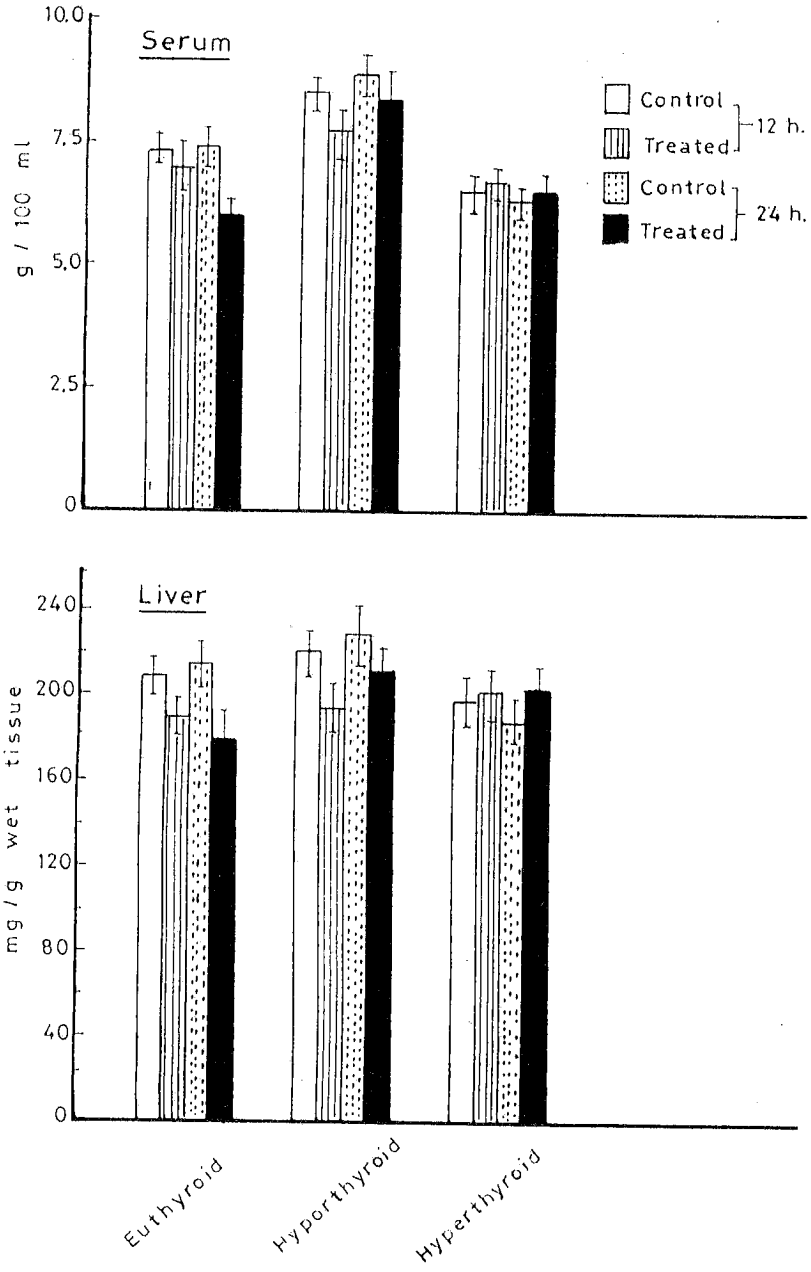

Fig.1. Changes in serum and liver total proteins in acute (LD_{50}) intoxicated male rats during different thyroid states.

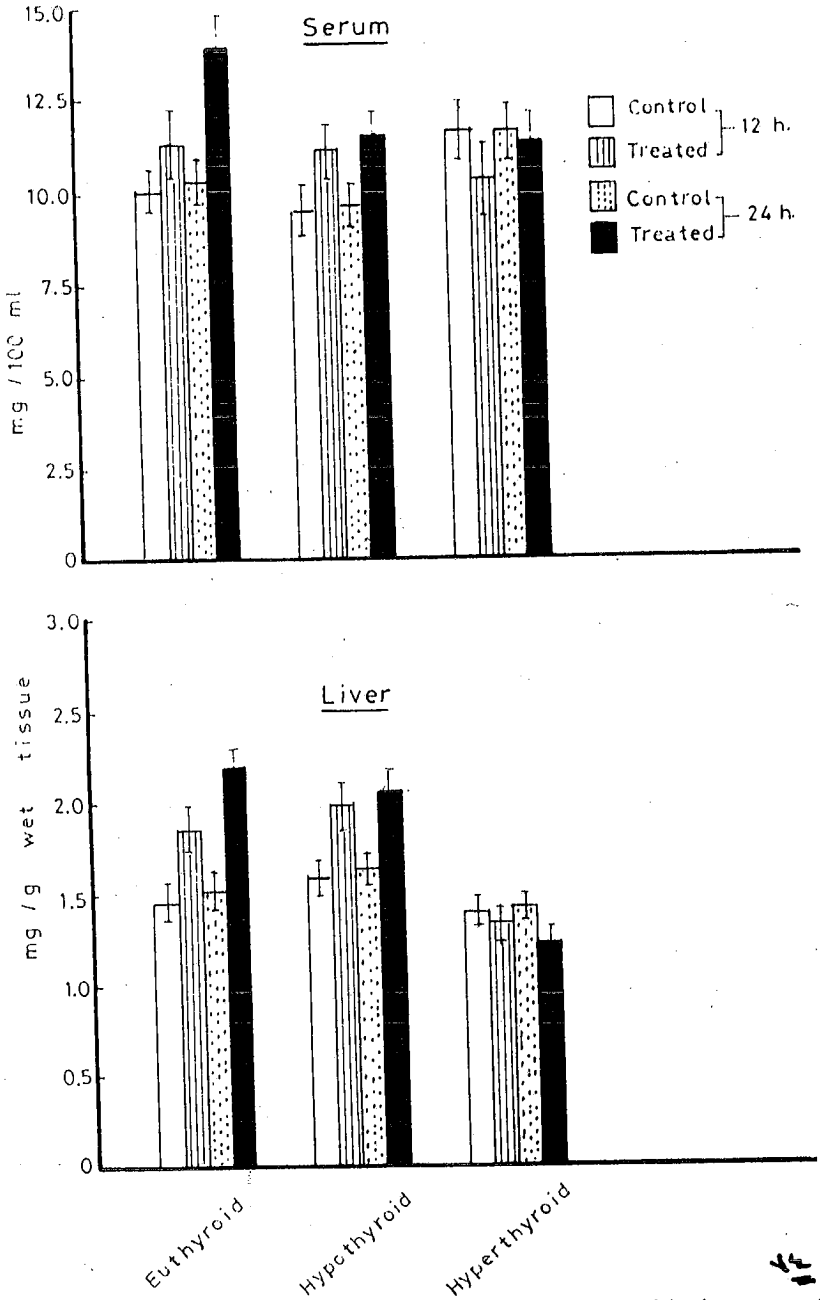

Fig.2. Changes in serum and liver total free amino acids in acute (LD_{50}) intoxicated male rats during different thyroid states.

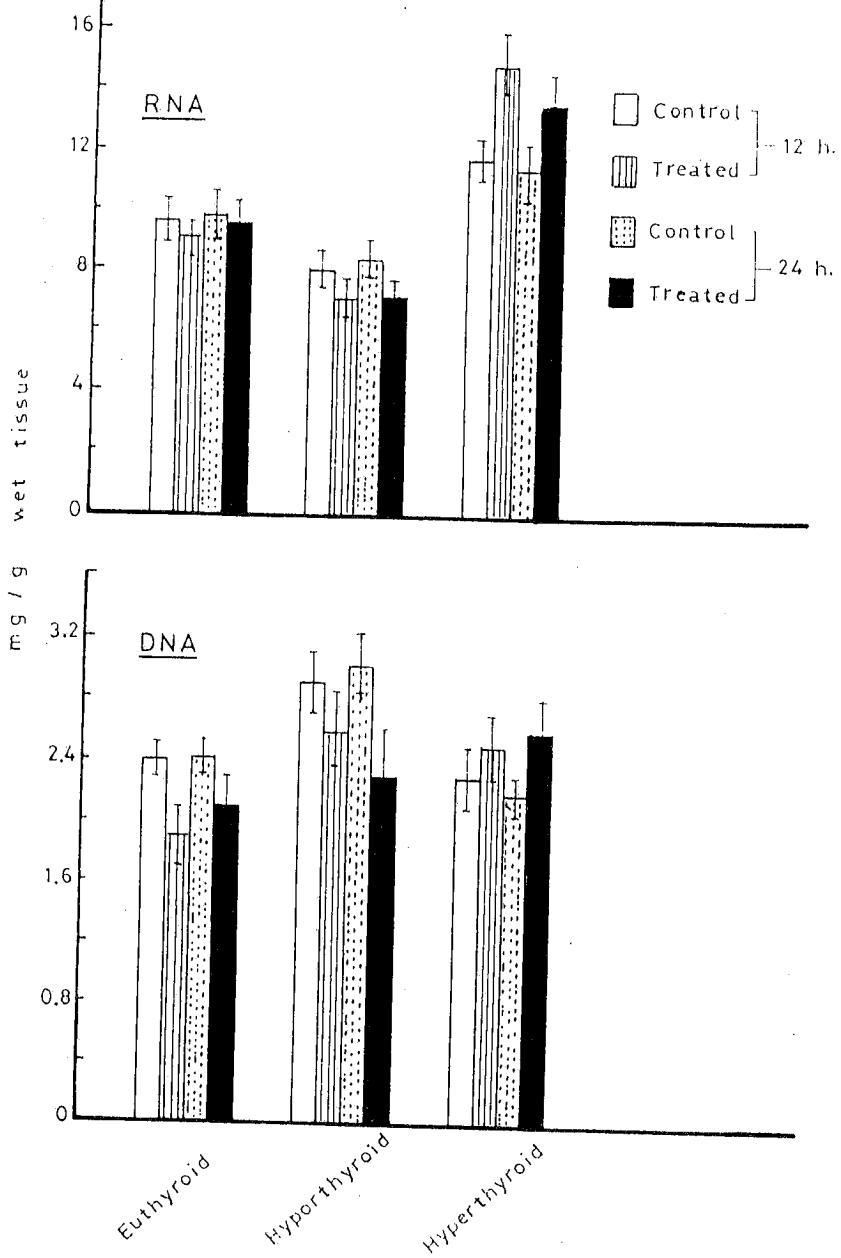

Fig.3. Changes in liver nucleic acids (RNA & DNA) contents in acute (LD_{50}) intoxicated male rats during different thyroid states.

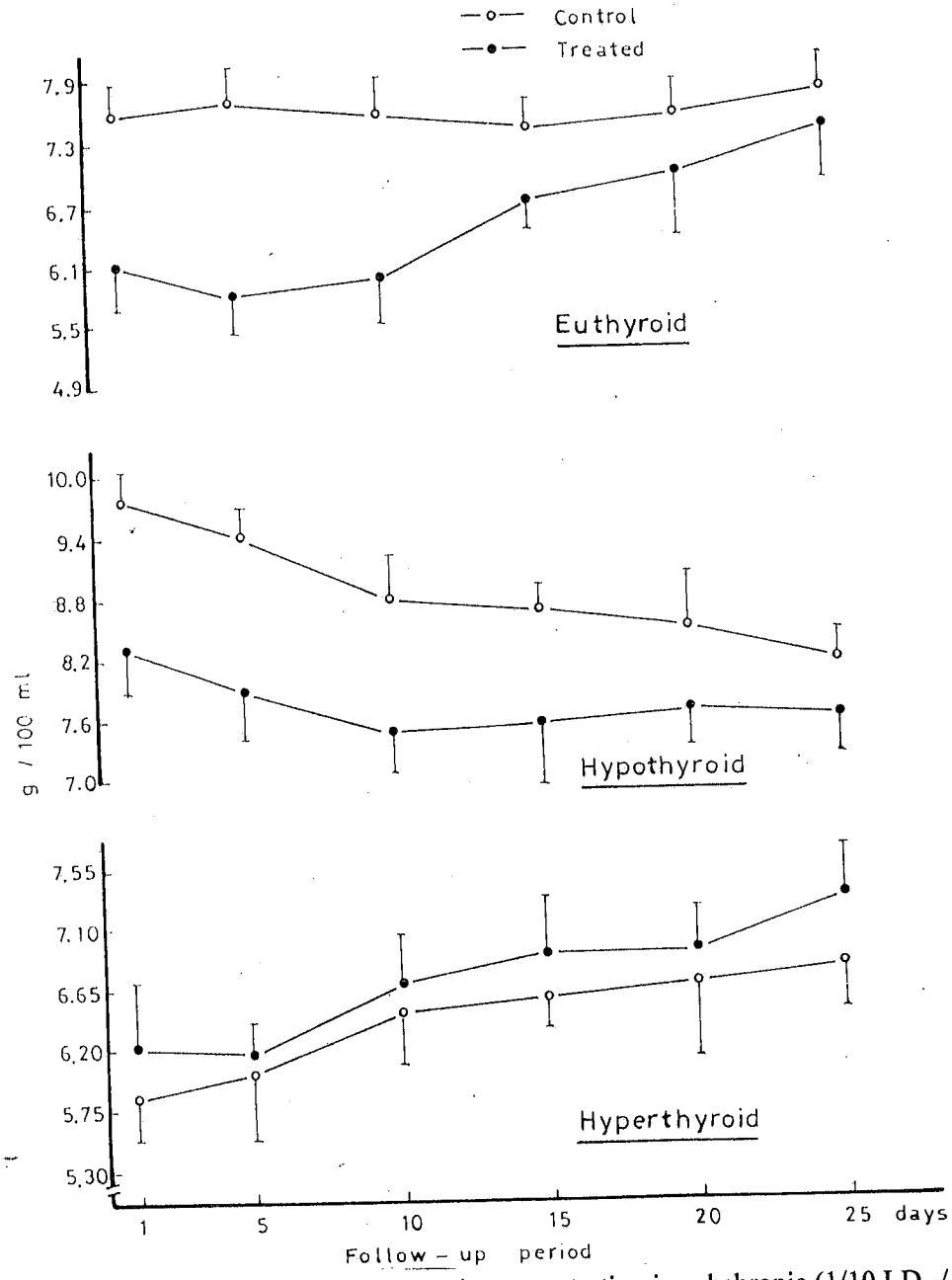

Fig.4. Changes in serum total protein concentration in subchronic (1/10 LD_{50}/ day x 10) intoxicated male rats during different thyroid sates.

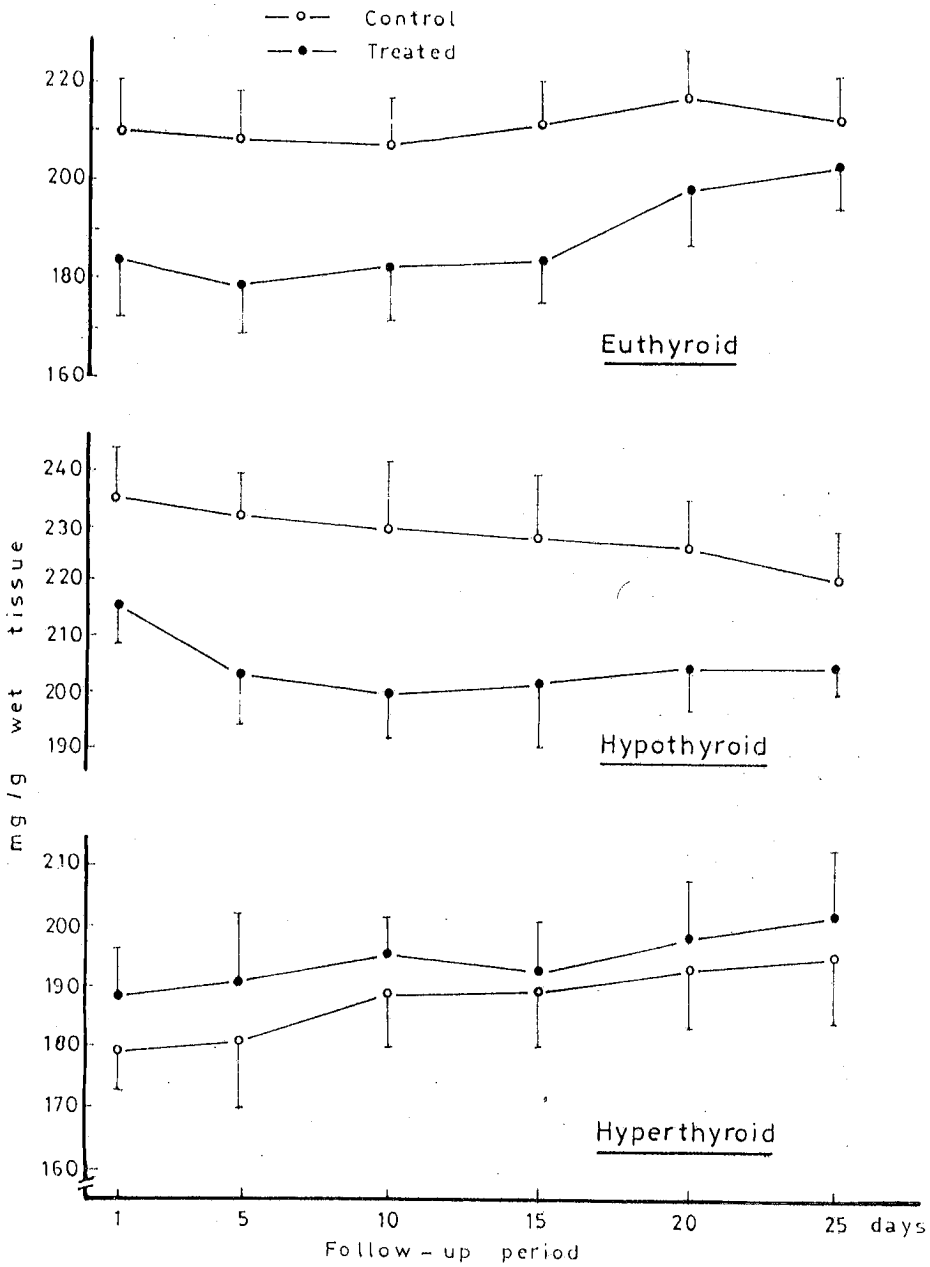

Fig.5. Changes in liver total protein content in subchronic (1/10 LD50/ day x10) intoxicated male rats during different thyroid states.

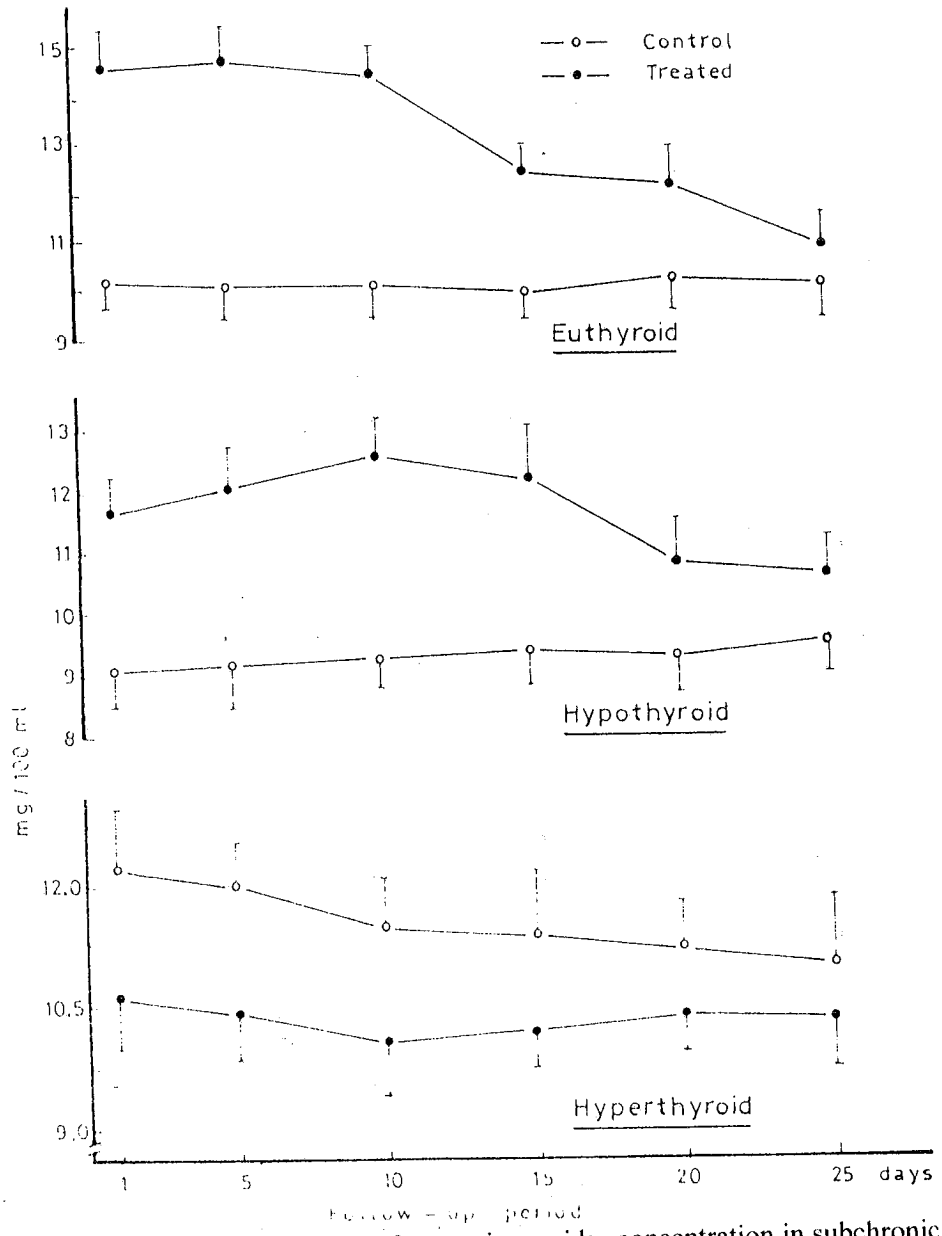

Fig.6. Changes in serum total free amino acids concentration in subchronic (1/10 LD_{50}/ day x10) intoxicated male rats during different thyroid states.

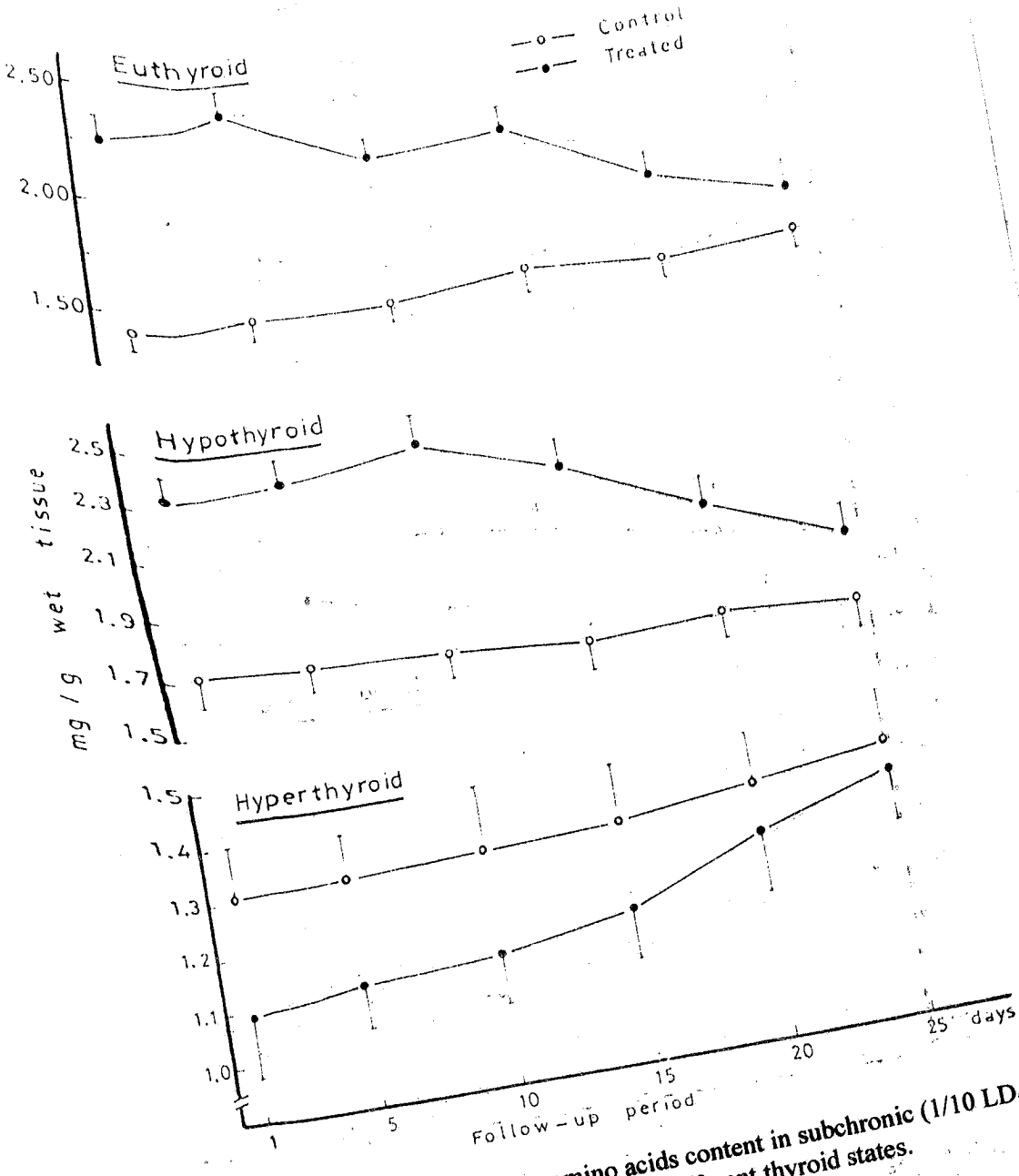

Fig.7. Changes in liver total free amino acids content in subchronic (1/10 LD_{50} day x10) intoxicated male rats during different thyroid states.

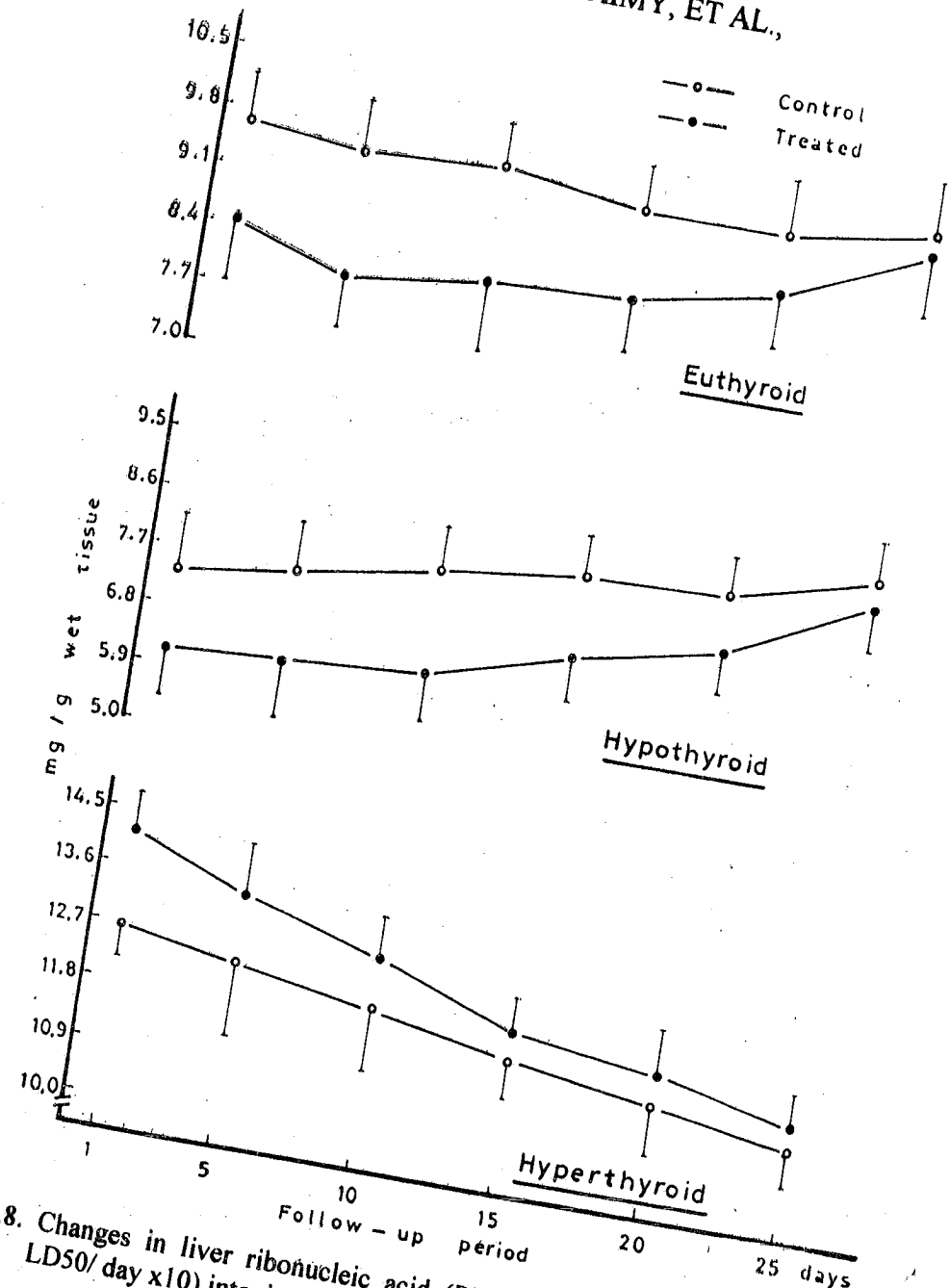

Fig.8. Changes in liver ribonucleic acid (RNA) content in subchronic (1/1′ LD50/ day x10) intoxicated male rats during different thyroid states.

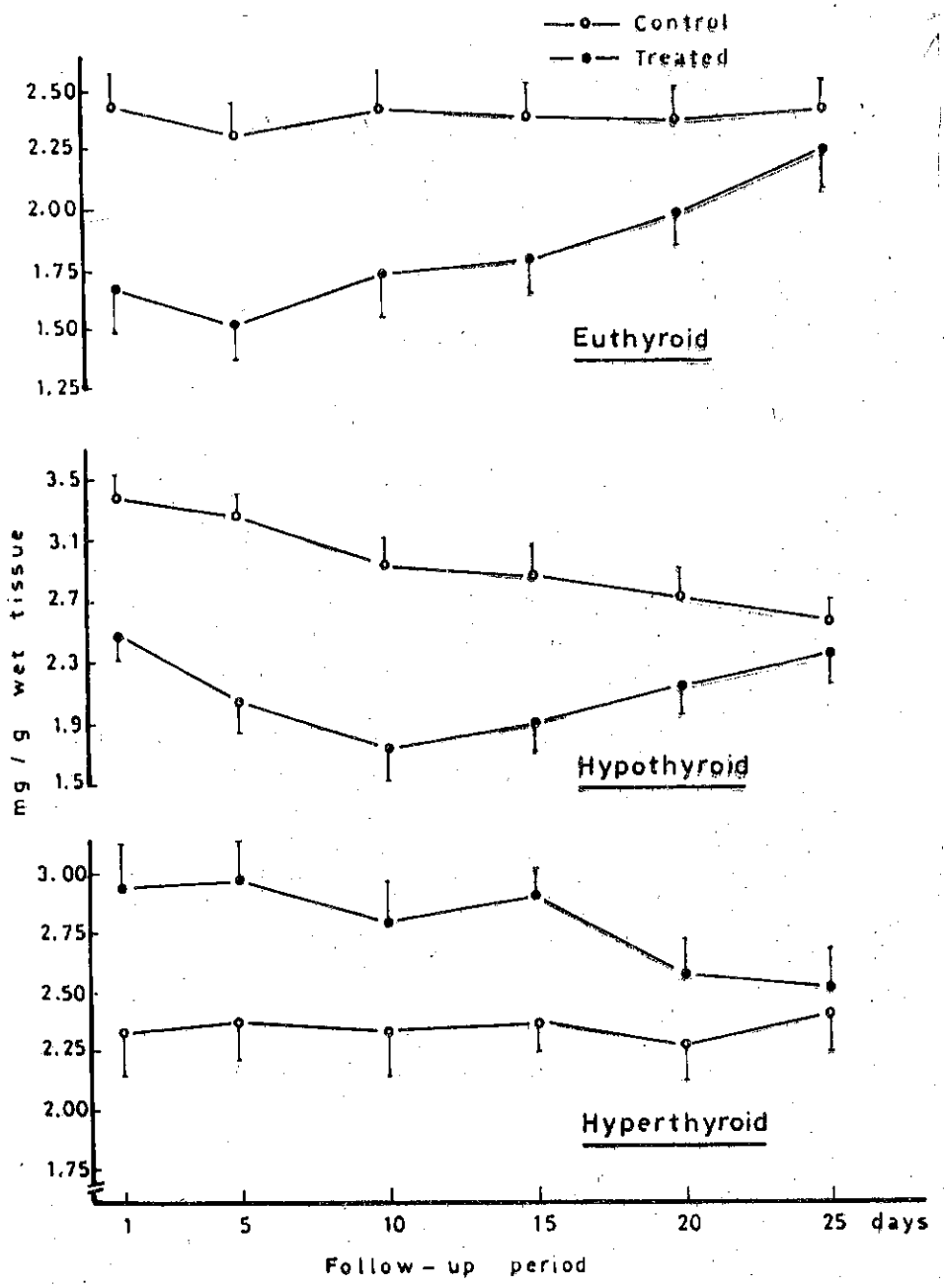

Fig.9. Changes in liver deoxyribonucleic acid (DNA) content in subchronic (1/10 LD_{50}/ day x10) intoxicated male rats during different thyroid states.