Effect of potassium Iodide on Thyroid Gland of Albino Mice (*Mus musculus)*

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Abstract

The present study was designed to examine the effecacy of potassium iodide for its efficacy to induce morphological malformations and histopathological lesions of thyroid gland of adult male mice and pregnant mice *Mus musculus*.

The histological examination showed many lesions of the thyroidof adult male mice and pregnant mice. The lesions appeared as such hemorrhage, atrophic and necrosis appeared in some cells with degeneration of nucleus and fibrosis was appeared in thyroid gland.

Introduction

Thyroid gland is a largest endocrine gland, shaped like a butterfly [1]. This gland was located in the anterior portion of the neck just below and bilaterally to the thyroid cartilage. It consists of two lobes connected by bridge of tissue, the thyroid isthmus and sometimes a pyramidal lobe arising from the isthmus in front of the larynx [2].

Commonly, the right lobe is larger than the left and the entire gland is bigger in women and in areas of the world with iodine deficiency. It enlarges during puberty, in pregnancy and during lactation. The parathyroid glands are situated between this and the inner capsule, from which trabeculae of collagen pervade the gland and carry nerves and a rich vascular supply to the cells [3]. Thyroid made up of multiple acini (follicles). Each follicles is surrounded by a single layer of cells and filled with pink staining protein material called(colloid) and the follicles responsible of synthesis and secretion of thyroxin(T4)and triiodothyronin(T3) [4, 5]. In mammals, the thyroid gland also secretes calcitonin, a calcium-lowering hormone [6, 7]. That synthesized by C cell [8].

Materials and methods

1- The animals

One hundred albino mice *Mus.musculus* were used in this study. They were purchased from the center of Infertility and Embryology Research, Baghdad, Iraq.

Mice were kept in the animal house in wire-meshed stainless steel cages (i.e. two animals in one cage), but the cages were arranged in a manner that one animal could see at least several others. The environment in the animal house was controlled in which the temperature was maintained at (20-24C°), light schedule of 12:12 hours light: dark cycle with good ventilation.

2. The drug used

The drug used in the experiment was pure powder of potassium iodide . It was kept in a cool, dry place, away from direct heat and light. The experimental animals were administered potassium iodide in three oral dose, therapeutic, hypo and hyper doses using cavage as follows:

1. 0.04 mg/0.025 kg/day in a single daily dose (therapeutic dose).
2. 0.08mg/0.025 kg/day in a single daily dose (hyper dose).
3. 0.02mg/0.025kg/day in a single daily dose (hypo dose).

3.Animal grouping

The mice were used in this experiment aged 3 months, and their average body weight was 25±2gram at the beginning of the experiment.

They were divided into three main groups as follows:

- **Adult males**

Consisted of 20 animals divided into four subgroups each of 5 animals:

A- Control males received only normal diet and water.

B- Male mice were administered potassium iodide in an oral dose of 0.04mg/0.025 kg /day in a single daily dose for four weeks (therapeutic dose).

C- Male mice were administered potassium iodide in an oral dose of 0.08mg/0.025 kg /day in a single daily dose for four weeks (hyper dose).

d- Male mice were administered potassium iodide in an oral dose of 0.02mg/0.025 kg /day in a single daily dose for four weeks (hypo dose).

- **Pregnant females**

Consisted of 20 animals divided into four subgroups each of 5 animals:

A- Control mothers received only normal diet and water.

B- Mothers were administered potassium iodide in an oral dose of 0.04mg/0.025 kg /day in a single daily dose, the treatment was continued from the 7^{th} day of pregnancy to the 21^{st} day of lactation.

C- Mothers were administered potassium iodide in an oral dose of 0.08mg/0.025 kg /day in a single daily dose, the treatment was continued from the 7^{th} day of pregnancy to the 21^{st} day of lactation.

D- Mothers were administered potassium iodide in an oral dose of 0.05mg/0.025 kg /day in a single daily dose, the treatment was continued from the 7^{th} day of pregnancy to the 21^{st} day of lactation.

4- Preparation for histological study

All animals were dissected under chloroform anesthesia. The thyroid gland weight was recorded after dissection for each animal using Sartorious sensitive balance (0.001 mg subdivision),and placed in fixative.

5- Histological sections

The tissues were processed as follows:

1-Fixation

Immediately after removal and weighing of thyroid, both lobes were taken and fixed in 10% neutral buffered formalin solution (10ml of 40% formaldehyde + 90ml of tap water), for 18-22 hours at room temperature.

2-Dehydration

The tissues were removed from the formalin (10%) and then washed in running tap water for 30 minutes to remove traces of fixative.. **3-Clearing** The purpose of this stage was to remove alcohol from tissue (dealcoholization). **4- Infiltration and embedding** after clearing the tissues, they were passed through mixture of xylene and molten paraffin wax (melting 56-58C°) for 30 minutes.

5-Tissue sectioning rotary microtome (LKB-U.K.) with disposable blades was used. **6- Tissue attachment** since formalin (10%) used as fixative, therefore section adhesive was needed using Mayer's glycerol-albumin mixture.**7- De-wax and hydration** de-wax was made using two changes of xylene (15 minutes for each change) .**Staining** haematoxylin and Eosin staining were used. **9- Mounting** this was made using DPX, cover slips were used to cover the sections.

Results

The histological appearance of control thyroid gland of all groups of mice under light microscopy showing large aggregation of follicles which were oval, circular shapes, and in normal sizes, the parafollicular cells or C-cells which are large polygonal cells in the forms of clamps having large round nuclei with clear cytoplasm were observed in a few number scattered between the follicular cells or in the interfollicular stroma (Fig. 1). In the present study under light microscope demonstrated that the thyroid gland showed different changes such as hemorrhage has occurred between the follicles, atrophy, necrosis appeared in some cells with degeneration of nuclei, the colloid was condensed eosinophilic vacuolated substance, the follicular septum are revealed its fibrosis appearance and the small follicles are lined by columnar or cuboidal epithelial cells while the large follicles are lined by flattened epithelial cells (Fig. 2, 3, 4, 5, 6, 7).

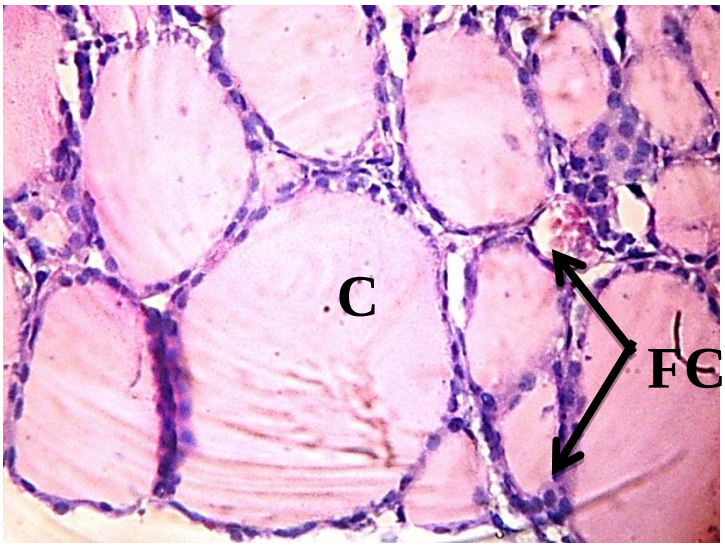

Figure (1): Thyroid gland of control adult mice showed Colloid (C) and Follicular Cells (FC) (H&E 400X).

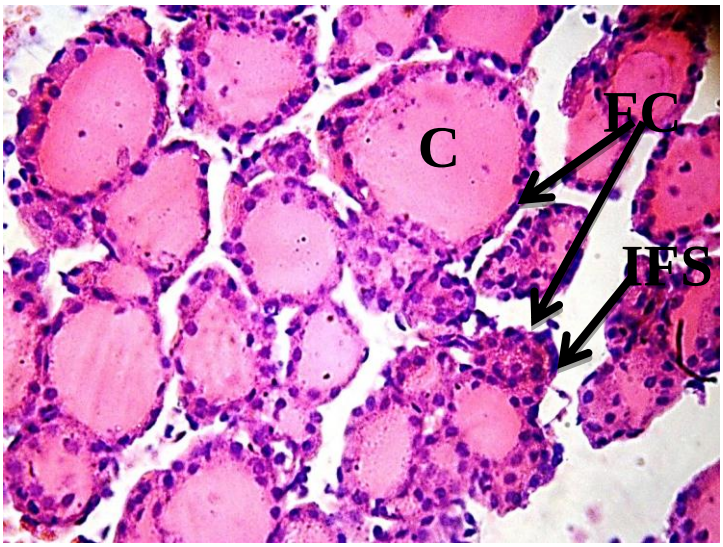

Figure (2): Thyroid gland of adult male mice administrated therapeutic dose for 30 days showed Colloid (C), Follicular Cells (FC) and Inter Follicular Septum (IFS) and reduction of follicular size (H&E 400X).

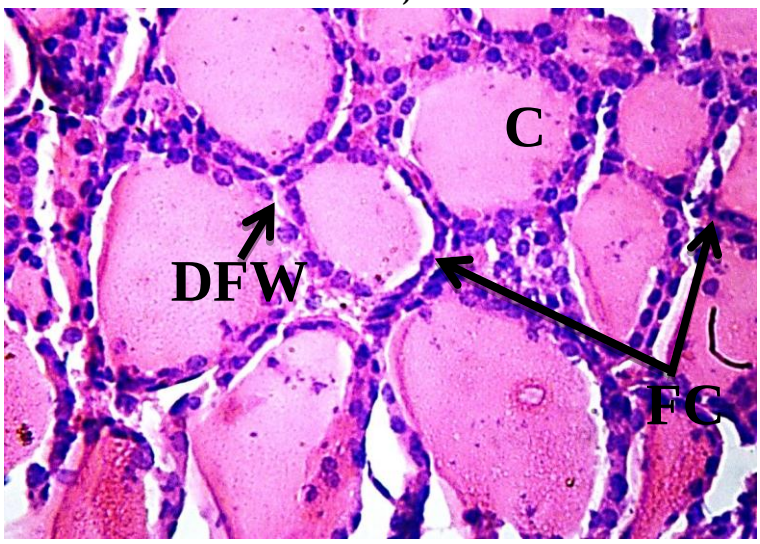

Figure (3): Thyroid gland of adult male mice administrated hyper dose for 30 days showed Colloid (C), Follicles Cells (FC), Damage Follicular Wall (DFW) and Condensed of Colloid(H&E 400X).

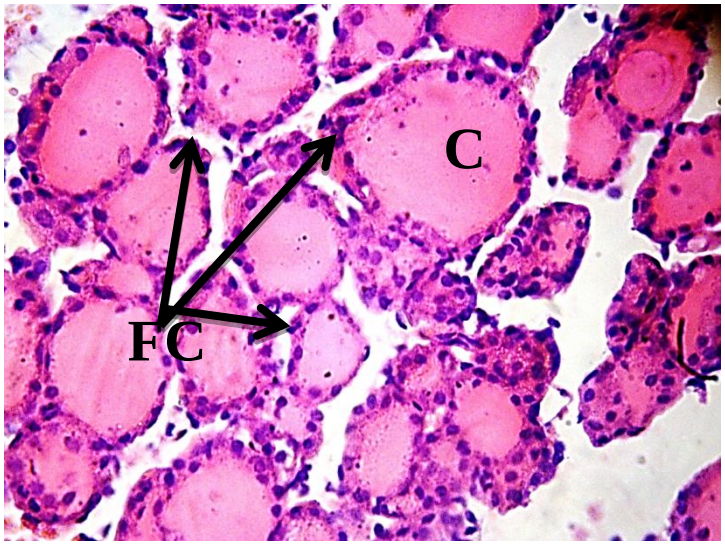

Figure (4): Thyroid gland of adult male mice administrated hypo dose for 30 days showed Colloid (C), Follicles Cells (FC) reduction in size (H&E 400X).

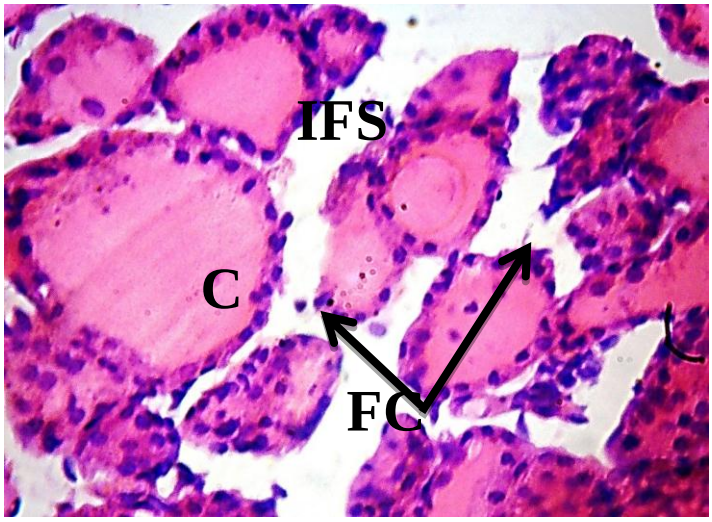

Figure (5): Thyroid gland of pregnant mice administrated therapeutic dose showed Colloid (C), Follicular Cells (FC) separation from each other and Necrosis of Inter Follicular Septum (IFS) (H&E 400X).

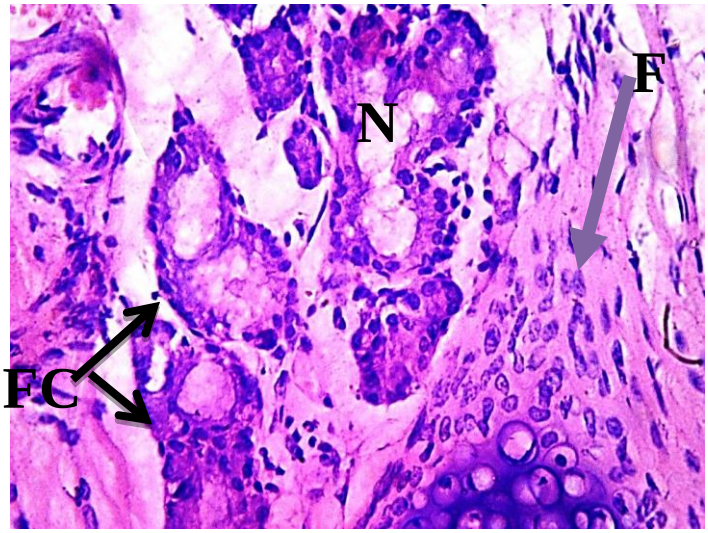

Figure (6): Thyroid gland of pregnant mice administrated hyper dose showed columnar follicular cells (FC) that form the follicle and smaller size of the follicle, Necrosis (N), Fibrosis (F) and fibrosis (H&E 400X).

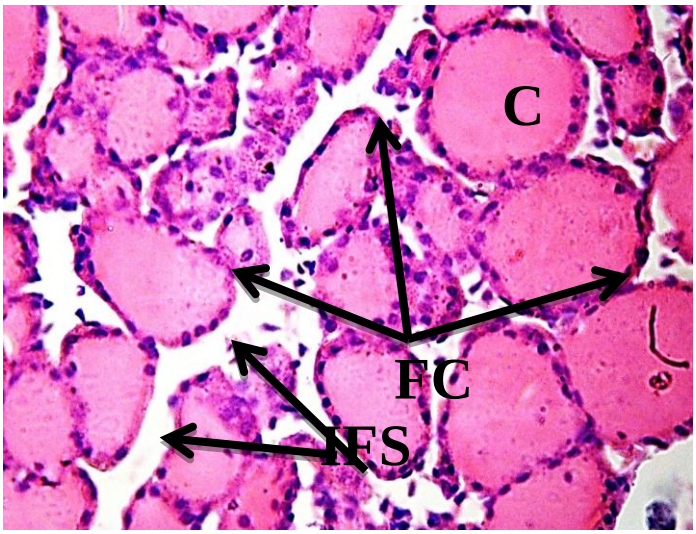

Figure (7): Thyroid gland of pregnant mice administrated hypo dose showed Inter Follicular septum (IFS), Colloid (C) and irregular arrangement Follicular cells (H&E 400X).

Discusion

These results were in agreement with [9] concerning the effect of vitamin A on cell proliferation of thyroid proliferative lesions induced by simultaneous treatment with thiourea in rats. They observed hemorrhage between the follicles, fibrosis, necrosis and degeneration of nucluse.

[10] and [11] reported increase lobular interstitial space with age in human thyroid gland. The reason was the interstitial fibrosis which occur mainly due to age related increased content of collagen fibers.

These results were in agreement with [12] study thiocyanate induces cell necrosis and fibrosis in selenium- and iodine-deficient rat thyroids. They observed that selenium deficiency coupled to iodine deficiency increased necrosis, induced fibrosis and impeded compensatory epithelial cell proliferation.

These results were in agreement with [13] study when referred to the atrophy (shrinkage) of the follicles due to the decrease in volume of colloid, this leads to collapse of empty follicles, the others were small follicles filled with pale and sometime clumped colloid and were lined by flatting epithelial cells.

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تأثير آيوديد البوتاسيوم على الغدة الدرقية في الفأران البيض *Mus musculus*

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الملخص

أجريت الدراسة الحالية للتعرف على تأثير فعالية آيوديد البوتاسيوم على أحداث الآفات النسجية المرضية في الغدة الدرقية لدى الفئران الذكور البالغين والفئران الحوامل نوع *Mus musculus*.

أظهر الفحص النسيجي آفات عديدة في الغدة الدرقية لمجموعة الفئران الذكور البالغين والفئران الحوامل. تمثلت هذه الآفات بنزف، انكماش، تنخر في بعض الخلايا مع تحلل النواة وتليف ظهرت في الغدة الدرقية.