TRIIODOTHRONINE LEVEL IN BREAST FED INFANTS-VERSUS COW MILK FED INFANTS

THESIS

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By

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بسم الله الرحمن الرحيم

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INTRODUCTION

Introduction and Aim of the Work

The thyroid hormones are essential for maintaining the metabolism of the tissues at the optimal level for their functions.

Thyroid hormones are particularly important as regulators of development and are necessary for normal growth and maturation. (Ganong, 1981).

It is well known that 3, 5, 3' triiodothyronine (T_3) is approximately four times more active than thyroxine (T_4). (Root et al., 1979).

In the last few years, it became evident that most of the T_3 in the body is obtained by the peripheral deiodination of T_4. (Williams, 1981).

El-Ridi and coworkers in 1967, reported that diet markedly influences the rate of the peripheral conversion of T_4 into T_3. Dogs recieving unsaturated fats showed an increased rate of conversion by 100%, in contrast to those recieving saturated fats, in which the rate increased only by 68% .

On the other hand, fat-enriched diet induces significant lowering of serum T_3 . (Johannessen et al., 1981). Increased carbohydrate intake is associated with an increase in the serum T_3 concentration. (Spaulding et al., 1976).

Various milks used in infant feeding, differ quantitatively and sometimes qualitatively, as regards their contents of fats, carbohydrates, proteins, vitamins and minerals. Consequently, they may have different effects on T_3 levels in infants recieving them.

With these concepts in mind, our work was conducted to compare the serum T_3 level in breast-fed infants with that in infants recieving cow or buffalo milk, or recieving humanized formulas.

REVIEW
OF
LITERATURE

The Thyroid Gland

Embryology:

The thyroid gland is first recognizable in the 20-somite embryo. It develops as an epithelial proliferation in the pharyngeal floor between the tuberculum impar and the copula, at a point later indicated by the foramen caecum. (Warwick & Williams, 1973).

The thyroid primordium then descends infront of the pharyngeal gut, as a bilobed diverticulum connected to the pharyngeal floor by a narrow stalk, the thyroglossal duct. The thyroid gland reaches its final position infront of the trachea at about the seventh week.

The thyroglossal duct undergoes dissolution and fragmentation by the second month after conception. Cells of the lower part of the duct differentiate into thyroid tissue, forming the pyramidal lobe.

The capacity of future follicular cells to form thyroglobulin is established at the 29th day of gestation. The thyroid gland is able to synthesize its hormones at the end of the third month of gestation. The fifth pharyngeal pouch gives rise to the ultimobranchial body which will form the parafollicular cells that produce calcitonin. (Ezrin et al., 1979).

Anatomy and Histology:

The thyroid gland weighs about 20 g . It is made up of two lobes joined together by the isthmus. The pyramidal lobe projects upwards from the isthmus, just to the left of the mid-line. The lateral lobes are conical in shape. Compared to other organs in the body, the thyroid gland has one of the highest rates of blood-flow per gram tissue. (Ganong, 1981).

The gland is invested by a thin fibrous capsule.

By light microscopy, the gland is seen to be composed of closely packed acini or follicles. The follicles are filled with a clear substance, the colloid. The average diametre of the follicles is about 200 u . The wall of the follicle

is lined by a single layer of cuboidal cells.
In the resting gland, the cells become flat, and under thyrotropin stimulation they become columnar.

By electron microscopy, the cells are seen to possess numerous microvilli which serve to increase the secretory surface.

In addition, the thyroid gland possesses small groups of cells, the parafollicular cells (C-cells) that secrete thyrocalcitonin.(Leeson and Leeson, 1978)

Physiological Considerations

The thyroid gland secretes two metabolically active hormones, L-thyroxine and 3,5,3` L-triiodo-thyronine, which are manufactured from iodine and tyrosine. The thyroid gland also secretes calcitonin.

Biosynthesis of the Thyroid Hormones: (Fig 1 & Fig. 2)

Iodine Metabolism:

Iodine enters the body chiefly with food and water, but it can readily enter via intact skin and lungs. Most of the organic iodine compounds are reduced to ionic iodine before being absorbed. Absorption takes place throughout the gut, but is most active in the small intestine. (Ezrin et al., 1979).

The concentration of inorganic iodide in the plasma is usually less than 1 ug/dL. Two thirds of the iodide is removed from plasma by the kidneys. The remaining one third is taken up by the thyroid gland. It is also trapped by the salivary glands and the stomach. Minute amounts appear in the sweat and in the expired air. Iodide also appears in the milk of lactating females. (Degroot and Stanbury, 1975).

There is no homeostatic mechanisms to keep a constant plasma iorganic iodide level. When dietary iodine is deficient, plasma iodide falls. However, the thyroid gland does compensate for dietary iodine deficiency by increasing iodine uptake. (Kelley and Limbeck, 1974).

Thyroid Iodide Transport:

The thyroid gland withdraws iodine from the circulation, and concentrates it to more than thirty times its plasma level. This concentration occurs more within the colloid, rather than within the parenchymal cells. (Ezrin et al., 1979).

The transport of iodide across the cell membrane , against both a concentration and an electrochemical gradient, is an active mechanism via a transport carrier system that is dependant on

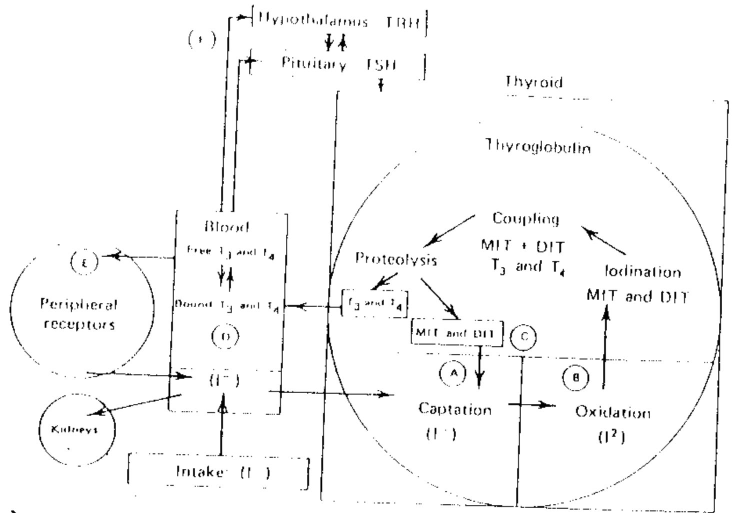

Fig. (1) Biosynthesis of thyroid hormones and intrathyroidal iodine turnover.

(After Pierson, 1981)

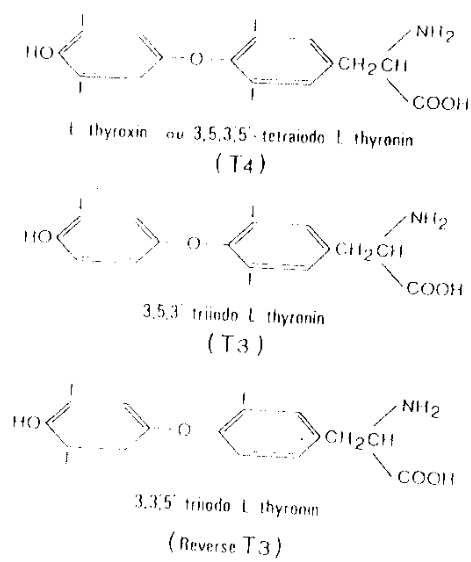

Fig. (2) Structures of thyroid hormones.

(After Pierson, 1981)