CHAPTER VI
EFFECTS OF THYROTROPHIC HORMONE ON BRAIN AND
PITUITARY LIPIDS IN ATHEROSCLEROTIC RATS

In the previous two chapters changes in the brain and pituitary lipids in atherosclerotic rats have been presented. Both the anterior and the posterior portions of the pituitary gland possess a lipid mobilizing activity. Thyrotrophic hormone, one of the secretions of the anterior pituitary has four factors, one of which is said to participate in the above lipid mobilizing activity. In this chapter the results of administering thyrotrophic hormone on brain and pituitary lipids in a group of rats rendered atherosclerotic will be presented.

Methods and Materials:

Fifteen rats of both the sexes, kept on atherosclerotic diet for last eighteen weeks were selected
for the study. 0.2 I.U. of thyrotrophic hormone was injected in each of these animals for fifteen days and the atherosclerotic diet was also continued simultaneously. Ten of these animals were utilized for chemical estimation of brain and pituitary lipids while the remaining five animals were sacrificed for histochemical study at the end of this period. Details of the methods regarding maintenance of animals, collection of tissues, techniques utilized for biochemical estimation, chromatographic separation of phospholipids and histochemical study have been described previously (Chapters II, III, IV and V).

Results:

1. The mean concentrations of total, ester and free cholesterol, lipid phosphorus and total lipid in brain were found to be $21.64 \pm 0.59$, $2.44 \pm 0.29$, $19.20 \pm 0.78$, $1.91 \pm 0.05$, and $71.01 \pm 1.30$ respectively and those for pituitary as $12.00 \pm 0.22$, $10.21 \pm 0.29$, $1.79 \pm 0.01$, $1.67 \pm 0.04$ and $51.03 \pm 0.63 \text{ mg/gram}$
respectively, after treatment with thyrotrophic hormone following induction of atherosclerosis (Tables XII and XIII).

2. No qualitative change in the chromatographic pattern of phospholipid either in the brain or in the pituitary was observed in the group of atherosclerotic rats treated with TSH (Figs. 17 c & 25). The concentration of lecithin fraction in brain, however, was found to decrease almost to normal with administration of TSH.

3. Histochemical analysis showed no obvious change in the concentrations of any of the lipid components in the brain of TSH treated group of animals when compared with those of the atherosclerotic group (Figs. 9 b, c - 16 b,c & 18 b,c - 21 b, c). When compared with the controls however, the TSH treated group showed a change in concentrations in all the lipid components of brain (Figs. 9 a, c - 16 a, c & 18 a, c - 21 a, c). In the pituitary no obvious change could be detected histochemically either in phospholipid, neutral fat or total
cholesterol between TSH treated and atherosclerotic groups of animals (Figs. 22 b, c - 24 b, c) and 26 b, c & 27 b, c).

Comments:

Thyrotrophic hormone was administered in a group of rats in whom atherosclerosis was induced using Hartroft diet for a period of twenty weeks. The hormone was administered for a period of fifteen days during which the atherosclerotic diet was deliberately continued in order to simulate the clinical condition. Thiouracil one of the constituents of Hartroft diet was also continued during the period of TSH therapy. The idea was to observe the effects of TSH in absence of thyroid hormone. That it was so, could be observed from the fact that acini of the gland which was found distended with colloid lined by flattened cells during atherosclerosis still remained in the same functional state even after administration of TSH (Fig. 8 c).
No significant change was observed in any of the brain lipid components on treatment with TSH from those observed in atherosclerosis (Table VI) excepting in ester cholesterol \(p < 0.02\) where there was a significant increase. When compared with the control series, a significant increase in the total cholesterol, free cholesterol, and total lipid was observed (Table V). An increase in mean concentration in ester cholesterol and phospholipid fraction was observed which however had no significance whatsoever.

A critical analysis of the estimated values of the different lipid components (Table VI) in brain of TSH-treated group indicates that a significant increase in ester cholesterol fraction takes place in absence of increase in other components. Increase in ester cholesterol in absence of corresponding increase in lipid phosphorus perhaps signifies that in presence of TSH, esterification of free cholesterol takes place mainly by ATP and coenzyme A (Portman and Sugano, 1964; Nutrition Reviews, 1965). The enzyme transacylase (Glomsett, 1962) even if it is present perhaps plays
very little role in the esterification process under this condition. In the pituitary, on the other hand, a significant increase in the lipid phosphorus could be observed in the absence of a change in any other lipid components (Table XI). This perhaps signifies an increased synthesis of phospholipid in pituitary under the action of TSH. Such conclusions however, should be drawn with reservation as the method of estimation was complicated by a number of factors. Morton & Schwartz (1953) however has reported such increase in phospholipid synthesis in thyroid when treated with TSH.