

A Study on the Role of Thyroid Hormone in Regulating the Serum Sodium, Plasma Osmolarity and Plasma Vasopressin Levels

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Summary

Serum sodium levels are under strict control of hormones including renin-angiotensin system, atrial natriuretic peptide and vasopressin(AVP). Secretion of these hormones, in turn, are regulated by other hormones and neural tones.

Only a limited number of studies on the role of thyroid hormone in electrolyte regulation has been published, although hyponatremia is frequently encountered in patients with hypothyroidism especially myxedema coma.

To avoid individual variation in clinical study, rat study was performed.

First, euthyroid and hypothyroid rats were deprived of water for 3 days. Second, rats were injected with saline with various osmolarity. Third, they were injected with normal saline containing polyethylene glycol(PEG). Second and third series of experiment was done to study the osmoregulation and baroregulation of AVP secretion, respectively. In all these experiments, plasma AVP levels after manipulation were much higher in hypothyroid animals, although basal AVP levels, plasma osmolarity, serum sodium and hematocrit values were not significantly different from those of euthyroid controls. Thus increased sensitivity of AVP to stimulatory manipulation in hypothyroidism was suggested.

Then, to study the underlying mechanism for the above phenomenon, thyroid hormone metabolism in neural lobe of rat pituitary was studied. Contrary to previously prevailing view, posterior lobes actively metabolized thyroid hormone by 5'-deiodination, which is an activating pathway of thyroxine. Neural lobe contained type-II 5'-deiodinase, which has been found in limited number of tissue, including brain, anterior pituitary, pineal, brown fat, with very high affinity for thyroxine and postulated role of maintenance of intracellular active thyroid hormone. Thus thyroid hormone might have a previously unrecognized role in posterior pituitary physiology, although no definite evidence is available at present.

In order to clarify the overall role of thyroid hormone in sodium balance, experiments with kidney is now under way.