# Effects of L-Thyroxine on rat hippocampal neurons


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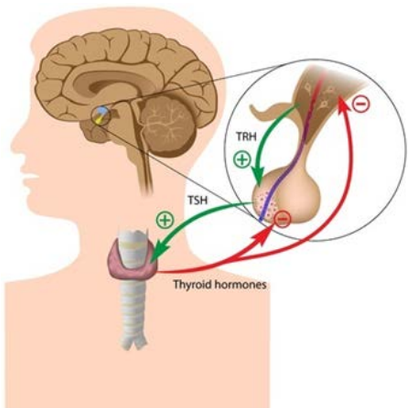
## INTRODUCTION

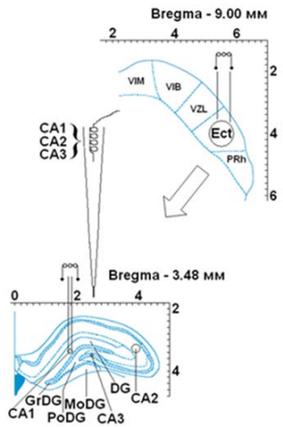
The thyroid gland releases triiodothyronine (T3) and thyroxine (T4). These hormones play an important role for brain development and function. These alterations have also been observed in animal models, such as adult rats, in which hypothyroidism is associated with the deterioration of memory and learning capacity and impairment of long-term potentiation.





Thyroid hormones regulate nervous system-related growth. In particular, the central nervous system needs T3 and T4 to upkeep normal development. A drug, L-T4 (which consists of T4), when administered to rats, enhanced spatial memory [Smith et al 2002].

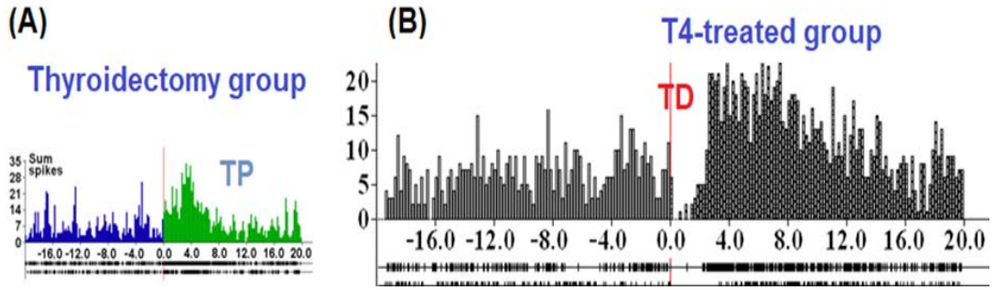
## MATERIALS AND METHODS




***In Vivo extracellular electrophysiology***

For recording of extracellular spike activity from hippocampal neurons, a microelectrode (tip diameter 1–2 μm, resistance, 1.5–2.5 mW) filled with a 3 M KCl solution was repeatedly submerged into the Entorhinal cortex according to stereotaxic coordinates of rat brain atlas (*Paxinos and Watson 2005*). High-frequency stimulation (HFS, 100 Hz for 1) of NBM was performed using bipolar cylindrical electrodes with application of rectangular impulses of current with a duration of 0.05 ms, and an amplitude of 0.10 – 0.14 mA.

## RESULTS




*Mean peri-stimulus frequency histogram of spike activity and percentage distribution type of responses of hippocampal single neurons to HFS of entorhinal cortex in thyroidectomized (A) and L-Thyroxine -treated (B) groups.*

In rodents, thyroid hormones play an important role in thermogenesis of brown fat, allowing them to adapt to cold temperatures. In vivo electrophysiological recordings have shown that thyroidectomized rats have abnormal hippocampal neuronal activity, and that treatment with thyroxine (T4) normalizes electrical activity. The body temperature was significantly lower in the thyroidectomized group than in the thyroxine-treated group.

Thyroid hormone supplementation directly affects the hippocampus and exerts protective effects.


**The work was supported by the Science Committee of RA, in the frames of the research project №22YR-1F003**