TITLE: ADULT ONSET-HYPOTHYROIDISM HAS MINIMAL EFFECTS ON SYNAPTIC TRANSMISSION IN THE HIPPOCAMPUS OF RATS INDEPENDENT OF HYPOTHERMIA

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Introduction: Thyroid hormones (TH) influence central nervous system (CNS) function during development and in adulthood. The hippocampus, a brain area critical for learning and memory is sensitive to TH insufficiency. Synaptic transmission in the hippocampus is impaired following modest degrees of hypothyroidism induced during development. The impact of the TH insufficiency on hippocampal synaptic function in the adult model, however, has not been as well studied - reports are limited and results inconsistent across laboratories. The present study was designed to assess the effects of adult-onset TH insufficiency on synaptic function in the dentate gyrus of the hippocampus of the rat.

Methods: Adult male rats were exposed to the goitrogen propylthiouracil (PTU: 0 or 10 ppm) through the drinking water for 1 month to reduce serum THs. This dose of PTU increased thyroid gland weight and reduced body weight gain and serum T3 and T4. Field potentials were recorded in the dentate gyrus under urethane anesthesia in animals warmed on a heating pad set to 36.5 °C. In a second experiment, the contribution of hypothermia induced by hypothyroidism was assessed. Body temperature, brain temperature, and hippocampal field potentials were monitored in control and PTU-exposed animals.

Results: In contrast to TH insufficiency induced during development, excitatory and inhibitory synaptic transmission were only marginally impaired. However, response latencies were significantly increased in hypothyroid animals and despite warming, body temperature in hypothyroid animals could not be adequately maintained. Hypothyroidism reduced both brain and body temperature and this hypothermic response was exacerbated under continued anesthesia. Warming reduced latencies in hypothyroid animals while cooling increased latencies in controls.

Conclusions: The alterations in field potential amplitudes and latencies are consistent with previous reports of brain temperature and hippocampal function. These data indicate that only modest changes in hippocampal physiology accompany TH-insufficiencies induced in adulthood and provide clear evidence that synaptic delays in hypothyroid animals are mediated by brain hypothermia independent of the thyroid status. (Does not reflect EPA policy)