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Developmental expression of type 2 deiodinase in the chicken hypothalamus

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Thyroid hormone is an essential factor of brain development and function. Thyroxine is a pro-hormone that needs to be converted to 3,5,3'-triiodothyronine (T3) to be able to bind the thyroid hormone receptors. Type 2 deiodinase (D2) is the key enzyme that generates T3 in the brain. D2 is abundantly expressed in hypothalamic tanycytes that are special glial cells lining the floor and walls of the third ventricles. In chicken, adenohypophysis starts promoting thyroidal secretion at embryonic day (E) 11.5, while thyroid hormones start exerting their negative feedback effect on the TSH production only at E19. It can be hypothesized that a special pattern of D2-mediated T3 generation in developing hypothalamus could be required for the development of T3 dependent negative feedback. Using in situ hybridization, we detected D2 mRNA in tanycytes in the floor and walls of the third ventricle at E13 in the chicken mediobasal hypothalamus. At this stage, the mRNA of the Nkx-2.1 transcription factor could be also detected in tanycytes while it was absent from the perivascular space where D2 expressing astrocytes are present. Promoter studies in U87 glioma cells proved that Nkx-2.1 can induce transcription of the cdio2 gene. In conclusion, the appearance of Nkx-2.1 mediated D2 expression in chicken tanycytes well before the onset of feedback suggests that D2 expression in these cells could be required, but not sufficient to initiate T3 dependent negative feedback in the hypothalamus.