

The importance of thyroid hormone for brain development

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Thyroid hormones are necessary for normal brain development during foetal and neonatal life.

Already from the sixth gestational week onwards T4 is present (from the mother via coelomic and amniotic fluid), while P11 , P12 , P11 -thyroid receptors are present in human foetal cerebral cortex and also deiodinase II and III activity in the brain can be found.

From literature on iodine deficiency especially, but also from isolated case reports on cases of combined hypothyroidism of both mother and foetus we know that foetal thyroid hormone deficiency results in a complex and severe clinical picture of spastic diplegia with postural rigidity, mental retardation, deafness, speech disturbances and squinting.

In case of subtler thyroid hormone deficiency also a subtler clinical picture is to be expected, which can however affect more domains of development, cognition, motor development and behaviour.

Currently, 3 types of subtle thyroid hormone deficiency are of interest: maternal hypothyroxinemia during the first semester of pregnancy, transient hypothyroxinemia of prematurity and transient hypothyroidism after birth. Only the first two will be discussed during the talk.

In several studies, from different (iodine replete) countries a relation is found between low maternal FT4 and worse developmental indices between 1 and 9 years of age. These studies described delays in general IQ and motor scores as well as verbal scores later on in development, again pointing towards the requirement for T4 in different parts of the brain. In case of very preterm birth, FT4 and other thyroid parameters are also lower than at higher gestational ages. This condition seems to be especially associated with neomotor disturbances later in life. Evidence for efficacy of thyroid hormone supplementation is still lacking at this point. The current available evidence will be discussed.

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