

## **Stereological analysis of the cerebellum of 24-day old rats with propylthiouracil-induced hypothyroidism**

Mwangi, D. K.; Warui, C. N

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### **Abstract:**

**Objective:** To investigate the structural parameters of the developing cerebellum in propylthiouracil (PTU)-induced hypothyroidism during pre and postnatal stages in 24 day old rat pups. **Method:** Hypothyroidism was induced by feeding the breeding dams with PTU in water before and during copulation, pregnancy and lactation and the pups through the dams and ingestion in water. The number of control and treated dams and pups was five for each dam group and twelve and thirteen for pups respectively. The whole cerebellum was dissected out from the pups and processed routinely for histological examination and morphometric analysis. The total volumes of cerebellum, intracerebellar nuclei and cerebellar compartments were estimated by Cavalieri method. The mean numerical densities of neurones and neuroglia in the intracerebellar nuclei and Purkinje, granule and combined stellate and basket cells in cerebellar cortex were estimated using optical disector and the total numbers calculated as the product of the respective numerical densities and reference volumes. **Results:** The treated dams and pups had relatively lower mean body weights and triiodothyronine (T<sub>4</sub>) serum concentrations. The serum triiodothyronine (T<sub>3</sub>) was normal and lower in the treated dams and pups respectively. The differences in the respective body weights and dam T<sub>4</sub> concentration in treated dams and pups were significant ( $p < 0.05$ ) compared to the control. Morphometric results showed that the mean volumes of cerebellum, intracerebellar nuclei, white matter, internal granular layer, molecular layer and the cerebellar cortex were lower and the differences between the values for each parameter were significant ( $p < 0.05$ ) in the treated pups compared to the control. The mean numerical densities of neurones and neuroglia in the intracerebellar nuclei (N<sub>vne</sub>; N<sub>vgl</sub>) and the combined stellate and basket cells (N<sub>vsb</sub>) in the cerebellar cortex were relatively higher and the mean values for the respective numerical densities of Purkinje and granule cells (N<sub>vpu</sub>; N<sub>vgr</sub>) were relatively lower in the treated pups compared to the control. On the other hand the treated pups had relatively lower values for the respective total numbers of neurons (N<sub>ne</sub>), neuroglia (N<sub>gl</sub>), Purkinje (N<sub>pu</sub>), granule (N<sub>gr</sub>) and the combined stellate and basket (N<sub>sb</sub>) cells compared to the control. The differences between the respective values for N<sub>vne</sub>, N<sub>vsb</sub>, N<sub>pu</sub>, and N<sub>gr</sub>, were significant ( $p < 0.05$ ). **Conclusion:** These results show that rat pups with PTU-induced hypothyroidism have relatively lower mean values for the structural parameters in the cerebellum when compared to control pups. This confirms that growth and maturation of the cerebellum is dependent on the maintenance of normal T<sub>4</sub> and T<sub>3</sub> levels, underscores the magnitude of the deviations from the normal and sheds light on possible structural limitations in the cerebellum in