



Effect of Iodine Deficiency in Animal Model

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DESCRIPTION

The thyroid gland's hormones must contain iodine, which has an atomic weight of 126.9 g/atom. Iodine and thyroid hormones are necessary for mammalian life. In the ecosystem of the earth, iodine (as iodide) is widespread yet unevenly distributed. The majority of iodide (around 50 g/L) is found in the oceans, where it is oxidized to elemental iodine in seawater before volatilizing into the atmosphere and returning to the soil via rain to complete the cycle. Iodine deficiency develops in soils and groundwater due to slow and inadequate iodine cycling, which occurs in many locations. People and animals who consume food cultivated in these soils become iodine deficient since the crops grown there have low iodine content.

Iodine content in meals made from plants grown in iodine deficient soils may be as low as 10 g/kg dry weight, as opposed to 1 mg/kg in plants cultivated in iodine sufficient soils. Although they can also exist in coastal regions, inland regions, mountainous areas and areas that experience frequent flooding are where iodine deficient soils are most prevalent. This is due to leaching caused by snow, water and severe rains, which removes iodine from the soil and it dates back to the last ice age. Iodine deficiency is common in the hilly parts of Europe, the Northern Indian Subcontinent, China, the Andean region of South America and the smaller ranges of Africa. Additionally, there is endemic iodine shortage in the Ganges Valley in India, the Irrawaddy Valley in Burma and the Sangla valley in northern China. Populations living in these locations will continue to be iodine deficient until dietary diversification introduces foods grown in iodine sufficient areas or iodine enters the food chain by being added to foods (for example, iodizing salt).

Deficiency of iodine in animal models

When fed a diet that included a mixture of maize (60%) peas (15%) torula yeast (10%) and dried iodine deficient mutton (10%), marmosets (*Callithrix Jacchus*) developed severe iodine deficit. The hair growth on the newborn iodine deficient marmosets was somewhat patchy. With a severe decrease in plasma T4 in both moms and neonates and being larger in the second pregnancy than the first, the thyroid gland may have been

more severely deficient in iodine. The neonates from the second pregnancy had a significantly lower brain weight than those from the first, but not by much. The cerebellum's weight and cell count reductions and histological abnormalities indicating poor cell acquisition made the findings there more startling. As a result of shortage of iodine have serious impacts on the brains of primates.

A low-iodine diet of crushed maize and pelleted pea pollard (8-15 µg iodine/kg), which gave 5-8 µg iodine per day for sheep weighing 40-50 kg, has been shown to cause severe iodine deficit in sheep. At 140 days, the iodine deficient foetuses had a markedly different physical appearance from the control foetuses. Reduced weight, no wool growth, a goiter, various degrees of subluxation in the foot joints and a deformed cranium were all present.

The delayed emergence of epiphyses in the limbs also showed a delay in bone formation. The iodine deficient babies showed goiter from 70 days and thyroid histology showed hyperplasia from 56 days gestation, which was linked to a decrease in the foetal thyroid's iodine content and a decrease in plasma T4 levels. As early as 70 days, the brain weight and DNA content decreased indicating a decline in cell quantity that was likely caused by delayed neuroblast multiplication, which generally takes place between 40 days and 80 days in sheep.

The body weight and brain weight of the lambs were partially restored after a single intramuscular injection of iodized oil (1 ml=480 mg iodine) was administered to the iodine deficient mother at 100 days gestation and the plasma T4 levels of the mother and foetus returned to normal. Studies on the underlying mechanisms have shown that both maternal and foetal thyroidectomy have a major impact on brain development throughout the middle of pregnancy. In addition to having more severe consequences than iodine shortage, the combination of a maternal thyroidectomy (performed six weeks before conception) and a foetal thyroidectomy led to a higher decline in the levels of both the mother's and the foetus' thyroid hormones. These results in animal models demonstrate the significance of both maternal and foetal thyroid hormones in the development of the foetal brain.

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