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CHANGES IN FOETAL LIVER AND BRAIN THYMIDINE KINASE ACTIVITY DUE TO MATERNAL ZINC DEFICIENCY

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The production of thymidine monophosphate for DNA synthesis during rapid cellular proliferation is thought to occur predominantly via the 'salvage' pathway, and this feature has been used as the basis for the estimation of DNA synthesis rates in vivo. Previous work from this laboratory (Dreosti, 1978) and others (Eckhert & Hurley, 1977) has shown decreased incorporation of ^{3}H-thymidine into liver and brain DNA of zinc deficient foetuses. Thymidine kinase (T.K.) which appears to be zinc dependent may be the rate controlling enzyme for this process, as its activity parallels the rate of DNA synthesis in many types of actively proliferating cells.

Previous studies (Duncan & Hurley, 1978) have shown that the difference in the soluble T.K. activities of the whole foetus between zinc deficient animals and their controls increased over days 9-14 of gestation. Also the incidence of foetal malformations increases when zinc deficiency is imposed in the second half of pregnancy (Hurley & Shrader, 1972). Taken together, these observations seem to indicate that the intrauterine effects of zinc deficiency are more pronounced in the latter part of gestation.

This current study examines the activities of T.K. in the soluble portions of brains and livers of foetuses taken from zinc deficient dams in the later stages of pregnancy.

The results indicate that the activity of the enzyme in the brains of the zinc deficient foetus is apparently 40% lower than the control animals at both day 17 and day 20 of gestation. This is in contrast to the liver, which shows a 30% reduction at day 20, but appears unaffected at day 17.

These results suggest that the brain is more susceptible to zinc deficiency during gestation than the liver. The decrease in T.K. activity in the liver at day 20 probably reflects a decrease in the soluble T.K. activity of the haematopoetic cells.

Since neuronal cell proliferation in the rat is almost complete by day 20, but glial cell production and brain maturation still continue, a decrease in activity of T.K. prior to day 17 may be manifest more in reduced or delayed neuronal and glial cell formation and the attendant gross anatomical defects observed. Decreased enzyme activity thereafter may affect brain maturation and could contribute to the behavioural anomalies observed later in life in rats subjected to a maternal zinc deficiency in the last third of pregnancy.

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