ABSTRACT

STUDIES ON THE TOXICITY OF CADMIUM IN THE PREGNANT RAT

by

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Intravenously administered Cd^{2+} was significantly more toxic to the pregnant rat on the 20th day of gestation than to the young adult, weanling or old breeder, and caused extensive damage to the liver and kidneys. The foetal part of the placenta was affected first at 8 h and the whole organ lost its architecture at 20 h.

A single intravenous injection of 1.25 mg Cd^{2+}/kg body weight between the 9th and 15th day of gestation resulted in hydrocephalus and other malformations. Cd^{2+} administration on the 12th day caused a dose-dependent inhibition of placental Zn^{2+}-transport. At the teratogenic dose, Zn^{2+}-transport was inhibited by 75% and caused a 33% reduction in embryonic Zn^{2+}-concentration at 20 h.

The teratogenic dose of Cd^{2+} inhibited the activity of embryonic thymidine kinase by about 60% at 4 h and at 20 h the embryonic DNA concentration was reduced significantly. The activity of the enzyme isolated from these embryos was restored by the addition of Zn^{2+} *in vitro*. Placental transport of ^{14}C-leucine and ^{14}C-formic acid as well as the utilization of these precursors in the synthesis of protein and RNA respectively, were unaffected at least at short times after administration of Cd^{2+}. Therefore, the teratogenic effects of Cd^{2+} may be related to the inhibition of DNA synthesis.

Oral Cd^{2+} (30 ppm) for 52 weeks did not produce congenital deformities, but the generation soon died out. Addition of Pb^{2+} (150 ppm) to this diet caused an even more dramatic effect on the reproductive performance, but without foetal deformities. Dietary Pb^{2+} increased the kidney uptake of Cd^{2+}, but reduced the renal concentration of Cd^{2+}, associated with discernible renal damage, from 80 to 50 μg/g wet weight.

Dietary Cd^{2+} (30 ppm) produced a Zn^{2+} deficiency in the foetuses probably by an inhibition of placental Zn^{2+}-transport and led to a high incidence of foetal deaths and resorptions.