In Vivo Effects of 137 Cesium on Steroidogenesis on Rats Chronically Contaminated from Different Ages

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More than twenty years after the Chernobyl nuclear power plant explosion, radionuclids are still mainly bound to the organic soil layers. The radiation exposure is dominated by the external exposure to gamma-radiation following the decay of 137 cesium (137Cs) and by soil-to-plant-to-human transfer of 137Cs through the food chain. Because of this persistent contamination with 137Cs, questions regarding public health for people living in contaminated areas were still raised. In territories near Chernobyl, studies report various malfunctions affecting the cardiovascular, nervous, immune or urogenital systems, in addition to a large increase of thyroid cancers among adult populations. Moreover, it has been shown increases in children's general morbidity and increases in rare illnesses in the Chernobyl polluted territories. More particularly, children present some perturbations of the endocrine system, as well as delay of puberty, or acceleration of sexual development. Despite of these observations no experimental study has been conducted regarding the effects of 137Cs on steroidogenesis metabolism to understand mechanisms responsible for these perturbations. Two rodent models were developed in our laboratory, to mimic exposure of adult and juvenile populations. We contaminated rats via their drinking water for nine months (equivalent to twenty years for human) with a dose that can be found in contaminated territories (6500Bq/L). Adults' rats were contaminated from the age of three months. Pups were contaminated in a first time via dams' milk, then directly through their drinking water, until the age of 9 months. Concerning hormonal profiles, a three-fold decrease in estradiol level was noted following adult-contamination. This hormonal modification was not found after post-natal contamination. In addition, no modification in circulating testosterone level was observed for both models. Concerning gene expression of biosynthesis enzymes, no change was noticed for adult-contamination. For post-natal contamination, only aromatase (responsible for estradiol synthesis) is up-regulated (two-fold). Surprisingly aromatase protein expression as well as activity were unmodified. These studies reveal that long term contamination of 137Cs differently affects testicular steroidogenesis metabolism when began at birth or from adulthood. It suggests that this radionuclide dos not have the same effects on testicular metabolism before and after puberty. It could be of great interest to study the effects of 137Cs contamination since in-utero development (to mimic Chernobyl's children). In addition the effects of contamination on several generations should be studied.

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