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Long-term effect of diet amended by risk elements contaminated soils on risk element penetration and physiological parameters of rats

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The long-term accumulation of risk elements (As, Cd, Pb) originated from differently contaminated soils in rat organism was investigated during a model two-generation experiment. The effect of soil contamination level, gender, and length of exposure as well as the interactions between risk elements and selected essential macro- and microelements were studied. Rat diet contained 10% of individual soils (based on dry weight): (i) Fluvisol heavily polluted by As, Cd, Zn, and Pb, (ii) Luvisol contaminated by As, Cd, and Zn, and (iii) uncontaminated Chernozem. Male and female Wistar rats used for the experiment were housed in cages in a room with controlled temperature for 60 days and were fed ad libitum the mentioned diets. Subsequently, the pregnant females were continuously fed the experimental diet until weaning when the young animals were separated to male and female and fed the experimental diet till day 110 of age. The element contents in rat tissues reflected the risk element contents in contaminated soils. The bioaccessibility and bioavailability of the risk elements decreased in the order Cd>As>Pb and was affected by the soil physicochemical parameters. No significant differences were observed between male and female rats as well as between the first and the second generation. However, interactions were reported among the risk elements where the high cadmium content in Fluvisol resulted in increasing arsenic accumulation in the rat liver. Moreover, arsenic-copper interactions were observed where significant increase of the copper level was determined in kidney of the animals fed Luvisol exceeding 50-fold the maximum permissible limits for As content in agricultural soils. Among the hematological and biochemical characteristics of rats, total erythrocyte count (Er), hematocrit (Hct) increased confirming adverse effect of soil-derived risk elements especially in male rats.

Keywords:

Keywords: risk elements; soil; soil ingestion; liver; kidney; blood; *Rattus norvegicus*

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