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EVOLIUCINĖ MEDICINA: ŽMOGAUS RAIDOS PERSPEKTYVOS IR SVEIKATA BESIKEIČIANČIOJE APLINKOJE

EVOLUTIONARY MEDICINE: PERSPECTIVES ON HUMAN DEVELOPMENT AND HEALTH CONSEQUENCES IN A CHANGING ENVIRONMENT

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TRANSGENERATIONAL ASSOCIATIONS OF MATERNAL NUTRITIONAL INSUFFICIENCY WITH RENAL HISTOPATHOLOGICAL CHANGES IN RAT OFFSPRING

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Background and Aim: Developmental Programming of Fetal Growth claims that prenatal factors such as maternal malnutrition may impair fetal organogenesis and increase the risk of chronic disease. This study evaluates histopathological kidney changes in first (F1) and second generation (F2) rat offspring exposed to maternal dietary restrictions.
Materials and Methods: Maternal rats were divided into three groups: control group (CG; fed normal diet), first experimental group (1EG; receiving a 50% reduced diet before pregnancy), and second experimental group (2EG; receiving the same reduced diet before and throughout pregnancy). Kidney sections of F1 (CG: n=2, 1EG: n=6, 2EG: n=6) and F2 (CG: n=2, 1EG: n=6, 2EG: n=6) were examined microscopically across ten randomly selected fields per section using CellSens software. Renal corpuscle count (RCC) and size (RCS), Bowman's capsule size (BCS) were assessed. All analyses were performed using R statistical software package.
Results: In F1 generation, maternal diet restriction tended to reduce RCS compared with controls (CG:148,16±16,73 μm vs. 1EG:130,58±7,66 μm, 2EG:132,94±7,96 μm; p=0,069); RCC and BCS were also lower in the experimental groups, but the differences were not significant (p=0.324 and p=0.339). In F2 offspring, RCS and BCS remained lower in both experimental groups than in controls, although the differences were not significant (p=0,918; p=0,108), however both experimental groups had significantly fewer renal corpuscles versus controls (CG:11,4±0,85 vs. 1EG:9,58±0,87, p=0,009; 2EG:9,35±0,84, p=0,005). From F1 to F2, BCS and RCC increased (10,59% and 7,03%, respectively), while RCS decreased (9,53%). Significant sex-related differences were observed in F2 (males: larger RCS and BCS, p=0,016; p=0,039; females: higher RCC, p=0,003), with the same pattern present but non-significant in F1.
Conclusions: Transgenerational histopathological kidney changes in offspring were associated with maternal dietary restrictions. All F1 and F2 experimental groups showed reduced RCC, RCS, and BCS compared with controls. Notable sex-related differences were observed in F2.

Keywords: developmental programming, growth and development, kidneys, maternal undernutrition, rats