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# Early Life Overnutrition Impacts on Subsequent Infantile Renal Risks in Male Rats: Experimental Evidence of Developmental Programming

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## Early Life Overnutrition Impacts on Subsequent Infantile Renal Risks in Male Rats: Experimental Evidence of Developmental Programming

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Overnutrition during critical perinatal periods is associated with determining susceptibility to obesity and well known comorbidities. We aimed to investigate the effects of overnutrition during neonatal periods on the development of early-onset obesity and renal pathophysiological changes. Rat pup litters were adjusted to either 3 or 10 pups per mother (overnurition and control, respectively) from day 1 to days 21 of life. We measured the effects of early postnatal nutrition excess on body weight, blood pressure, blood glucose and potential renal changes related to obesity by 28 days. Smaller litter male pups weighed heavier than controls between days 4 and 28 after birth ($p<0.05$). By 28 days of age, kidney weight or heart weight per body weight ratio was decreased in small litter group ($p<0.05$). There were no differences of blood pressure and blood glucose levels between the two groups. Overnutrition had no significant effects on renal cell proliferation, apoptosis, numbers of ED-1 positive macrophages and glomerulosclerosis. In immunoblots and immnnohistochemistry, renin and angiotensin II type (AT) 2 receptor protein expressions significantly increased in neonatally overfed rats ($p<0.05$). In contrast, plasminogen activator inhibitor (PAI)-1 and matrix metalloproteinase (MMP)-9 protein expressions decreased in the overnutrition group ($p<0.05$). AT 1 receptor, monocyte chemoattractant protein-1, tissue inhibitor of MMP-1, tumor necrosis factor-$\alpha$, osteopontin and adiponectin expressions were not different between the two groups. Our data demonstrate that postnatal overfeeding leads to early-onset obesity and brings unexpected and deleterious renal alterations. Increased renin and AT2 may decrease renal PAI-1 and MMP-9, suggesting an inhibitory effect on accumulation of extracellular matrix proteins or the impairment of matrix turnover in neonatally overfed male rats.

**Key Words :** 비만, 주산기 프로그래밍, 신장
Obesity, Perinatal programming, Kidney