

Renal physiology

Prenatal and Postnatal Malnutrition: Relationship with AQP2 and GLUT4 Expression in Male Adult Rats

Velázquez-Orozco Verónica¹, Pérez-Fuentes Ricardo², Nicolás-Toledo Leticia³, Cuevas Estela³, Castelán Francisco⁴, Rodríguez-Antolín Jorge³.

¹Doctorado en Ciencias Biológicas, Universidad Autónoma de Tlaxcala. ²Facultad de Medicina, Benémrita Universidad Autónoma de Puebla. ³Centro Tlaxcala Biología de la Conducta, Universidad Autónoma de Tlaxcala. ⁴Instituto de Investigaciones Biomédicas, Universidad Nacional Autónoma de México.

Introduction: The physiology of the urinary tract achieves the elimination of toxic substances from the organism, particularly in the kidneys. There are several molecules and proteins which participate in the kidney function. Among others, this organ has to transport water and glucose and it has specific proteins that make it possible. Fourteen aquaporins (AQPs) have been described until now, distributed in different parts of the organism. Some of them (1,2,3,4,6,7 and 11 AQPs) are differentially expressed along the kidney and are highly relevant for the water transport across the renal tubules. Particularly, AQP2 is located on the collecting duct where the urine will be diluted or concentrated because of the function of Antidiuretic hormone (ADH). The ADH links up with its specific receptor in principal cells, triggers the trafficking of AQP2 to the apical membrane to permit the water passage. Also, in these tubules there is glucose exchange, to do that there are glucose transporters (GLUTs). Specifically, GLUT4 have been determined in glomerulus, proximal and collector tubule. This kind of transporter has been studied in insulin sensitive organs but it is not clear how it is working in kidney. The high consumption of sugared drinks has been associated with metabolic diseases, including type 2 diabetes mellitus that is linked to renal failure.

Objective: To determine whether the consumption of sugared water during pregnancy and lactation, alters the expression of AQP2 and GLUT4 in the kidney of adult male offspring.

Material and Methods: We used female rats that were mated and divided in a control group fed with standard diet and tap water, and the experimental group fed with standard

diet and 5% sucrose diluted in tap water (sugared water). At weaning, two male rats were randomly selected per litter; one of them had free access to simple water while the other had free access to the sugared water. The male rats were sacrificed at four months old and the expression of AQP2 and GLUT4 in the left kidney was analyzed by Immunohistochemistry and Western blot.

Results: Opposite the group that consumed plain water during the experiment with the group that consumed sugared water during pregnancy, lactation and postnatal life, preliminary results show an overexpression of AQP2 and GLUT4 in the last group. It seems that the consumption of sugared water, even in low concentration, modifies the renal expression of AQP2 and GLUT4.

Conclusions: Present finding encourage to a further regionalization of the AQP2 and GLUT4 expression in kidneys. In doing this, we advanced in the knowledge of renal outcomes associated to the intake of sugared beverages.

Keywords: Prenatal malnutrition, postnatal malnutrition, AQP2 and GLUT4 expression, male adult rats