KSN 2021
FULLY VIRTUAL MEETING
September 02 (Thu) - 05 (Sun)

Abstract Submission No. : 2411

Analysis of glomerular filtration rate and AQP2 expression in male and female mice and high fat diet-fed mice.

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Objectives: Glomerular filtration rate (GFR) is one of best indicator of kidney function. However, its use in small animal, including mice, is interfered by the difficulty of urine collection. Here, we tested whether an addition of water by injection of saline into the peritoneal cavity is affordable to GFR measurements.

Methods: Eight to ten-week old C57BL/6 male or female mice, or low fat diet (LFD)- or high fat diet (HFD)-fed 14-week old male mice were administered with saline 5 or 10% of body weight, intraperitoneally. Some mice were not administered with saline. Urine was collected individually for 4 hrs after injection, using a cylindrical metabolic cage without water and food supply. Blood was collected at same time. Aquaporin 2 (AQP2) mRNA and protein expression was determined in the kidney by real time PCR and western blot analysis.

Results: Urine volume increased, depending on saline dose in normal water-supplied male mice, but GFR was same. , After saline injection, the AQP2 mRNA expression in the kidneys was not changed compared with that in the kidneys of non-saline injected mice. However, this saline injection induced the increase of AQP2 expression in the membrane fraction of kidney lysate. When GFR was determined in the mice after 5% saline injection, GFR was lower in female mice than male mice. GFR in the HFD-fed mice was also lower than that in LFD-fed mice.

Conclusions: Our results indicate that external saline administration increased urine volume without significant GFR change and that sex and high-fat diet affect GFR, suggesting that external saline administration is a useful tool for urine collection in the mice. In addition, GFR is affected by sex and diet intake. It also shows that in the model.