KSN 2020
FULLY VIRTUAL MEETING

**Abstract Type : Oral**
**Abstract Submission No. : OR-1675**

# Graphene quantum dots prevent glomerular and interstitial injury in murine Adriamycin nephropathy through macrophage depletion

**Kyu Hong Kim[1]**, Jong Bo Park[2], Yong Chul Kim[1], Ji Eun Kim[1], Jung Pyo Lee[3], Jae Wook Lee[4], Dong Ki Kim[1], Byung Hee Hong[2], Yon Su Kim[1], Seung Hee Yang[5]
[1]Department of Internal Medicine-Nephrology, Seoul National University Hospital, Korea, Republic of
[2]Department of chemistry, Seoul National University, Korea, Republic of
[3]Department of Internal Medicine-Nephrology, SMG-SNU Boramae Medical Center, Korea, Republic of
[4]Department of Internal Medicine-Nephrology, National Cancer Center, Korea, Republic of
[5]Department of Kidney Research Institute, Seoul National University College of Medicine, Korea, Republic of

**Objectives:** Macrophage infiltration is a key feature of the pathogenicity associated with glomerular and tubulointerstitial injury in kidney disease. Graphene quantum dots (GQDs) are considered a promising material because of their good free radical scavenging activity, low toxicity, and excellent water solubility. Here, to investigate this possibility, the effect of GQDs was studied in a murine model (Adriamycin nephropathy, AD)

**Methods:** Investigating the effects of GQDs on renal injury, we used Adriamycin nephropathy mice model and $H_2O_2$-induced in vitro models with cultured human podocytes. Adriamycin nephropathy was provoked in male BALB/c mice by a single intravenous injection of Adriamycin (11.5 mg/kg). GQDs (20mg/kg) were given by intraperitoneal at days -1, 0, 1, and 4. After seven weeks, renal function and histology were studied by histomorphometry and flow cytometry.

**Results:** GQDs treatment ameliorated kidney function, after lowering proteinuria that was accompanied by a significant reduction in Adriamycin-induced tubular injury, apoptosis, and inflammatory cell infiltration on AD model. *In vitro* study, GQDs improved impaired wound healing on primary cultured podocytes by reducing IL-11, IL-8, ROS and proportion of dead cells in $H_2O_2$-induced oxidative stress. Compared with Adriamycin-treated mice, GQDs-treated mice also restored kidney function and decreased proteinuria and pathologically decreased mesangial expansion, glomerular sclerosis, and interstitial expansion than the mice on Adriamycin alone. Furthermore, the administration of GQDs significantly reduced NGAL and pSTAT3 expressions in the kidney. Flow cytometric analysis revealed a marked decreased in the number of $CD11b^+Gr1^+CD206^+$ macrophage in kidney and spleen of the GQDs-treated mice. RNA-seq analysis highlights specific gene activation cascade pattern related to apoptosis, cell cycle, and kidney injury, especially DNA damage response pathway such as Parp9, Parp10, Mad212 and AP5s1.

**Conclusions:** Our study has uncovered a major protective role of GQDs in AD model through macrophage depletion. GQDs are potential therapeutic target for renal preservation.