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Diabetic Renal Injury in Catalase Null Mice

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Backgrounds : Reactive oxygen species (ROS) play an important role in the development and progression of diabetic renal injury. Catalase is a major antioxidant enzyme that decomposes hydrogen peroxide, thereby preventing the generation of hydroxyl radical by the Fenton reaction. The antioxidant activity of catalase is dependent on the type of tissue and pathologic condition. Catalase overexpression was recently shown to protect against diabetic renal injury, but the effect of catalase deficiency on diabetic nephropathy has not been reported.
Methods : Six- week- old male homozygous catalase knock- out (*Cat*$^{-/-}$) mice and wild- type (WT) mice were divided into two subgroups (5 mice per group): control and streptozotocin (STZ)- induced diabetic group. Experimental diabetes was induced by intraperitonea l injection of STZ 50 mg/kg for 5 days. At 4 weeks after the induction of diabetes, blood glucose, plasma creatinine, and urinary albumin excretion rate were measured. Mice were then sacrificed and kidney weight was obtained. Whole kidneys were homogenized and E- cadherin, a- smooth muscle actin (α - SMA), bone morphogenic protein- 7 (BMP- 7), and fibronectin protein and mRNA were measured.
Results : STZ induced hyperglycemia in both WT and *Cat*$^{-/-}$ diabetic mice. Renal expression of fibronectin was significantly increased and E- cadherin and BMP- 7 decreased in both diabetic mice groups compared to respective control mice. α - SMA expression was significantly increased in *Cat*$^{-/-}$ diabetic mice compared to WT control and WT diabetic mice. Changes in fibronectin, E- cadherin, and BMP- 7 expression in *Cat*$^{-/-}$ diabetic kidneys tended to be higher compared to WT diabetic kidneys, although statistically insignificant.

	Blood Glucose (mg/dL)	Plasma Creatinine (mg/dL)	UAE (mg/24 h)	E-cadherin		BMP-7 Protein (ng/mg prot)	α-SMA protein
				mRNA	protein		
WT	197.2±22.2	1.88±0.21	0.28±0.07	1.88±0.17	1.83±0.11	211.37±23.01	0.78±0.08
WT+DM	442.0±54.6*	1.68±0.16	0.96±0.39	1.10±0.14*	1.00±0.13*	124.23±32.52*	1.00±0.07
Cat$^{-/-}$	162.9±24.0	1.88±0.22	0.30±0.10	1.31±0.11*	1.33±0.14*	244.09±7.99	1.09±0.14
Cat$^{-/-}$/+DM	471.4±31.3*	1.41±0.50	2.62±1.54	0.81±0.06*, †	0.69±0.32*, †	54.45±28.24*, †	1.56±0.46*, †

Abbreviation : UAE, urinary albumin excretion; meanμSE, *p<0.05 vs WT, †p<0.05 vs *Cat*$^{-/-}$, †p<0.05 vs WT+DM

Conclusion : Catalase deficiency appears to render diabetic animals more susceptible to renal injury, supporting the importance of oxidative stress in diabetic nephropathy. Further studies are required for long- term effect of catalase deficiency in the progression of diabetic renal injury.
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Key Words : 카탈라제 결핍 생쥐, 당뇨병성 신증
Catalase deficiency, Diabetic nephropathy