



## Tetramethylpyrazine Attenuates Renal Ischemia-Reperfusion Injury in Rats through Inhibiting Inflammation and Oxidative Stress and Enhancing Autophagy

Pu CHEN<sup>1</sup>, Jianjun LI<sup>2</sup>, Shuwen LIU<sup>1</sup> & Ribao WEI<sup>1\*</sup>

<sup>1</sup> Department of Nephrology, The First Center of Chinese PLA General Hospital, Chinese PLA Institute of Nephrology, State Key Laboratory of Kidney Diseases, National Clinical Research Center for Kidney Diseases, Beijing Key Laboratory for Kidney Diseases, Beijing 100853, China

<sup>2</sup> Department of Nephrology, Dongzhimen Hospital, Beijing University of Chinese Medicine, Beijing 100700, China

**SUMMARY.** In this study we evaluated the effect and mechanism of tetramethylpyrazine (TMP) on renal ischemia-reperfusion injury (RIRI) in rats. Forty-five SD rats were randomly divided into sham-operated (SO), RIRI and TMP+RIRI group, 15 rats in each group. The TMP+RIRI group was treated with 200 mg/kg TMP by intragastrical administration, once a day, for seven consecutive days. Then, the RIRI model was made in RIRI and TMP+RIRI groups. After 24 h from reperfusion, compared with RIRI group, in TMP+RIRI group the renal index and serum creatinine and blood urea nitrogen levels were decreased; the renal tissue tumor necrosis factor  $\alpha$ , interleukin 1 $\beta$  and interleukin 6 levels were decreased, and the interleukin 10 level was increased; the renal tissue superoxide dismutase level was increased, and the malondialdehyde level was decreased; the renal tissue LC3-II/LC3-I ratio and Beclin-1/ $\beta$ -actin ratio were increased. In conclusion, the TMP can attenuate the RIRI in rats through inhibiting the inflammation and oxidative stress and enhancing the autophagy in renal tissue.

**RESUMEN.** En este estudio evaluamos el efecto y el mecanismo de la tetrametilpirazina (TMP) en la lesión por isquemia-reperfusión renal (RIRI) en ratas. Cuarenta y cinco ratas SD se dividieron aleatoriamente en un grupo operado simulado (SO), RIRI y TMP+RIRI, 15 ratas en cada grupo. El grupo TMP+RIRI se trató con 200 mg/kg de TMP mediante administración intragástrica, una vez al día, durante siete días consecutivos. Luego, el modelo RIRI se realizó en grupos RIRI y TMP+RIRI. Después de 24 h desde la reperusión, en comparación con el grupo RIRI, en el grupo TMP+RIRI el índice renal y los niveles séricos de creatinina y nitrógeno ureico en sangre disminuyeron; los niveles de factor de necrosis tumoral del tejido renal  $\alpha$ , interleucina 1 $\beta$  e interleucina 6 disminuyeron y el nivel de interleucina 10 aumentó; se aumentó el nivel de superóxido dismutasa del tejido renal y se disminuyó el nivel de malondialdehído; la proporción de tejido renal LC3-II/LC3-I y la proporción de Beclin-1/ $\beta$ -actina aumentaron. En conclusión, el TMP puede atenuar el RIRI en ratas al inhibir la inflamación y el estrés oxidativo y mejorar la autofagia en el tejido renal.

**KEY WORDS:** autophagy, inflammation, oxidative stress, renal ischemia reperfusion injury, tetramethylpyrazine.

\* Author to whom correspondence should be addressed. E-mail: weiribao1@126.com.