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Consumption of hydrogen-rich water protects against ferric nitrilotriacetate-induced nephrotoxicity and early tumor promotional events in rats

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Abstract

The aim of this work was to test whether consumption with hydrogen-rich water (HW) alleviated renal injury and inhibited early tumor promotional events in Ferric nitrilotriacetate (Fe-NTA)-treated rats. Rats were injected with Fe-NTA solution (7.5mg Fe/kg body weight) intraperitoneally to induce renal injury and simultaneously treated with HW (1.3 ± 0.2mg/l). We found that consumption with HW ameliorated Fe-NTA-induced renal injuries including suppressing elevation of serum creatinine and blood urea nitrogen and inhibited early tumor promotional events including decreasing ornithine decarboxylase activity and incorporation of [3H]thymidine into renal DNA. Consumption with HW suppressed Fe-NTA-induced oxidative stress through decreasing formation of lipid peroxidation and peroxynitrite and activities of NADPH oxidase and xanthine oxidase, increasing activity of catalase, and restoring mitochondrial function in kidneys. Consumption with HW suppressed Fe-NTA-induced inflammation marked by reduced NF-κB, IL-6, and MCP-1 expression and macrophage accumulating in kidneys. In addition, consumption with HW suppressed VEGF expression, STAT3 phosphorylation and PCNA expression in kidneys of Fe-NTA-treated rats. Consumption with HW decreased the incidence of renal cell carcinoma and suppressed tumor growth in Fe-NTA-treated in rats. In conclusion, drinking with HW attenuated Fe-NTA-induced renal injury and inhibited early tumor promotional events in rats.

Keywords: ATP; BUN; Fe-NTA; Ferric nitrilotriacetate; HO; HW; Heme oxygenase; Hydrogen-rich water; Inflammation; MCP-1; MDA; ODC; OONO−; Oxidative stress; PCNA; RCC; ROS; Renal cell carcinoma; STAT3; VEGF; adenosine triphosphate; blood urea nitrogen; hydrogen-rich water; malondialdehyde; monocyte chemotactic protein-1; ornithine decarboxylase; peroxynitrite; proliferating cell nuclear antigen; reactive oxygen species; renal cell carcinoma; signal transducers and activators of transcription 3; vascular endothelial growth factor.

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