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## **Protective mechanism of reduced water against alloxan-induced pancreatic beta-cell damage: Scavenging effect against reactive oxygen species.**

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Reactive oxygen species (ROS) cause irreversible damage to biological macromolecules, resulting in many diseases. Reduced water (RW) such as hydrogen-rich electrolyzed reduced water and natural reduced waters like Hita Tenryosui water in Japan and Nordenau water in Germany that are known to improve various diseases, could protect a hamster pancreatic beta cell line, HIT-T15 from alloxan-induced cell damage. Alloxan, a diabetogenic compound, is used to induce type 1 diabetes mellitus in animals. Its diabetogenic effect is exerted via the production of ROS. Alloxan-treated HIT-T15 cells exhibited lowered viability, increased intracellular ROS levels, elevated cytosolic free Ca(2+) concentration, DNA fragmentation, decreased intracellular ATP levels and lowering of glucose-stimulated release of insulin. RW completely prevented the generation of alloxan-induced ROS, increase of cytosolic Ca(2+) concentration, decrease of intracellular ATP level, and lowering of glucose-stimulated insulin release, and strongly blocked DNA fragmentation, partially suppressing the lowering of viability of alloxan-treated cells. Intracellular ATP levels and glucose-stimulated insulin secretion were increased by RW to 2-3.5 times and 2-4 times, respectively, suggesting that RW enhances the glucose-sensitivity and glucose response of beta-cells. The protective activity of RW was stable at 4 degrees C for over a month, but was lost by autoclaving. These results suggest that RW protects pancreatic beta-cells from alloxan-induced cell damage by preventing alloxan-derived ROS generation. RW may be useful in preventing alloxan-induced type 1-diabetes mellitus. PMID:19003114

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