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Anti-diabetes effect of water containing hydrogen molecule and Pt nanoparticles

Electrochemically reduced water (ERW) contains a lot of hydrogen molecule (H_2) and scavenges reactive oxygen species (ROS) to protect DNA from oxidative damage. ERW also contains small amounts of Pt nanoparticles (NPs) and elongates the lifespan of C. elegans. Pt NPs are newly recognized multi-functional ROS scavengers. ERW exhibits anti-diabetes effects in vitro and in vivo. We proposed mineral nanoparticle active hydrogen reduced water hypothesis to explain the activation mechanism of H_2 to hydrogen atom (H). Recently, H_2 has been reported to scavenge ROS and suppress a variety of oxidative stress-related diseases, however, the action mechanism of H_2 has not been clarified thoroughly. Here, we examined anti-diabetes effects of H_2 and Pt NPs. H_2 stimulated glucose uptake into L6 cells. Pt NPs catalyzed the activation of H_2 to hydrogen atom (H) to scavenge DPPH radical in vitro. The combined use of molecular hydrogen and Pt NPs resulted in extremely stimulated glucose uptake into L6 cells, suggesting that H produced from H_2 by catalyst action of Pt NPs regulated glucose uptake signal transduction. As oppose to the paper by Ohsawa et al., H_2 of 25 to 75% concentration in the mixed gas significantly scavenged intracellular H_2O_2 in rat fibroblast L6 cells and induced the gene expression of antioxidative enzymes such as CAT, GPx and HO-1 via activation of Nrf2. H_2, Pt NPs and their combination significantly suppressed the levels of fasting blood glucose and improved the impaired sugar tolerance abilities of obese insulin-resistant type 2 diabetic KK-Ay mice. H_2, Pt NPs, and their combined use resulted in activation of glucose uptake signal transduction pathways and stimulation of glucose uptake into L6 myotubes. In the groups of H_2, Pt NPs and their combined use groups, blood sugar levels and impaired sugar tolerance of type 2 diabetes model mouse (KK-Ay) were significantly improved, suggesting that H_2, Pt NPs and H are redox regulation factors in animal cells.

Related Information

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