Nishikawa R, Teruya K, Katakura Y, Osada K, Hamasaki T, Kashiwagi T, Komatsu T, Li Y, Ye J, Ichikawa A, Otsubo K, Morisawa S, Xu Q, Shirahata S.
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In the two-stage cell transformation theory, cancer cells first receive initiation, which is mainly caused by DNA damage, and then promotion, which enhances transformation. Murine Balb/c 3T3 cells are widely used for transformation experiments because they lose contact inhibition ability when transformed. Electrolyzed reduced water (ERW), which is produced near a cathode during electrolysis of water, is an alkaline drinking water that is beneficial to health. ERW contains a high concentration of dissolved hydrogen and scavenge reactive oxygen species (ROS), along with a small amount of platinum (Pt) nanoparticles (Pt nps) derived from Pt-coated titanium electrodes. Pt nps stably disperse in aqueous solution for a long time, and convert hydrogen molecules to active hydrogen (atomic hydrogen) that can scavenge ROS. Therefore, ERW supplemented with synthesized Pt nps is a model strong reduced water. This is the first report that ERW supplemented with synthesized Pt nps strongly prevents transformation of Balb/c 3T3 cells. ERW was prepared by electrolysis of 0.002 M NaOH solution using a batch-type electrolysis device. Balb/c 3T3 cells were treated with 3-methyl cholanthrene (MCA) as an initiation substance, followed by treatment with phorbol-12-myristate-13-acetate (PMA) as a promotion substance. MCA/PMA-induced formation of a transformation focus was strongly suppressed by ERW supplemented with Pt nps but not by ERW or Pt nps individually. ERW supplemented with Pt nps suppressed transformation at the promoter stage, not at initiation, suggesting that ERW supplemented with Pt nps suppressed the PMA-induced augmentation of intracellular ROS. ERW supplemented with Pt nps is a potential new antioxidant against carcinogenesis.

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