ENERGETIC AND ANTI-OXIDATIVE PLASMON-ACTIVATED WATER EFFECTIVELY RESCUE THE HIPPOCAMPAL BIOENERGETICS FOR PARKINSON'S DISEASE OF ANIMALS

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Abstract - Nowadays, aging-related diseases are concerned. Parkinson's disease (PD) is a progressive neurodegenerative disease with cognitive dysfunction wherein impaired hippocampal bioenergetics due to enhanced oxidative stress underlies the molecular mechanism of this deficiency. Considering plasmon-activated water (PAW) possesses significant anti-oxidative effects, present study aims to determine whether PAW would successfully depress the oxidative stress, and thereby, rescue the hippocampal bioenergetics following PD. Adult rats subjected to intranigral 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine (MPTP) injection were daily drank of deionized water or PAW for 2 weeks. The malondialdehyde level, time-of-flight secondary ion mass spectrometry (TOF-SIMS), quantitative immunohistochemistry, [^{14}C]-2-deoxyglucose (2-DG) assay, and novel object recognition test were used to detect the oxidative stress, ionic/neurochemical expression of molecular machineries involved in long-term potentiation, the hippocampal bioenergetics, as well as the cognitive function, respectively. Results indicated that in MPTP-injected rats, enhanced oxidative stress, diminished Ca^{2+} intensity, decreased *N*-methyl-D-aspartate receptor and phosphorylated cAMP response element-binding protein expression, reduced nitric oxide level, and increased α-synuclein with low 2-DG activity were detected in hippocampal regions. Impairment of the hippocampal bioenergetics corresponded well with poor performances in cognitive test. However, in rats daily drank of PAW during the post-MPTP period, all above parameters were greatly returned to nearly normal levels. No noticeable loss of tyrosine hydroxylase activity was detected in substantia nigra. Behavioral test also showed a significant improvement in cognitive activity following PAW. As PAW successfully rescue the hippocampal bioenergetics through preserving the ionic/molecular machineries involving in neuro-plastic regulation, daily drinking of PAW may be worthy of trial for clinical use as a novel strategy to counteract the PD-induced cognitive dysfunction with more natural and convenient way.