Immunomodulatory effects of phosphodiesterase inhibitors in chlorpyrifos-induced toxicity in human lymphocytes

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Abstract Chlorpyrifos (CP) is a broad-spectrum organophosphate (OP) insecticide used for a variety of agricultural and domestic applications. It has been expressed that OP induces oxidative stress by generating free radicals. This study investigated the hypothesis that 3 types of phosphodiesterase inhibitor drugs including rolipram (R), milrinon (M) and pentoxifylline (P) can synergistically alleviate the toxicity of chlorpyrifos in human lymphocyte. Lymphocytes were isolated from human blood and exposed to CP, M, R, P and combination of them for 72 hours. After 3 days of incubation, the viability of the lymphocytes by measuring mitochondrial activity and flow cytometer were assessed. Also, level of myeloperoxidase (MPO), lipid peroxidation (LPO), total thiol molecules (TTM) and total antioxidant potential (TAP) as oxidative stress factors and level of tumor necrosis factor-α (TNF-α) as inflammatory marker were measured. CP significantly increased the level of apoptosis, oxidative stress and inflammatory markers. Hopefully, phosphodiesterase inhibitor drugs, specially combination of them, restored these effects and significantly decreased apoptosis and rate of MPO, LPO, TTM and TAP and also TNF-α in comparison to CP group. It is concluded that phosphodiesterase inhibitors has antioxidant effects which may result in attenuation and recovering the chlorpyrifos-induced toxicity in human lymphocytes.

Keyword: phosphodiesterase inhibitors, chlorpyrifos, human lymphocytes, oxidative stress, apoptosis.