

Toxicological characterization of fullerene C₆₀ in vitro – dependence on preparations and cell line

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We have investigated the biological effects of the crystalline C₆₀ (surface, covered by the fullerene) and water soluble complex C₆₀/PVP, in which the degree of aggregation of C₆₀ molecule is low) on various cell lines.

It is stated, that the surface, covered by the fullerene, is non-toxic in darkness for all tested cell-lines within the concentrations range 10-30 mkg/cm². On the contrary, under the intensive irradiation by visible or UV light (36-45 mW/cm²) the viability of the cells depends on the intensity and time of irradiation. The effect of irradiation was blocked by several anti-oxidants: nonselective Hypoxen and sodium azide, the scavenger of singlet oxygen. Besides that, the photodynamic damage of the cells of tumor origin (HeLa, A-549) was more pronounced at the equal conditions, than of normal (embryonic human fibroblasts) or of spontaneously transformed (MA-104) cells.

The inclusion complex C₆₀/PVP (1-5 mg/ml of C₆₀/PVP, C₆₀ 70-465 mkM) also has not caused the any visible changes of viability and cell metabolism in darkness (under the exposition of 5-72 hours). Under the irradiation by visible light it had just non-significant phototoxicity on the maximal of the used concentration. At the same time C₆₀/PVP complex had protected the cells in the culture from the phototoxicity, caused by the UV light. C₆₀/PVP complex in the concentration of 5 mg/ml had caused the significant changes of the cell ultrastructures, especially the increase of number and size of mitochondria.

Therefore the biological properties, in particular, phototoxicity of pristine fullerene C₆₀ *in vitro* depend on its aggregation state (type of preparation); the phototoxicity of fullerene occurs by the formation of ROS, especially of singlet oxygen; and the cells of tumor origin are more sensitive for C₆₀ photodynamic action than the normal ones.