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In silico studies and *in vitro* effects of combined action of C_{60} fullerene with *N*-(diphenylphosphoryl)pyrazine-2-carboxamide or diphenyl-N-(trichloroacetyl)amidophodphate

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Extension of drugs range via the development of new biologically active compounds is the important problem of the medical and pharmaceutical research. Carbacylamidophosphates (CAPh) are promising class of biologically active compounds with antimitotic and antiproliferative activities which could be a perspective antitumor agents.

Representatives of CAPh *N*-(diphenylphosphoryl)pyrazine-2-carboxamide (HL1) or Diphenyl-N- (trichloroacetyl)amidophodphate (HL2) were synthesized and identified by the methods of FTIR, ^{1}H and ^{31}P NMR spectroscopy at Taras Shevchenko National University of Kyiv. A highly stable water colloid solution of C_{60} fullerene (10^{-4} M, purity >99.5%, nanoparticles average size 50 nm) was synthesized at Technical University of Ilmenau (Germany).

The aim of this work was *in silico* study of the DNA interaction with HL1 or HL2 separately and in combination with C_{60} fullerene and to estimate the cytotoxicity of these compounds *in vitro*.

By using computer modeling it was shown that studied compounds can form nanocomplexes with C_{60} fullerene. HL1 forms the stacking interactions with C_{60} fullerene via phenyl and pyrazine rings. In the case of HL2 with C_{60} fullerene form cation-π bonds via CCl_3 group.

In silico study showed that HL1 and HL2 both separately and in combination with C_{60} fullerene form stable complexes with DNA. The differences in the mechanisms of components binding determine the distinct cytotoxic effects of studied compounds.

Both HL1 and HL2 changed the structure and physicochemical properties of red blood cells membrane. The resistance of erythrocytes to hemolysis increased at combined preincubation with compounds and C_{60} fullerene. Time and dose-dependent effects of HL1 and HL2 separately and in combination with C_{60} fullerene on leukemic cells viability was demonstrated.