PHOTOSENSITIZERS ON THE BASE OF FULLERENES AND FULLERENE-LIKE NANOSTRUCTURES FOR BIOLOGY AND MEDICINE

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Introduction

It is known that being solved in a true solution nonmodified fullerene is an effective generator of singlet oxygen [1].

Taking into account fullerene insolubility in water we have set a problem to prepare specific water suspensions of such fullerenes and fullerene-like nanostructures (astralenes). The suspensions are to possess properties of effective singlet oxygen generation in aqueous media and of considerable photodynamic inactivation of viruses in biological fluids.

Results and discussion

Special conditions for preparing of amorphous fullerene water suspension and polyhedral multi-layer carbon nanostructure (astralene) water suspension were created. Surface appearance and average size of particles of the suspensions was studied by transmission electron microscopy.

Photosensitizing properties of the suspensions were investigated by two methods: (a) by registration of singlet oxygen luminescence signal at wavelength of 1268 nm and (b) by detection of optical density variation taking place in the reaction mixture containing a chemical singlet oxygen trap. Histidine was chosen as a chemical trap [2]. As a source of optical excitation of a photosensitizer was used in the first case - Nd:YAG laser (operating wavelength – 532 nm), in the second case - Cu-vapor laser providing simultaneously generation of two light wavelengths (λ_1 = 510 nm, λ_2 = 578 nm). Luminescence duration was found to be about 3 μs that is in a good agreement with literature concerning singlet oxygen lifetime in water [3].

It was shown in biological experiments made up both in physiological solutions and in real biological media (allantoic fluid of hen's egg) that the suspensions of fullerene and astralene can effectively produce photodynamic inactivation of influenca viruses. Important role of oxygen in the inactivation process was pointed out.

Conclusions

It was demonstrated that amorphous fullerene water suspension and astralene water suspension are effective generators of singlet oxygen in aqueous media and can *in vitro* destroy viruses.

Reference:

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