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Fluorescence Properties of Fluorine-containing Hydantoin Derivatives as Potential Fluorescent Probes

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The cyclohexanespiro-5-hydantoine and 8,8-difluorocyclohexanespiro-5-hydantoine were chosen as a model substances for properties comparison of hydantoin and its fluorine-containing analogues. Hydrolysis of such hydantoin derivatives allows to obtain an 1-aminocyclohexane and 1-amino 4,4-difluorocyclohexanecarboxylic acids, which are the constituents of many medicines.

It was established that incorporation of fluorine atoms into the cyclohexane ring of chosen hydantoins causes the improving of their acidic and fluorescence properties. The sensitive fluorescence technique of determination of fluorinated hydantoins content in blood serum and urine were elaborated (DL ≈ 20 mg/ml, Sr ≤ 5%). The fluorescence quantum yield of 1-amino 4,4-difluorocyclohexanecarboxylic acid is 0.15 ± 0.01 and significantly increases at the presence of the protein molecules. At that the protein fluorescence intensity decreases. These phenomena confirm the interaction between ovalbumin and the fluorine-substituted amino acid. Obtained results indicated the prospective of application the fluorine derivatives of hydantoin as fluorescent probes for biochemical and clinical studies. The offered technique of fluorescence determination of such hydantoins is characterized by satisfactory analytical parameters and can be proposed for using at pharmacokinetic investigations of these type substances.

Keywords: hydantoin derivatives, cyclohexanespiro-5-hydantoine, 1-aminocyclohexanecarboxylic acid, fluorescence, quantum yield, interaction with protein