

Human and bovine serum albumin time-resolved fluorescence : tryptophan and tyrosine contributions, effect of DMSO and rotational diffusion.

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Streszczenie

Albumin is the most abundant protein in mammalian serum and one of the major natural drug carriers in human body, therefore the study of small molecule interactions and other physicochemical processes such as oligomerization or supramolecular assembly have been intensely studied using both human (HSA) and bovine (BSA) serum albumin. The importance of these proteins also supports the need for fundamental and systematic studies of their properties, particularly, their photophysical properties, since a large number of studies relies on their intrinsic fluorescence. Here, multi-wavelength fluorescence intensity decays upon excitation at 280 nm were measured for HSA and BSA, the maximum absorption wavelength of tryptophan. Global analysis of the decay curves revealed the presence of four exponential components and the decay-associated spectra showed small contributions of tyrosine residues to the overall protein luminescence for emission below 340 nm, especially for HSA, in agreement with the fluorescence anisotropy decays obtained for each protein. We also showed that the addition of 2% DMSO, a commonly used drug co-solvent, diminishes the contribution of tyrosine residues. The fluorescence anisotropy decays at 280 nm excitation allowed to determine with high precision a short (0.28 ± 0.10 ns (HSA) and 0.29 ± 0.02 ns (BSA)) and a long (27.1 ± 0.3 ns (HSA) and 27.6 ± 0.1 ns (BSA)) rotational correlation time. Using our experimentally determined viscosity values, they could be assigned to the wobbling of the fluorescent residues side-chains (short time) and to the rotation of the protein molecule (long time). While the former were surprisingly similar despite the different contributions of tyrosine and tryptophan residues to the emission in HSA and BSA, the latter were also identical for both proteins and consistent with hard sphere and oblate ellipsoid models.

Słowa kluczowe

Tryptophan fluorescence, Tyrosine fluorescence, Decay-associated spectra, Rotational correlation times, Fundamental anisotropy, DMSO co-Solvent

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