PHOTOPHYSICAL STUDY OF ANTICANCER DRUG TIRAPAZAMINE BASED COMPOUNDS

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Tirapazamine (TPZ) is a compound in the benzotriazine-di-N-oxide class of cytotoxins [1]. It is an anticancer drug, that selectively acts in hypoxic (low oxygen levels) conditions that are found in solid tumors. Tumor hypoxia is still a big challenge in the treatment of cancer as the hypoxic regions are resistant to the effect of radiation therapy and other anticancer drugs [2]. During the treatment stage, TPZ compound can attach oxygen to its molecule and so reduce to a radical that causes DNA double-strand, single-strand breaks and base damage [3]. The use of TPZ derivatives in medicine has been widely investigated for several decades. However, the photophysical examination of these compounds remains scarce. In order to successfully understand their usability, more studies of TPZ optical properties need to be performed.

Here we present a photophysical study of tirapazamine based derivatives, that have no oxygen atoms, one double bonded oxygen atoms at N1 position of tirapazamine core or two double bonded oxygen atoms at N1 and N4 positions. In addition, the substituents at C8 were also altered. The optical properties of TPZ compounds were tested in polar environment: ethylacetate, acetonitrile and 1 v/v% dimethylsulfoxide (DMSO)/water mixture. Various characterization techniques, such as steady-state absorption and fluorescence and time-resolved fluorescence spectroscopy, were employed. Photophysical properties of TPZ compounds are changing dramatically in the presence of one double bonded oxygen atom and can be controlled by the different substituents at C8. Furthermore, another interesting feature is observed as the fluorescence quantum yields tend to increase in solvent of higher polarity. The experiments in DMSO/water mixture also gave promising results as sufficient fluorescence quantum yields were recorded. This may allow using new TPZ derivatives for the applications in biological systems.

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