

Antioxidative vs cytotoxic activities of organotin complexes bearing 2,6-di-tert-butylphenol moieties

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Abstract

Copyright © 2018 John Wiley & Sons, Ltd. Two series of organotin(IV) complexes with Sn–S bonds on the base of 2,6-di-tert-butyl-4-mercaptophenol (L1SH) of formulae $\text{Me}_2\text{Sn}(\text{L1S})_2$ (1); $\text{Et}_2\text{Sn}(\text{L1S})_2$ (2); $\text{Bu}_2\text{Sn}(\text{L1S})_2$ (3); $\text{Ph}_2\text{Sn}(\text{L1S})_2$ (4); $(\text{L1})_2\text{Sn}(\text{L1S})_2$ (5); $\text{Me}_3\text{Sn}(\text{L1S})$ (6); $\text{Ph}_3\text{Sn}(\text{L1S})$ (7) ($\text{L1} = 3,5\text{-di-tert-butyl-4-hydroxyphenyl}$), together with the new ones $[\text{Me}_3\text{SnCl}(\text{L2})]$ (8), $[\text{Me}_2\text{SnCl}_2(\text{L2})_2]$ (9) ($\text{L2} = 2\text{-(N-3',5'-di-tert-butyl-4'-hydroxyphenyl)-iminomethylphenol}$) were used to study their antioxidant and cytotoxic activity. Novel complexes 8, 9 of $\text{MenSnCl}_4 - n$ ($n = 3, 2$) with Schiff base were synthesized and characterized by ^1H , ^{13}C NMR, IR and elemental analysis. The crystal structures of compounds 8 and 9 were determined by X-ray diffraction analysis. The distorted tetrahedral geometry around the Sn center in the monocrystals of 8 was revealed, the Schiff base is coordinated to the tin(IV) atom by electrostatic interaction and formation of short contact Sn–O 2.805 Å. In the case of complex 9 the distorted octahedron coordination of Sn atom is formed. The antioxidant activity of compounds as radical scavengers and reducing agents was proved spectrophotometrically in tests with stable radical DPPH, reduction of Cu^{2+} (CUPRAC method) and interaction with superoxide radical-anion. Moreover, compounds have been screened for in vitro cytotoxicity on eight human cancer cell lines. A high activity against all cell lines with IC_{50} values 60–160 nM was determined for the triphenyltin complex 7, while the introduction of Schiff base decreased the cytotoxicity of the complexes. The influence on mitochondrial potential and mitochondrial permeability for the compounds 8 and 9 has been studied. It is shown that studied complexes depolarize the mitochondria but don't influence the calcium-induced mitochondrial permeability transition.

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Keywords

2,6-di-tert-butylphenol, antioxidants, cytotoxicity, organotin(IV) complexes, Schiff bases

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