EC - Redox Processes

EC.01 - Plasmalogens pro-oxidant action by generation of excited singlet molecular $O_2(^1\Delta g)$ in the dark

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Plasmalogens are glycerophospholipid with a vinyl–ether linkage at the sn-1 position of the glycerol backbone. Even though they are found in all human tissues, being especially abundant in the brain and heart, the biological role of plasmalogens remains unclear. It has been suggested that plasmalogens are antioxidants because of the high reactivity of their vinyl ether groups with reactive oxygen species (ROS). However, plasmalogen reaction with singlet molecular oxygen (O2 (1Δg) can produce two primary unstable oxidation products, a hydroperoxide and a short-lived dioxetane intermediate whose decomposition can produce O2 (1Δg) by transferring energy to triplet molecular oxygen. Herein, we describe evidences of the generation of O2 (1Δg) by chemical trapping and monomol IR light emission at 1,270 nm. We have also characterized the main O2 (1Δg)-oxidation products of phosphatidylethanolamine plasmalogen (pPE) by high resolution tandem mass spectrometry (ESI-MS/MS). The results from mass spectrometry confirms the formation of pPE hydroperoxides and unstable dioxetanes, which were degraded to formyl phosphoethanolamine (formyl-PE), lyso-PE and fatty aldehydes with 15 and 17 carbons. These findings demonstrate that although plasmalogens are considered antioxidants, they can act as a pro-oxidant by promoting singlet molecular oxygen generation in the dark.
Keywords: photochemistry in the dark, Plamalogen, singlet molecular oxygen
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EC.02 - The contrast agent 2,3,5-triiodobenzoic acid (TIBA) induces cell death in tumor cells through the generation of reactive oxygen species

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TIBA is an iodine contrast agents used for diagnosis of tissue structures in X-ray techniques. However, its ionic form increases blood osmolarity, generating physiological complications such as contrast-induced nephropathies (CIN). The CIN leads to an increase in the generation of reactive oxygen species (ROS) in tubules and renal epithelium, causing the death of these cells. An antitumor activity of TIBA has been described in the non-small cell lung cancer (H460). In this model, TIBA induced cell death for mitochondrial intrinsic pathway, in considerably lower concentrations than iodinated contrast agents used in the clinic. But the subcellular mechanisms involved in TIBA-induced cell death are still unknown. Thus, the objective of this work was to evaluate whether the anti-tumor activity of TIBA involves ROS increase, in cell lines of non-small cell lung cancer (H460), chronic myeloid leukemia (K562), and its cytotoxicity in normal renal epithelial (VERO). The MTT assay was used for evaluation of cell viability, the fluorescent probe H2DCFDA to evaluate ROS induction, cell cycle analysis using flow cytometry to measure cell death, and immunofluorescence with annexin/7-AAD, to assess the association of cell death with the ROS generation. TIBA decreases cell viability in a dose-dependent manner for the H460 and K562. However, VERO cells showed less response to the drug, with 70% viable cells after 72 hours of treatment in the highest concentration of the drug. And the tumor cells with only 20% viable cells. Thus, tumor cells exhibited higher DNA fragmentation, compared to the renal line (VERO with 5% of fragmented DNA, H460 with 26%, and 56% in K562). Finally, TIBA-induced ROS and apoptosis in all lines, which is significantly decreased after treatment with the antioxidant N-acetyl-cysteine (NAC). These data demonstrate the relationship between the increased cellular oxidative stress and the anti-tumor action of the TIBA.
Keywords: TIBA, Cancer, Contrast Agent
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