

DOXYCYCLINE INTERACTION WITH SULFIDE (Na₂S) AND POLYSULFIDE (Na₂S₂) MEDIATES FREE RADICAL PROCESSES WITH CONSEQUENCES FOR PLASMID DNA INTEGRITY

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Tetracycline antibiotics are routinely prescribed in human and veterinary medicine to treat bacterial infections or just to prevent a development of such states. However, their biological potential is far beyond a beneficial frame as for doxycycline (Doxy) that has also numerous side effects including oxidative stress, inflammation, cancer or hypoxia-induced injury. Since endogenously produced sulfide and polysulfides influence similar biological processes, in which reactive oxygen species (ROS) play a role, we have studied the interaction of tetracyclines and sulfur-containing species. In this work, we used electron paramagnetic resonance (EPR) spectroscopy to study the interaction of sulfide (Na₂S), polysulfide (Na₂S₂) with Doxy and their effect on the integrity of plasmid DNA (pDNA) using the DNA cleavage measurement. EPR detection indicates that sulfide and polysulfide interact with tetracyclines and produce/scavenge free radicals. The production and scavenging of free radicals displays the bell-shaped pattern that is dependent on time and/or concentration of the mixture components. Moreover, the tetracyclines induced pDNA cleavage in the presence of Na₂S, but tetracyclines inhibited cleavage induced by polysulfide. In conclusion, sulfide and polysulfides interacting with tetracyclines mediates free radical processes, indicating a consequence for free radical biology under conditions of ROS production and tetracyclines administration.

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