Synthesis, physicochemical characterization and biological properties of vanadium-peroxido-zwitterion materials

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Vanadium is a known metal of high biological importance. It appears to possess properties that project a role as a potential immunostimulating agent, thus rendering it a candidate metallodrug in immunotherapy. This notion is based on currently held views and knowledge from ongoing research in the fields of (bio)chemical and medical interest. Poised to peruse the aforementioned role for vanadium, research was launched in our lab to develop new vanadodrugs for cancer, including ternary oxo-peroxido-vanadate compounds with physiologically-relevant ligands (betaine, amino acid zwitterions), thus discovering new approaches to cancer therapy. The biological activity of such complexes, however, is not clear yet and further biological work is needed. The new hydrolytically stable and highly effective vanadium(V)-peroxido materials were characterized by elemental analysis, FT-IR, Raman, NMR spectroscopy in solution and the solid state, UV-Visible, cyclic voltammetry, thermal gravimetric analysis and (TGA) and X-ray crystallography. The so arisen discrete vanadium(V)-peroxido species were investigated with respect to their biotoxicity in vitro, employing cancer cell lines vs control cell cultures. The results suggest that vanadium-peroxido species treatment enhances the biological effects of the metal on various cell lines, exhibiting cell tissue-specific effects likely involving metal ion coordination to peroxido moieties.

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