Abstract

Charles University in Prague

Faculty of Pharmacy in Hradec Králové

Department of Pharmacology and Toxicology

Candidate: Mgr. Jan Kolouch

Consultant: PharmDr. Tomáš Filipský, Ph.D.

Title of thesis: Assessment of chelating properties of 6,7-dihydroxycoumarin

Iron is an indispensable element in the human body. This element plays irreplaceable role in many metabolic processes, such as transport of oxygen and synthesis of DNA. The essential feature of iron is its ability to transport electrons and facilitation of catalytic reactions. These reactions are realized by redox properties of iron, which naturally occurs at two different oxidation states, i.e. Fe^{2+} and Fe^{3+}. Nevertheless, this element can catalyze not only beneficial, but also toxic reactions. One of those is Fenton reaction, which results in the formation of reactive oxygen species that are toxic to the surrounding tissue.

In this thesis we have focused on the assessment of chelating properties of 6,7-dihydroxycoumarin (67DHC) at various pH conditions (4.5, 5.5, 6.8 and 7.5) using both competitive and direct UV-Vis spectrophotometry. Further, we have evaluated its reducing activity at pH 4.5 and 5.5.

By the analysis of UV-Vis absorption spectra we have found out, that 67DHC chelated Fe^{2+} ions at pH 5.5, 6.8 and 7.5 at the chelating ratio 2:1 (67DHC:Fe^{2+}). Contrary, Fe^{3+} ions were chelated at pH 6.8 and 7.5 at the chelating ratio 1.5:1 (67DHC:Fe^{3+}). Using the competitive UV-Vis spectrophotometry we have concluded that 67DHC chelated Fe^{2+} ions at pH 5.5, 6.8 and 7.5 and significantly reduced Fe^{3+} ions at pH 4.5, while the reduction at pH 5.5 was minimal.

On the basis of the stated results, it is predictable that 67DHC is a promising iron chelator at the higher pH conditions in particular.