

Abstract

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Title of Thesis: Preparation of a method for detection of the extent of chelation of calcium and magnesium ions

Calcium and magnesium are biogenic elements belonging to the second group of the periodic table. Calcium is the fifth most abundant element in the human body. In addition to its important role in bone homeostasis, calcium is involved in other processes such as blood clotting, muscle contraction and regulation of nerve excitability. Magnesium is the cofactor of many enzymatic reactions essential for a row of physiological functions.

The aim of this work was to propose a novel screening method for determination of the degree of calcium and magnesium chelation. In the first step the UV-vis spectra of the selected indicator o-cresolphthalein complexone and its complexes with calcium and magnesium were measured. This was followed by verification of the linearity and the determination of the sensitivity of the method. Concurrently the stability of the indicator and its complexes with both ions was measured. In the last step, the suitability of the method was verified on a standard chelator ethylenediaminetetraacetic acid (EDTA).

The optimal wavelength for the calcium complex was 572,5 nm and for the magnesium complex 568 nm. At these wavelengths, the linearity between absorption and concentration was highest using the indicator dissolved in pH 7.5 buffer. The sensitivity (the lowest concentration of a metal which can be detected with significance at $p < 0.05$) was 2.5 μM for calcium and 2 μM for magnesium. The stability of the indicator in buffer 7.5 with both ions is at least 24 days and stability of the indicator in methanol with both ions is at least 39 days. The method was verified with EDTA where complexes with stoichiometry 1:1 were documented in harmony with known data.

In conclusion, it can be claimed that a methodology for determination of the degree of chelation of calcium and magnesium ions has been prepared. This method can be used for detection of interferences of different drugs with these ions which can be associated with side effects.