VANADIUM ASSOCIATION TO HUMAN SERUM PROTEINS BY FAST PROTEIN LIQUID CHOMATOGRAPHY-ICP-MS

K.G. Fernandes[1,3], M. Montes Bayón[2], E. Blanco González[2], A.R.A. Nogueira[1,3], J.A. Nóbrega[1] and A. Sanz-Medel[2]

[1] *Universidade Federal de São Carlos: Departamento de Química, Grupo de Análise Instrumental Aplicada, São Carlos (Brazil)*

[2] *University of Oviedo: Faculty of Chemistry, Department of Physical and Analytical Chemistry, Oviedo (Spain).*

[3] *Embrapa Pecuária Sudeste, São Carlos (Brazil)*

Vanadium is an element that has been far less studied in speciation analysis in comparison to other element such as arsenic and selenium. However, in recent years the interest in vanadium has grown because of its potential medicinal use as a drug in diabetes and cancer treatment [1]. Vanadium compounds are glocuse-lowering agents that are shown to mimic/enhance most of the metabolic actions of insulin both in vitro and in vivo. Despite numerous studies, the mechanism (s) by which vanadium mediates its metabolic effects in vivo are still not completely understood [2]. Some studies have shown that certain V oxidation states are distributed into the living systems through their coordination complexes with some serum proteins such as transferrin but a lot of work is still necessary to clarify biochemical and physiological functions of this element in higher organisms. In this regard, elemental speciation studies by hyphenated techniques (e.g. liquid chromatography coupled to inductively coupled plasma mass spectrometry, ICP-MS) can be a valuable tool to obtain information about possible biomolecules involved in vanadium transport and storage in body fluids and tissue [3].

Separation techniques such as size-exclusion or ion exchange chromatography have been preferred for the determination of these vanadium-complexes. However, Size Exclusion exhibits poor selectivity among species of similar molecular weights and therefore, Ion Exchange in the Anion Exchange mode is better to allow complexes separation [4]. On the other hand, vanadium detection by ICP-MS is affected by polyatomic interferences in the major isotope (^{51}V, 99.75% abundance) when using chlorinated solvent due to the formation of $^{35}Cl^{16}O^{+}$. Therefore, the use of Double Focusing instruments or Collision Cell is required in order to overcome such interferences.

In the present study, we investigated the coupling of Fast Liquid Chromatography (FPLC) with ICP-MS (Quadrupole and Collision Cell) for studying vanadium association to proteins present in human serum. Separation of human serum proteins is achieved on a MonoQ (HR5/5) anion-exchange column using an ammonium acetate gradient at the physiological pH of 7.4 with [Tris (hydroxymethyl)-aminomethane] -acetic acid buffer. A comparison of different ICP-MS detectors in order to evaluate V detection capabilities will be also illustrated. The experimental conditions and analytical performance characteristics will be presented.

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