EFFECT OF SELENIUM STATUS IN CRITICALLY ILL PATIENTS WITH SYSTEMIC INFLAMMATION: A MEDICAL GEOLOGY ISSUE?

W. Manzanares¹, A. Biestro¹, N. Mañay², G. Facchin³ and M.H. Torre³

¹Intensive Care Unit, Department of Critical Care, Hospital de Clínicas “Dr. Manuel Quintela”, School of Medicine, Avda Italia esq. Las Heras
²Toxicology and³Inorganic Chemistry (DEC), Facultad de Química, Gral. Flores 2124, UDELAR, Montevideo, Uruguay

Abstract: Selenium is an essential trace element for humans and animals. It is an integral part of several selenoproteins like glutathione peroxidase (GPx) and thioredoxin reductase (TR) where Se forms covalent bonds with carbon (C-Se). These selenium-dependent enzymes have several beneficial metabolic effects (peroxide degradation, cellular redox and transcription regulation, control of cytokine excretion, thyroid hormone deiodination, among others) and consequently, an insufficient Se intake is associated with several diseases. There are different dietary sources of Se but if the soils and water have not adequate levels, the Se deficiency in food can produce low Se status in animals. Nowadays it has been recognized that Se is deficient in at least a billion people worldwide. Therefore, together with the new insights into the important actions of selenoenzymes, Se supplementation has been demanded for different diseases. As part of our research on essential trace element deficiency studies and its relationship with health, we have been studying the role of Se in intensive care unit patients with systemic inflammatory response syndrome (SIRS) and/or multiple organ dysfunction syndrome (MODS) seen in patients with severe sepsis, septic shock, trauma, severe pancreatitis and burns, where oxidative stress is a characteristic pathogenic event. In this presentation an exploratory data analysis of serum Se and GPx activity in Uruguayan healthy subjects and in critically ill patients with and without SIRS/MODS are addressed and a medical geology approach is discussed as well. Besides, the supplementation with selenite was evaluated in patients with SIRS. Serum Se level was analyzed by graphite furnace atomic absorption spectrometry and GPx activity was determined by an indirect method based on the oxidation of glutathione (GSH) to oxidized glutathione (GSSG), catalyzed by GPx, which is then coupled to the recycling of GSSG to GSH using glutathione reductase and NADPH. The preliminary results showed that Se serum concentrations in Uruguayan healthy humans are lower than the levels necessary to optimize GPx activity. Patients with SIRS/MODS had Se serum levels and GPx activity lower than those from healthy humans. Besides, parenteral selenious acid administrated at a high dose (bolus of 2000 µg of Se followed by a continuous infusion of 1600 µg of Se per day) showed to be efficacious for patients with SIRS. The low Se-serum results could be associated with low Se levels found in drinking water through the country being this, a first step in developing further Medical Geology studies.

Keywords: selenium, SIRS, MODS, glutathione peroxidase, critical ill patients

Acknowledge: This research was supported by CSIC (UDELAR), Fondo Clemente Estable (DICYT) and PEDECIBA Química.