Trace element imbalances in hemodialysis patients – final results of a 16-month monitoring study in a Portuguese population

L. Araújo[1,2], H. Rodrigues[2], P. Ramos[1] and A. Almeida[1]

[1] REQUIMTE, Department of Chemical Sciences, Laboratory of Applied Chemistry, Faculty of Pharmacy, University of Porto, Portugal.
[2] Clínica Laboratorial dos Arcos de Valdevez Lda, Portugal.

Most trace elements are important from both a biochemical and toxicological point of view. Some are particularly toxic, potentially noxious to the human body, while others are "essential", i.e., well-defined signs and symptoms appear when a deficient intake exists and they attenuate or disappear when an adequate intake is re-established.

Patients with chronic renal failure submitted to hemodialysis therapy are at increased risk of imbalances in trace elements levels, which mainly results from the kidney failure itself, that predisposes to their accumulation (although losses can also occur in some situations, such as proteinuria), as well as from the dialysis process, which can also lead to significant losses of trace elements, contributing to a deficiency status with biological consequences, or be responsible for situations of overload, with potential toxicity [1,2].

Despite the extensive literature about the implications for the human body of imbalances on trace element status, there are still not very detailed studies regarding specifically hemodialysis patients (with the notable exception of aluminum).

Based on this background, we conduct a study aiming to evaluate, over a long period of time, the trace elements status in a population of individuals diagnosed with chronic renal failure performing regular hemodialysis therapy (mean of three times/week), in order to establish a link between the results, the underlying disease process and the therapy itself[1]. Blood samples were taken at several sampling time points (3 for Se; 8 for Pb and Mn; 6 for Cu and Zn), between January 2011 and April 2012, from ca. 50 hemodialysis patients. The work has focused on Cu, Zn, Se, Mn and Pb.

The results showed that patients with chronic renal failure undergoing hemodialysis therapy tend to suffer from imbalances in the blood levels of important trace elements. With the exception of Mn, for which normal values (and no significantly different from the control group) were obtained, significant imbalances were observed for the other elements studied: increased levels of Pb (patients: 14.8±4.8 μg/dL, n=304; controls: 3.8±2.5 μg/dL, n=44) and decreased levels of Cu (patients: 98.1±23.2 μg/dL, n=268; controls: 126.6±31.2 μg/dL, n=62), Se (patients: 82.5±28.8 μg/L, n=137; controls: 129.5±28.4 μg/L, n=30) and Zn (patients: 60.3±12.4 μg/dL, n=272; controls: 91.0±16.8 μg/dL, n=62).

References:

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