Trace Elements and Hemodialysis

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Dear Sir,

Hoskawa et al. [1] discuss 'Trace elements and complications in patients undergoing chronic hemodialysis', in relation to increased serum values for aluminum and silicon, and low serum values for zinc, manganese and nickel. They mention that these patients were on fiber dialyzers 5 h, three times a week, that diet and illness can influence values for Zn, Mn, Ni and Si and that it is important to have low dialysate levels for Al and Si. We would like to point out some other factors which need to be considered in interpretation of the results of body

fluid values of trace elements in dialysis patients. First, differences have been reported which depend on the sample analyzed [2]. For instance, differences have been found between serum and packed red cells for cobalt, rubidium, selenium, and zinc. Zinc was high in red cells but low in serum [2]. Secondly, results may be influenced also by residual renal function, the dialyzer membrane and size, the nature of the water used for the preparation of the dialysate, the method(s) of purification, and the composition of the concentrate. Sabbioni et al. [3] found that the salts used for preparation of the dialysate were the main source of metal contamination.

Table 1. Comparison of trace elements in water prepared by deionization and reverse osmosis (R/O), with that collected after mixing with concentrate

Element

Mass

1 Sensitivity (detection limit) of some elements limited because of interference from relatively large amounts of sodium, chloride, potassium and magnesium in the concentrate.

2 Recommendations for maximum by Association for Advancement of Medical Instrumentation, in part based on 1/10 of USEnvironmental Protection Agency (EPA) Drinking Water Standards [5].

3 Likely comes from use of tungsten carbide, commonly used in grinding of commercially available salts, as in the concentrate.

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We studied water after purification by deionization and reverse osmosis (R/O), and also after the addition of concentrates (table 1). Trace elements were determined by inductively coupled

plasma mass spectrometry [4]. The deionization-R/O water product was virtually free of most trace elements and met AAMI standards [5]. Of 53 elements for which we have values, 42 were $< 0.1 \mu\text{g/l}$ and the highest value was $5.6 \mu\text{g/l}$ for aluminum. However, the dialysate going into the dialyzer inlet had appreciable concentrations of mercury and chromium which were both above AAMI recommended levels [5] and of niobium, lead, copper, rubidium, vanadium, strontium, germanium and tungsten. Clearly, analysis must be made not only of the R/O water but also of the fluid going into the dialyzer [6], as the latter may be a critical factor in determining the concentration of trace elements in body fluids.

It would be helpful to have such additional information, especially dialysate concentrations, in publications which concern trace elements in dialysis patients.

Wallaey B, Cornells R, Mees L, Lameire N: Trace elements in serum packed cells, and dialysate of CAPD patients. *Kidney Int*, 1986;30:599–604.

Sabbioni E, Pietra R, Ubertalli L, Berlin A, et al: Salts as a source of metals in dialysis fluids: An assessment study by means of neutron activation analysis. *Sci Total Environ* 1989; 84:13–23.

Friel JK, Skinner CS, Jackson SE, Longerich HP: Analysis of biological reference materials, prepared by microwave dissolution, using inductively coupled plasma mass spectrometry. *Analyst* 1990; 115:269–273.

Arduino MJ, Bland LA, Favero MS: Adverse patient reactions due to chemical contamination of hemodialysis fluids. *Dialysis Transplant* 1989;18:655–658.

Abero K, Brown ST, Sella M: Correction of microcytosis following elimination of an occult source of aluminum contamination of dialysate. *J Kidney Dis* 1989;13:465–468.

References

1 Hosokawa, S, Oyamaguchi A, Yoshida O: Trace elements and complications in patients undergoing chronic hemodialysis. *Nephron* 1990;55:375–379.