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Less-oxidative hemodialysis solution rendered by cathode-side application of electrolyzed water

Electrolyzed water (EW) generated on the cathode side reportedly displays anti-oxidative properties, and application of EW to hemodialysis (HD) systems supposedly suppresses oxidative markers in patients on HD. However, most of the chemical properties and biological effects of such solutions remain unclear. This study aimed to examine those issues to clarify the scientific background for the clinical use of EW solution. Reverse osmosis water comprising EW from the cathode side (e-RO) was prepared and used to process a test HD solution (e-HD). Chemical and biological properties of these solutions were compared with controls. Redox properties were examined by chemiluminescence (CL) of the luminol-H_2O_2 system. Biological effects of e-RO on human polymorphonuclear leukocytes (PMNs) were tested with respect to the cellular protection against methylglyoxal, and with respect to the preservation of cellular function as to radical generation. Control HD solution presented the highest CL, followed by e-HD, control RO, suggesting a lower oxidative capacity for EW-based solutions. Increased levels of dissolved hydrogen were characteristic of e-RO and e-HD. Application of e-RO tended to be associated with less injury of PMNs by methylglyoxal, and with significantly higher levels of radical generation compared with the control. Compared with control HD, e-RO-based HD solution displays less-oxidative capacity in chemical terms, and may at least partly facilitate preservation of PMN viability. These results appear to offer a scientific basis for supporting the clinical challenge of applying this technology to HD treatment.

Related Information

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