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# Electrolysed-reduced water dialysate improves T-cell damage in end-stage renal disease patients with chronic haemodialysis

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## Abstract

**Background:** T-cell damage by increased oxidative stress in end-stage renal disease (ESRD) patients undergoing chronic haemodialysis (HD) led to the increased T-cell apoptosis and the alteration of surface markers and Th1/Th2 ratio in CD4(+) T lymphocytes. Antioxidant electrolysed-reduced water (ERW) was used as the dialysate in ESRD patients undergoing chronic HD to test for improved oxidative stress-related T-cell apoptosis, alterations of surface markers and intracellular cytokine profile.

**Methods:** We evaluated apoptosis formation by annexin V, CD25-related surface markers, and cytokine ratio of Th1/Th2 in CD4(+) T lymphocytes and Tc1/Tc2 in CD8(+) T lymphocytes of 42 ESRD patients haemodialysed with ERW for 1 year.

**Results:** In comparison to 12 healthy individuals, the ESRD patients had more T-cell apoptosis and less CD3(+), CD4(+) and CD8(+) T cells and CD25/CD69/CD94/CD3(+) phenotypes at baseline. Lower intracellular IL-2 and IFN-gamma levels in the Th1/CD4(+) and Tc1/CD8(+) cells and higher intracellular IL-4, IL-6 and IL-10 levels in the Th2/CD4(+) and Tc2/CD8(+) cells were also noted in the ESRD patients. After a 1-year ERW treatment, the patients had a decrease in T-cell apoptosis and increases in CD3(+), CD4(+) and CD8(+) cell numbers and CD25/CD69/CD94/CD3(+) phenotypes in the T cells. The intracellular IL-2 and IFN-gamma levels in the Th1/Tc1 cells significantly ( $P < 0.05$ ) increased and the intracellular IL-4, IL-6 and IL-10 levels in the Th2/Tc2 cells decreased. Furthermore, the Th1/Th2 and Tc1/Tc2 cytokine ratios were improved toward a normal status.

**Conclusion:** One-year ERW treatment effectively ameliorated T-cell apoptosis, altered CD25-related surface markers and intracellular cytokine profile in the HD patients.

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