CITRATE-BASED DIALYSIS BUFFERS ARE MORE BIOCOMPATIBLE IN COMPARISON TO STANDARD BICARBONATE BUFFERS AND COULD PREVENT THE PROGRESSION OF DIALYSIS VASCULOPATHY

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INTRODUCTION AND AIMS

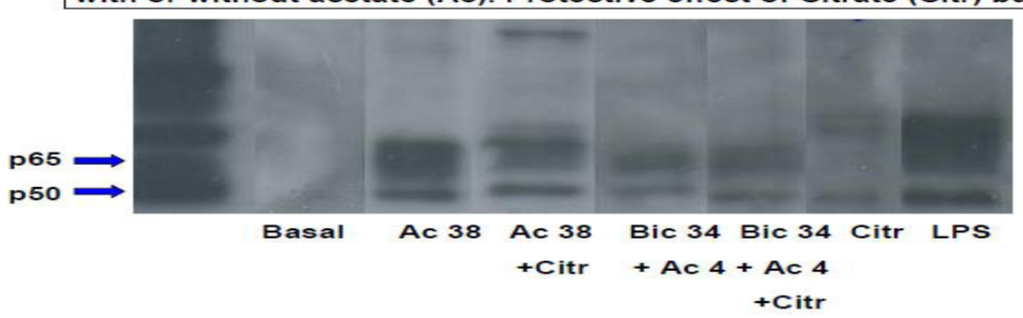
Bioincompatibility plays a key role in the pathogenesis of dialysis related vasculopathy responsible for the high mortality in CKD hemodialyzed patients. Beside membranes, acetate-based dialysis buffers seem to be one of the main actors in the pathogenesis of vasculopathy.
Acetate, even in the low concentrations present in bicarbonate buffer, by stimulating inducible nitric oxide synthetase, alter the intracellular redox state responsible for endothelial cells biological activity resulting in apoptosis and inflammation related to activation of stress sensitive pathways, including NF-kB and others. For these reason new available dialysis buffers have been proposed, among those the citrate based dialysis buffers.
Citrate by itself is provided with anticoagulant as well as antioxiodants properties.
Aim of this study was to compare the effects of acetate- or citrate-based dialysis buffers on some biologic parameters, such as NF-kB activation and total antioxidant capacity (TAC), in human endothelial cells in culture.

METHODS

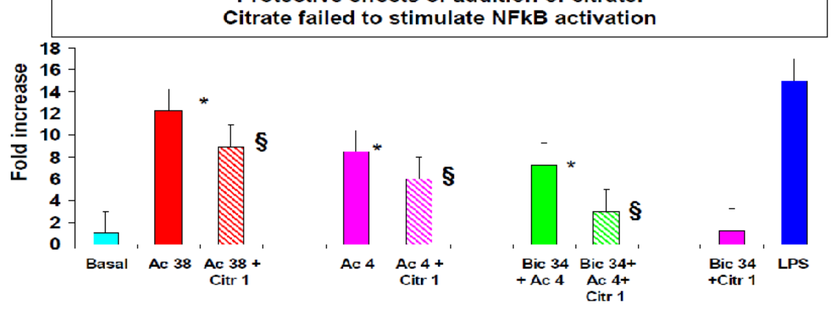
Human endothelial cells were incubated using transwell devices, with the following dialysis buffers: acetate (Ac) 38 mmol/Lt; acetate 4 mmol/Lt, bicarbonate (Bic) 34+ acetate 4 mmol/Lt; Bic 34 + citrate (Citr) 1 mmol/Lt, acetate 38 mmol/Lt + citrate 1 mmol/Lt, acetate 4 mmol/Lt + Bic 34/citrate 1 mmol/Lt; bicarbonate 34+ acetate 4 mmol/Lt+ Bic 34/citrate 1 mmol/Lt. LPS 10 µmol/ml was used as positive control.
Cells were incubated at 37°C in humidified athmosphere for 1 and 4 hours.
TAC levels were measured in the supernatants. Cell lysates were used for studying NF-kB nuclear translocation using western blot analysis.

RESULTS

Western blot analysis of p50 and p65 NFkB subunits in human endothelial cells conditioned with dialysis buffers with or without acetate (Ac). Protective effect of Citrate (Citr) buffer



Densitometric analysis of subunit p65 of NFkB in human endothelial cells conditioned with acetate free or acetate containing dialysis buffers. Protective effects of addition of citrate. Citrate failed to stimulate NFkB activation



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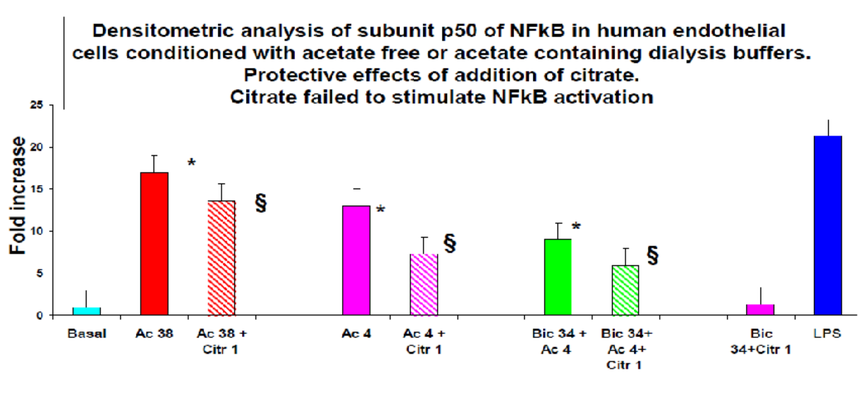
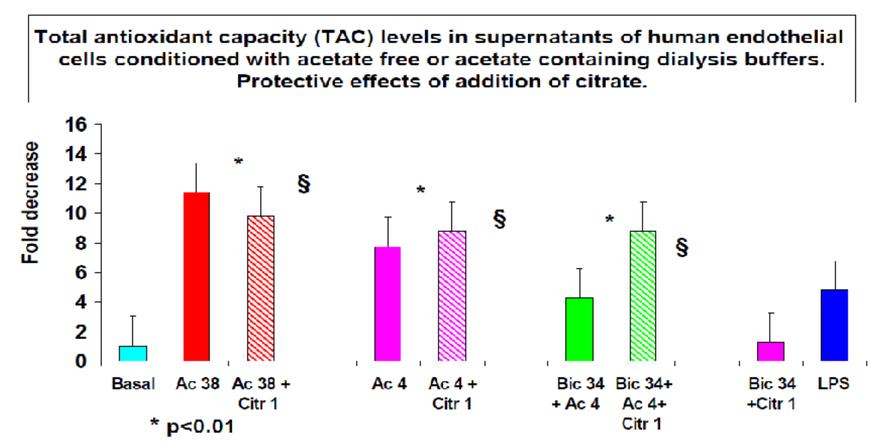


Total antioxidant capacity (TAC) levels in supernatants of human endothelial cells conditioned with acetate free or acetate containing dialysis buffers. Protective effects of addition of citrate.



* p<0.01
§ p<0.05 Ac + Citr vs Citr

CONCLUSIONS

Our results allow us to conclude that citrate-based dialysis buffers are more biocompatible than acetate-based ones and bicarbonate dialysis buffers containing low concentrations of acetate. Citrate per se exerts an antioxidative activity. The new citrate-based dialysis buffers is potentially useful to limit the bioincompatible reactions involved into the pathogenesis of long-term dialysis vasculopathy.

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