


# Time-resolving characterization of molecular weight retention changes among three synthetic high-flux dialyzers

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## Abstract

**Background:** Toxin removal capacity (i.e., performance) of a dialyzer is not constant but diminishes during treatment, as the adsorption of proteins to the membrane provides an additional barrier to uremic solutes. We investigated time-resolving molecular weight retention changes among synthetic high-flux dialyzers and compared the results with recent data from a randomized controlled trial.

**Methods:** In plasma recirculation experiments over 240 min, sieving coefficients (SC) for  $\beta$ 2-microglobulin, myoglobin, and albumin were determined for the FX CorAL (Fresenius Medical Care), ELISIO (Nipro), and xevonta (B. Braun). Molecular weight retention (MWR) curves were generated and the shifts over 120 min were characterized. Effective pore radius was determined, and the predicted albumin loss was compared with clinical data.

**Results:** SC decreased over time for all dialyzers (mean relative decrease across all dialyzers:  $\beta$ 2-microglobulin: 8.0% (120 min); myoglobin: 56.6% (240 min); albumin: 94.1% (240 min)). FX CorAL (7.3%, 52.6% and 91.1%) and ELISIO (7.7%, 51.0%, and 93.8%) showed a lower decrease than xevonta (9.0%, 66.2%, and 97.4%). For all dialyzers, MWR curves shifted toward lower molecular weight, with the lowest shift for FX CorAL (by 0.23 nm at SC50%, 120 min) and highest for xevonta (0.50 nm). FX CorAL had the highest slope over time and the smallest decrease in the effective pore radius (2 min: 2.31 nm, 120 min: 2.08 nm). Predicted albumin loss over 4 h was highest for xevonta (609.3 mg) and comparable between ELISIO (283.6 mg) and FX CorAL (313.3 mg).

**Conclusions:** Substantial differences in the temporal performance profile of dialyzers exist. The present approach allows the characterization of dialyzer permeability changes over time using standard, clinically relevant protein markers.

## KEYWORDS

albumin, dialyzer, hemodialysis, performance, sieving coefficients,  $\beta$ 2-microglobulin