

Thesis Title	Development of a Control Module With a Capability of Converting an Acetate Hemodialysis Machine into a Bicarbonate System.
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ABSTRACT

There is a continuing trend in the field of hemodialysis to switch from the traditional acetate dialysis procedure into a system using bicarbonate. The advantages include a more physiological approach with more stable acid base balance, and less metabolic complications.

We had successfully developed a control module that when installed into a Cobe acetate dialyser, allowed the system to function as a bicarbonate dialyser. The conversion cost is low, simple, and the resulting system is easy to maintain and durable. It is suitable for local environments since most of the accessories are available locally.

The principle of the design of the module that allows the conversion from acetate to bicarbonate system, is based on an assumption that if the inward flow of water delivered to the system could be kept constant by the introduced modified module, irrespective of the fluctuation of the incoming water pressure and the application of ultrafiltration procedure within the system, this would allow bicarbonate concentrate to be injected into the system at a constant rate. This simplifies the design of the bicarbonate delivery system, allowing the use of a simple fixed rate pump for bicarbonate delivery and avoiding the design of a complicate system of monitoring and a servo-feedback control which needs variable speed injection of bicarbonate.

Using the 36.83X protocol of the acidified and bicarbonate concentrated solutions, our modified system can deliver a dialysate with narrow physiological ranges of electrolytes in the face of fluctuating incoming water pressure and the application of ultrafiltration: Na^+ ranging from 134.0 to 142.3 mmol/l, K^+ from 1.9 to 2.1 mmol/l, Cl^- from 109.3 to 114.5 mmol/l and HCO_3^- from 28.9 to 36.5 mmol/l. The flow of the incoming water supplied could be kept within a narrow range of 520 to 560 ml/min in the face of changing supplying water pressure ranging from 5 to 20 psig and the ultrafiltration pressure from 0 to minus 400 mmHg.

We have demonstrated that the module functioned well and would be applicable to conversion of other similar acetate-based hemodialysers.