

Reverse Osmosis as a Method for Purification of Dialysis Water

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Tap water exerts an osmotic pressure that may be counteracted by mechanical pressure. Increasing the mechanical pressure to 35-40 kg/cm² makes possible a transfer of water across a cellulose acetate membrane. About 95% of the soluble substances, including electrolytes, are retained by the membrane during passage. This principle, called reverse osmosis, has been used as a method for purification of dialysis water.

About 100 circular membranes each measuring 180 cm² have been stacked in a column with a height of about 80 cm, resulting in a total membrane area of 1.8 m².

Tap water is supplied from the centre of the column, whereas the permeate flows through capillary tubings on the side of the column.

A piston pump generates the pressure. With the membrane area and pressure mentioned above a tap water flow of 6 litres per minute produces 0.5 l of permeate per minute.

Average conductivity readings and electrolyte concentrations of the permeate showed values reduced to about 5% of those of the original tap water.

Bacteria grew regularly from the permeate during the first few hours of the run, while samples drawn after the first 6 hours only in exceptional cases have shown growth of bacteria. Several examinations have failed to demonstrate presence of pyrogenic substances in the permeate.

Average electrolyte concentrations of permeate obtained from Copenhagen tap water after the first 6 hours were:

sodium 0.2 mEq/l, calcium 1.3 mEq/l, magnesium 0.2 mg/100 ml and chloride 0.3 mEq/l (approx. 200 measurements of each).

For periods of one month the mean flow rate of permeate was 498 ml per minute and the mean pH value was 6.08.

Experiments of 12-24 hours duration as well as continuous function of the apparatus for several months have yielded satisfactory and stable results

both concerning salt removal, sterility and permeate production.

The plant is simple and has proved safe. The running cost is approx. 60 cents per 1000 gallons of purified water. Continuous function is recommended to avoid bacterial contamination of the permeate.