HEMODIALYSIS

A. PHYSIOLOGIC PRINCIPLES

1. Determinants of Clearance- Clearance, $K$, can be calculated for any solute (urea, $K$, PO4) as $K = \frac{Q_b \times (A-V/A)}{V}$ (Qb = blood flow, A = inlet concentration, V = return concentration)
   a. Dialyzer characteristics:
      • Dialyzer efficiency- Measure of small molecule clearance
        – Mostly driven by membrane surface area
        – Often expressed as mass transfer area coefficient (KoA). KoA = The maximum clearance of a solute by a dialyzer when blood flow (Qb) and dialysate flow (Qd) are approaching infinity (high-efficiency dialyzers KoA ~ <600mL/min versus low-efficiency with KoA <500mL/min)
      • Dialyzer permeability- Measure of pore size
        – Low-flux: β2-microglobulin clearance < 10mL/min with usual Rx; water flux $K_{UF}$ <15mL/hr/mmHg
        – High-flux: β2-microglobulin clearance > 20mL/min with usual Rx; water flux $K_{UF}$ >15mL/hr/mmHg
   b. Blood (Qb) and Dialysate (Qd) flow
      • Urea clearance approaches Qb when Qd is >2.5 X Qb

   ![Graphs showing Urea Clearance vs Qd](image)

   ![Graphs showing Urea Clearance vs Qd](image)

   c. Solute characteristics:
      • Small molecules (< 0.5kDa) with low volume of distribution (< 1L/kg), low protein