



Physiology Of Peritoneal Membrane

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Outlines Of Lecture:

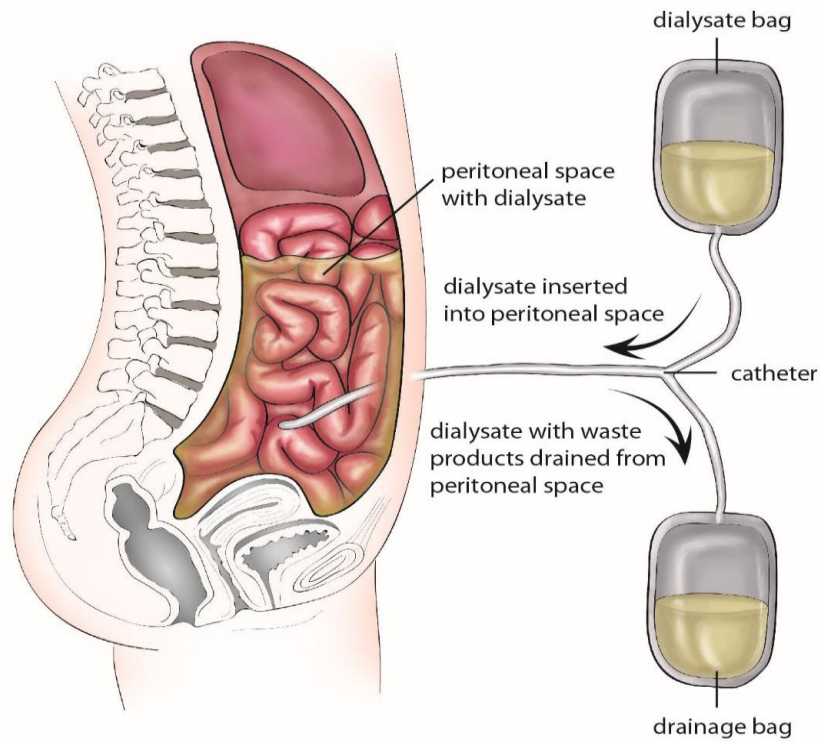
- * Definition Of Peritoneal Dialysis.**
- * Functional Anatomy Of Peritoneal Membrane.**
- * Modules Of Peritoneal Transport.**
- * Physiology Of Peritoneal Transport.**



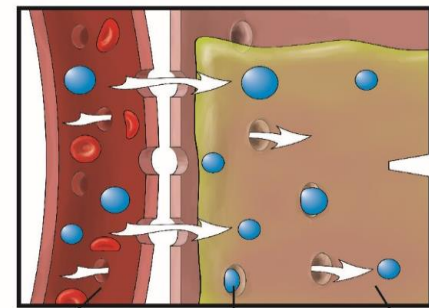
WHAT IS PERITONEAL DIALYSIS?

- ▶ Peritoneal Dialysis Involves The Transport Of Solutes And Water Across A “Membrane” That Separates Two Fluid-containing Compartments:
- ▶ (A) The Blood In The Peritoneal Capillaries, Which In Renal Failure Contains An Excess Of Urea, Creatinine, Potassium, And Other Waste Products
- ▶ (B) The Dialysis Solution In The Peritoneal Cavity, Which Typically Contains Sodium, Chloride, And Lactate Or Bicarbonate And Which Is Rendered Hyperosmolar By The Inclusion Of A High Concentration Of Glucose.
- ▶ That Dialysate Is Infused Into The Peritoneal Cavity Where It Comes Into Contact With Capillaries Perfusing The Peritoneum And Viscera. Solutes Diffuse From Blood In The Capillaries Into The Dialysate And Are Discarded.
- ▶ A Transmembrane Pressure Gradient Is Applied- Osmotically- And Results In Ultrafiltration Of Fluid From The Capillary Tubes Into The Dialysate; That Fluid Too Is Then Discarded.

PERITONEAL DIALYSIS



waste products cross the semipermeable membranes into the peritoneal space



dialysate with waste products drained from peritoneal space

Anatomy Of Peritoneal Membrane

- ▶ The Peritoneal Membrane Lining The Abdominal Cavity Consistes Of Two Layers:
- ▶ Parietal - Lines The Anterior Wall And Undersurface Of The Diaphragm - 20% Of Total SA.
- ▶ Visceral - Covers The Abdominal Organs - 80% Of Total SA.
- ▶ The Thickness Is Highly Variable.

Character Of Peritoneal Membrane

- ▶ Size Of Peritoneal Membrane Is 1.3–2.0 M² In An Adult.
- ▶ Semi-permeable/Bi-directional.
- ▶ Highly Vascular ;Peritoneal Blood Flow Range From 50 To 100 ml/Min.
- ▶ Lymphatic Drainage Through Diaphragmatic Stomata .
- ▶ Continuous With Fallopian Tubes In Females.

Peritoneal membrane histology:

- ▶ Peritoneal Membrane Is Lined By :
- ▶ Mesothelial Cells : Equipped With Microvilli ,Produce Thin Film Of Lubricant Fluid .
- ▶ Interstitium : It Is A Gel-like Matrix Containing Collagenous And Other Fibers, The Peritoneal Capillaries, And Some Lymphatics.

Transport Across The Peritoneal Endothelium

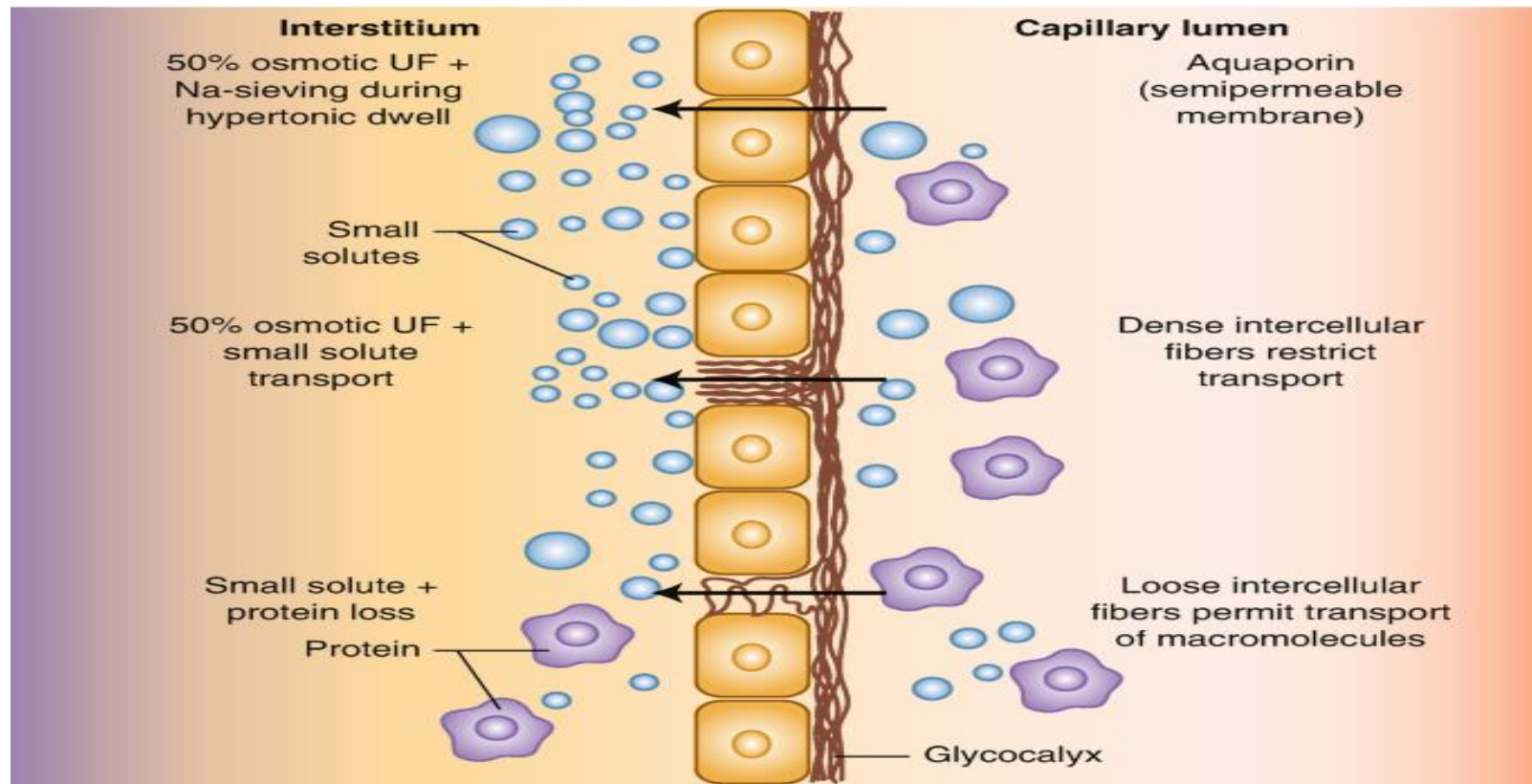
- ▶ The Three Pore Model:

- ▶ Large Pores (20-40 nm) - Few in Number (3% Of S.A) - Transport Macromolecules - Clefts Between Endothelial Cells.

- ▶ Small Pores (4-6 nm)

Most Numerous (95% Of Sa) - Allow Transport Of Small Solutes And Water.

- ▶ Ultrasmall (Transcellular) Pores (< 0.8) - many in number (But Only 2% Of S.A) - transport water Only (Na Sieving).



Physiology Of Peritoneal Transport:

▶ Peritoneal Transport Comprises Three Processes:

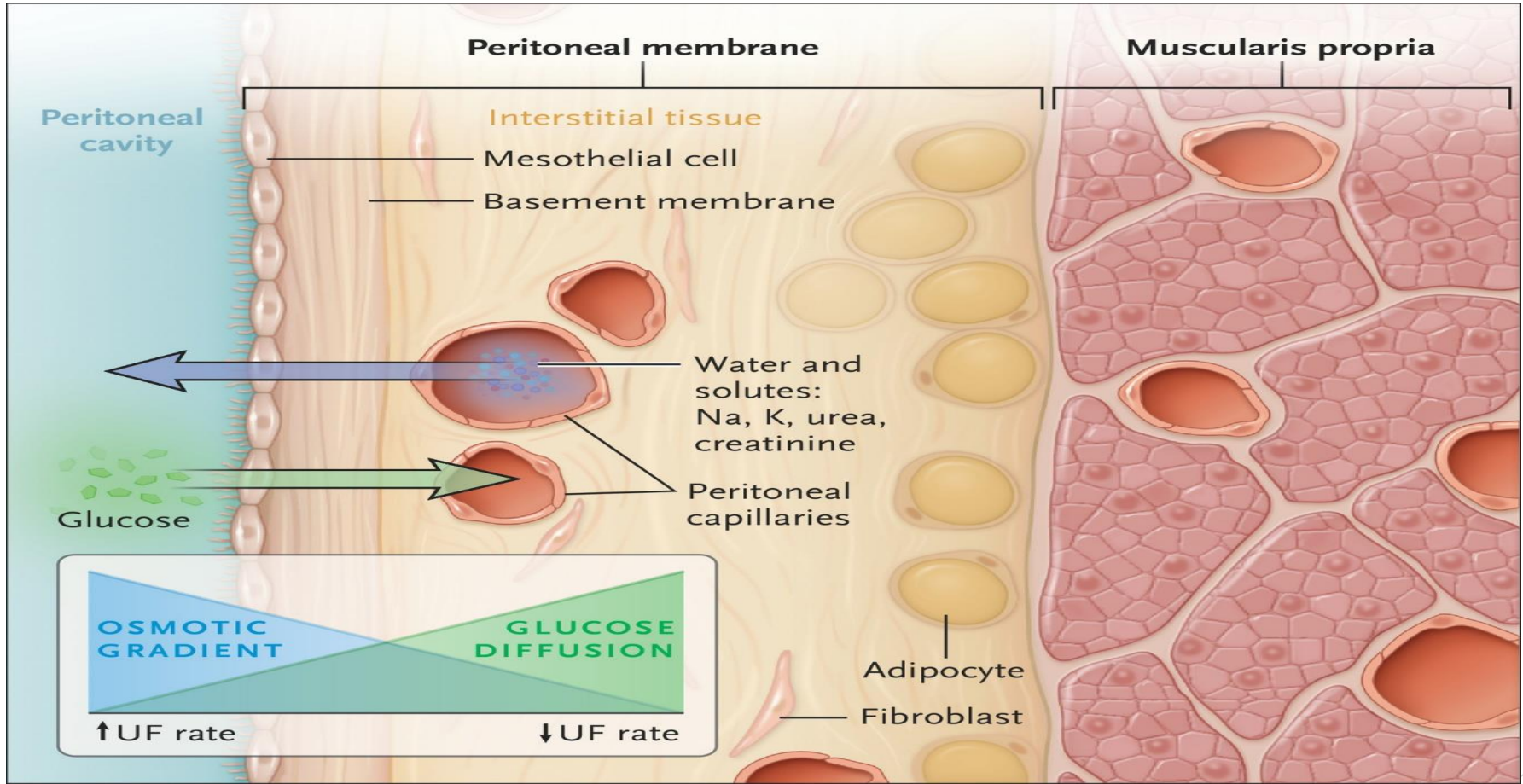
(a) Diffusion.

(b) Ultrafiltration.

(c) Fluid absorption.

Diffusion:

- ▶ Solute transport from peritoneal capillary blood into the peritoneal fluid .
(Concentration Gradient) .
- ▶ Phosphate diffuse from a high Concentration in plasma to dialysate .
- ▶ Occurs through Small Pores .
- ▶ Small Solutes Diffuse at a Faster Rate than larger Ones.
- ▶ Concentration gradient can also be from dialysate to Plasma. Lactate In dialysate diffuses across the peritoneal membrane from dialysate into plasma.



Diffusion Continuous ,,

- ▶ Peritoneal Diffusion Depends On :
- ▶ Concentration Gradient Of Solute.
- ▶ Effective Peritoneal Surface Area .
- ▶ Number Of Small Pores .
- ▶ Molecular Weight Of The Solute.
- ▶ Peritoneal Blood Flow.

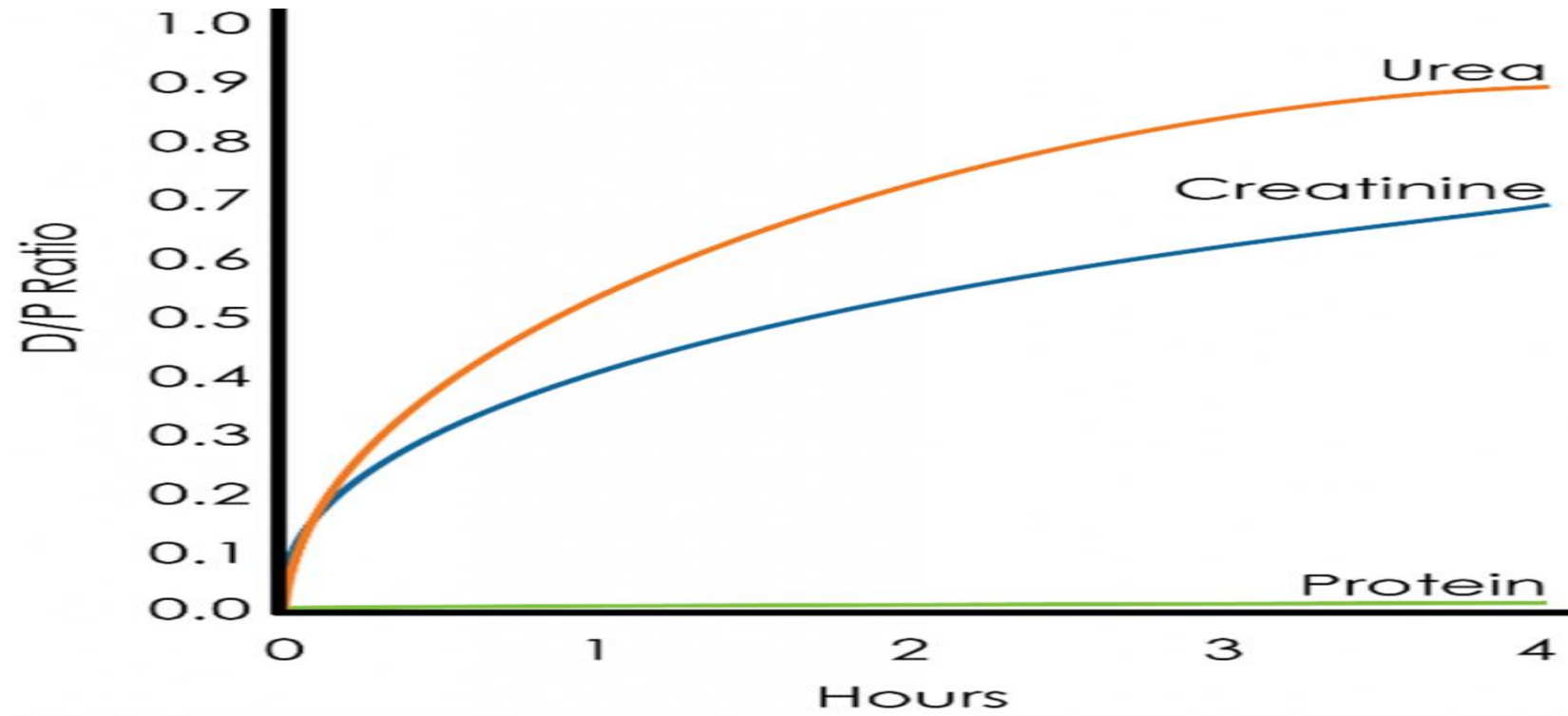
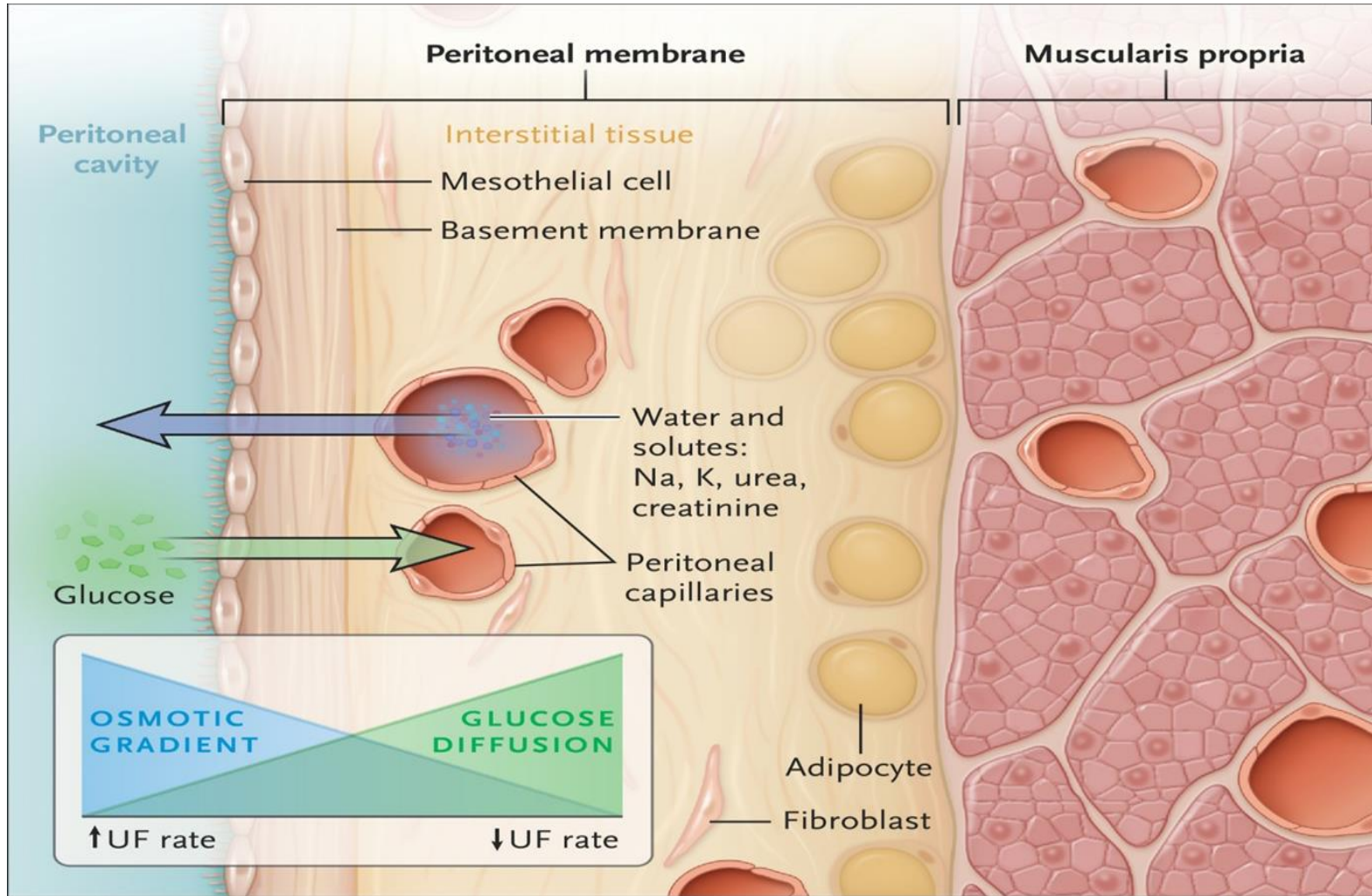


Figure 5. Diffusive Clearance of Solutes Over Time

Ultrafiltration ,,

Consequence Of The Osmotic Gradient Between The Dialysis Solution And The Peritoneal Capillary Blood And Depends On The Following:

- ▶ Concentration Gradient For The Osmotic Agent (e.g Glucose).
- ▶ Effective Peritoneal Surface Area.
- ▶ Reflection Coefficient For The Osmotic Agent (e.g Glucose). It Is Measures How Effectively The Osmotic Agent Diffuses Out Of The Dialysis Solution Into The Peritoneal Capillaries.
- ▶ Hydrostatic pressure gradient.
- ▶ Oncotic pressure gradient. Oncotic pressure acts to keep fluid in the blood, and so opposes ultrafiltration.
- ▶ Alternative osmotic agents (icodextrin).



Fluid Absorption:

- ▶ Fluid Absorption From The Peritoneal Space Occurs Via Lymphatics .
- ▶ Typical Rates Of Peritoneal Fluid Absorption Are 1.0–2.0 ml/min.
- ▶ The Factors That Affect The Rate Of Fluid Absorption Of A Peritoneal Dwell Are :
 1. Intra-peritoneal Hydrostatic Pressure.
 2. Effectiveness Of Lymphatics.

Convection:

- ▶ Known As Solute Drag. Movement of solute with a water flow .
- ▶ Occurs With U.F .
- ▶ Large Molecules, . Albumin, Predominantly Cross The Peritoneal Membrane By Convection And Utilize The Large Pores.

Home Massage,,,

- ▶ Peritoneal Membrane Is A Functional Unite Of Peritoneal Dialysis.
- ▶ The Mechanisms Of Action Of Peritoneal Membrane are Diffusion ,
Convection .
- ▶ Osmotic Gradient Result In Good Ultrafiltration.



**THANK YOU
FOR YOUR
ATTENTION**

