

Learning Objectives – Integrating Years 1 and 2

Below are essential concepts to be reviewed and integrated as you progress through the MHD Renal block.

FHB Renal

There will be 3 questions on the April 26, 2012 MHD II exam developed from the following objectives:

Trace the several intravascular and extravascular pathways a water molecule might traverse on multiple passes through the kidney

Explain why exogenous inulin and endogenous creatinine can be used for determining the glomerular filtration rate and why one substance might be superior to the other.

Show how RPF and RBF can be estimated and explain why no substance in the blood can have a clearance exceeding that of PAH.

Name the capillary beds in the kidney which form portal systems and defend why their distinct anatomical placements are of functional significance.

Show how intrinsic factors within the kidney can explain autoregulation of GFR and RBF and how extrinsic factors can override this autoregulation.

Detail the several mechanisms in the kidney that can be exploited to move substances across tubular cells (tubule to blood and vice versa)

List regions along the nephron where water can (water permeability) and cannot (water impermeability) move down its osmotic gradient.

Compare and contrast the different body water compartments with respect to volume, composition, and osmolality, and how volumes are individually measured

Predict changes in EC water and IC water osmolalities and volumes following ingestion of hypertonic, isotonic and hypotonic solutions.

Distinguish antidiuresis from water diuresis, normal physiological stimuli evoking each state, and the resultant urine volumes and osmolalities.

Review how urea is processed by the kidney, urea's contribution to the medullary osmolality gradient, and the effect of increased urine flow on urea excretion.

Discuss the renal handling of sodium and water along the tubules and alterations in GFR during: euolemia; volume contraction and expansion; the edematous state.

Outline the many factors involved in potassium homeostasis, clarifying why the maintenance of plasma $[K^+]$ within narrow limits is so crucial to life.

Compare and contrast the renal processing of metabolic H⁺ by the proximal tubule and distal tubule, and explain the consequences of tubular failure at each level.

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Histology

There will be 2 questions on the April 26, 2012 MHD II exam developed from the following objectives:

Identify the structures and regions seen grossly in a frontal section of kidney as well as describe their organization and general function(s).

Describe the structure and contents of a renal lobe and lobule.

Identify the components of the glomerular filtration barrier in a transmission electron micrograph (TEM) or diagram a portion of a renal corpuscle. Describe the components of the physical versus charge barriers.

Describe the structure and function of mesangial cells.

Describe the function of the juxtaglomerular apparatus and identify its components