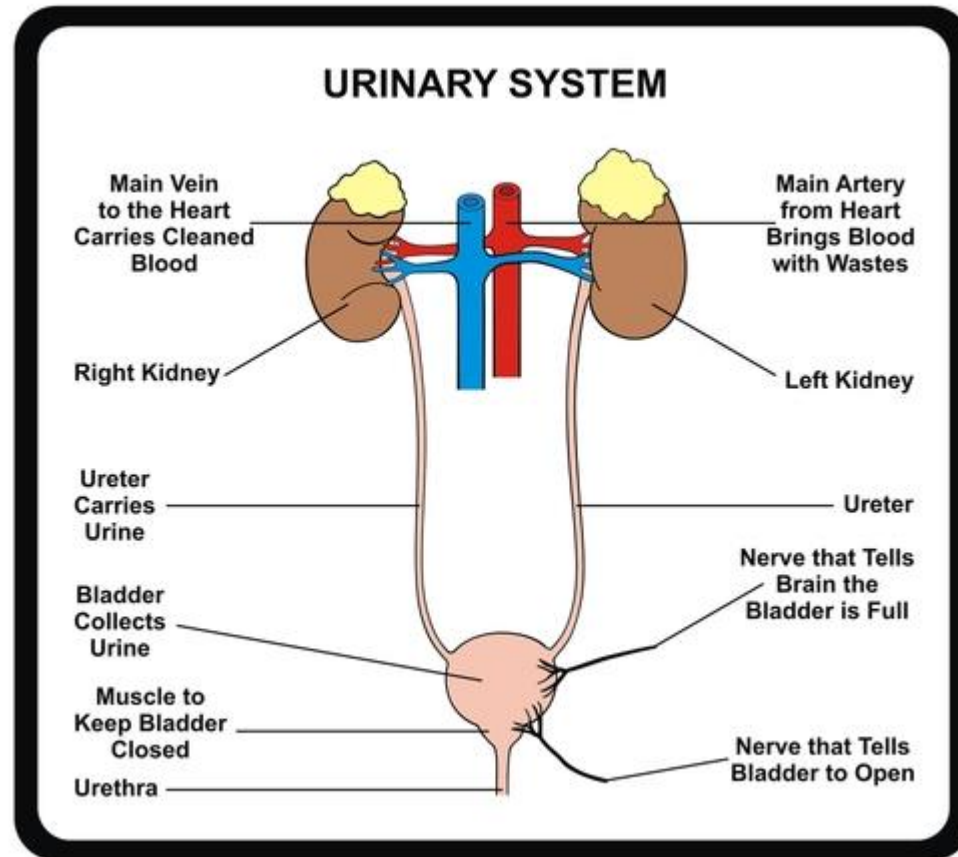


The Human Kidney: The Basics of this Organ



What does the renal system look like?



Video about Kidney Basics

How do your kidneys work?

<https://www.youtube.com/watch?v=FN3MFhYPWWo>

How the normal kidney works

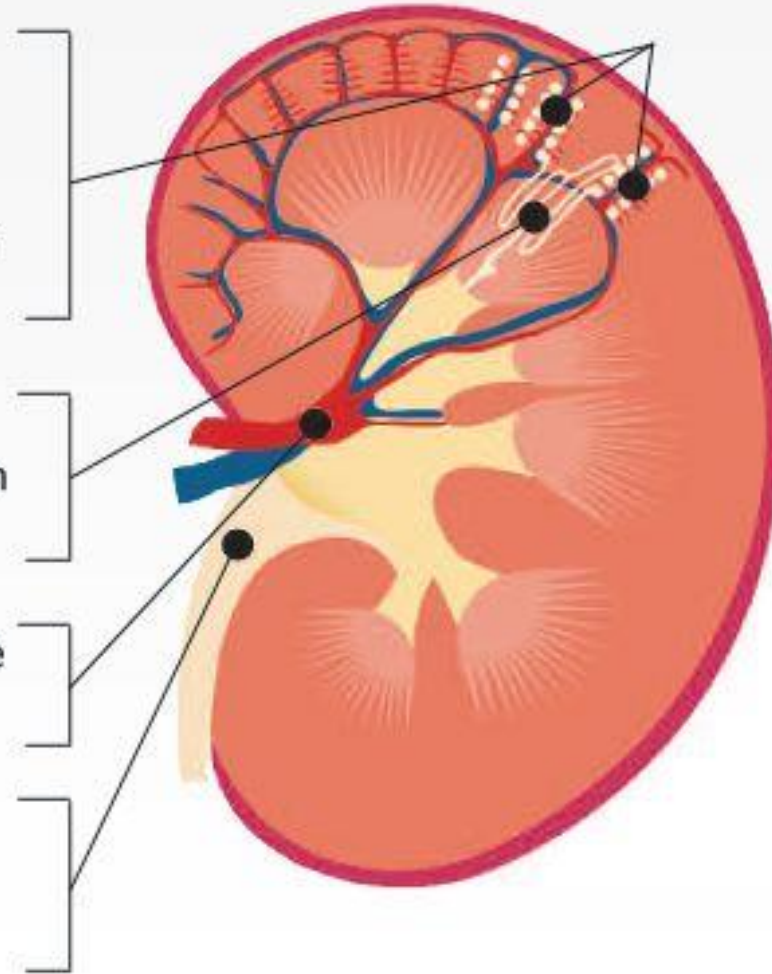
How Kidneys Work

Inside each nephron, a special blood vessel called a glomerulus works like a strainer to keep blood cells and needed substances in while letting extra fluid and wastes out.

Each kidney contains about one million nephrons—tiny filtering centers that clean the blood.

Blood enters the kidney here, through the renal artery.

Drop by drop, urine is produced and travels to the bladder through this tube, called a ureter.



Mnemonic for kidney functions: A WET BED

1-4

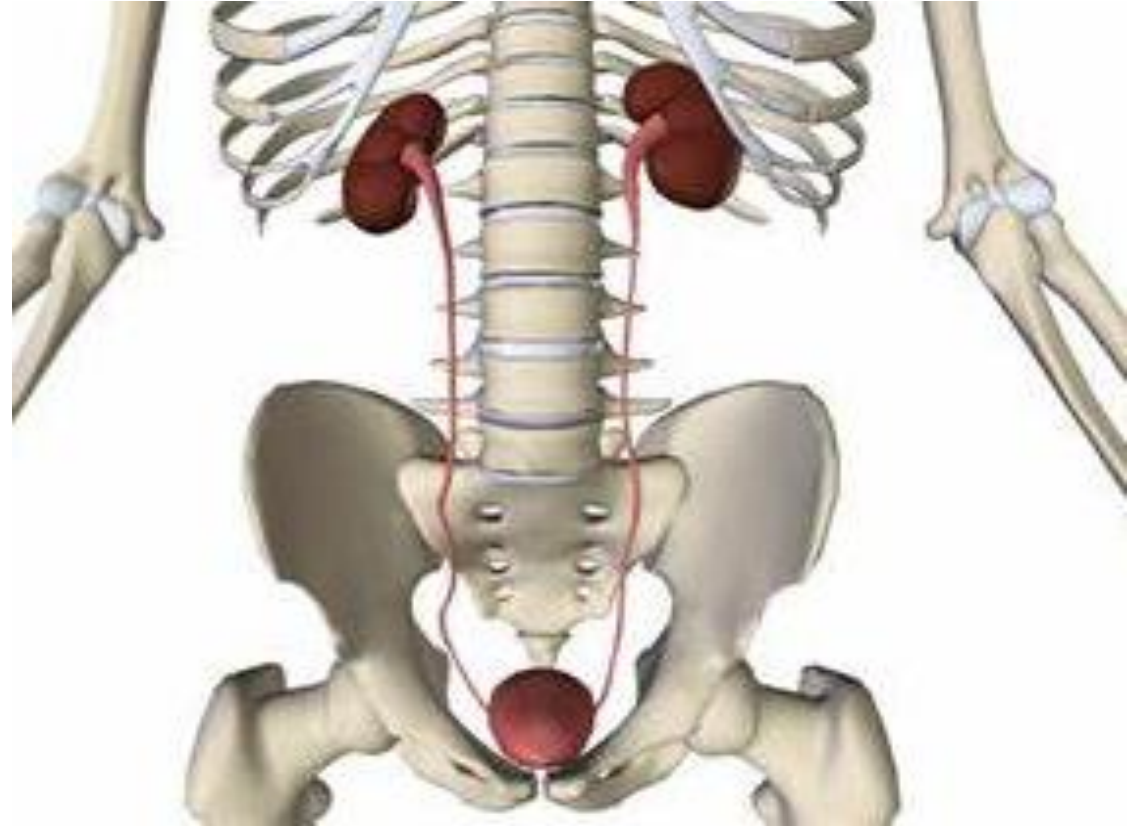
- A – controlling ACID-base balance. H^+ , Na^+ , NH_3^- , PO_3^-
- W – controlling WATER balance, ICF and ECF.
- E – maintaining ELECTROLYTE balance.
- T – removing TOXINS and waste products from the body.

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- B – controlling BLOOD PRESSURE.
- E – producing the hormone ERYTHROPOIETIN.
- D – activating vitamin D.

Where are the kidneys located?

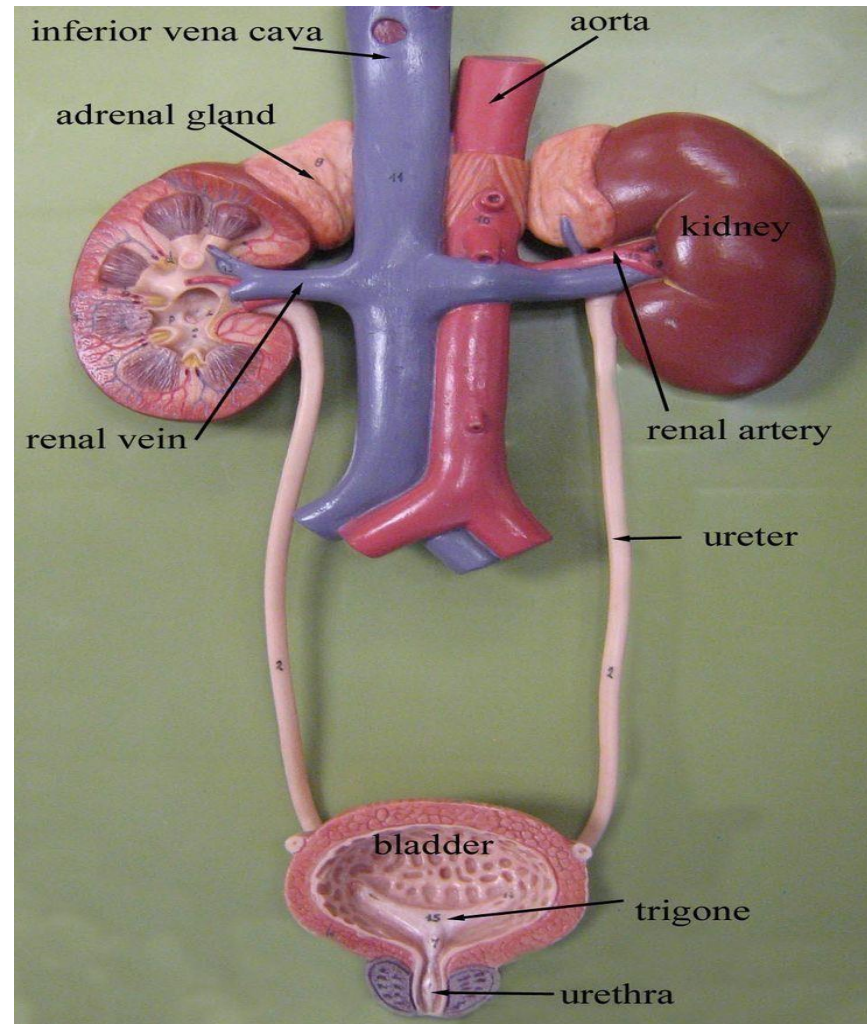
- The kidneys are located on either side of the spine, below the rib cage, behind the belly.
- The top of each kidney is roughly around the 11th rib space.
- The kidneys are between the diaphragm and the intestines, roughly speaking.



Here is the kidney, including ureter and bladder.

Some Amazing facts!

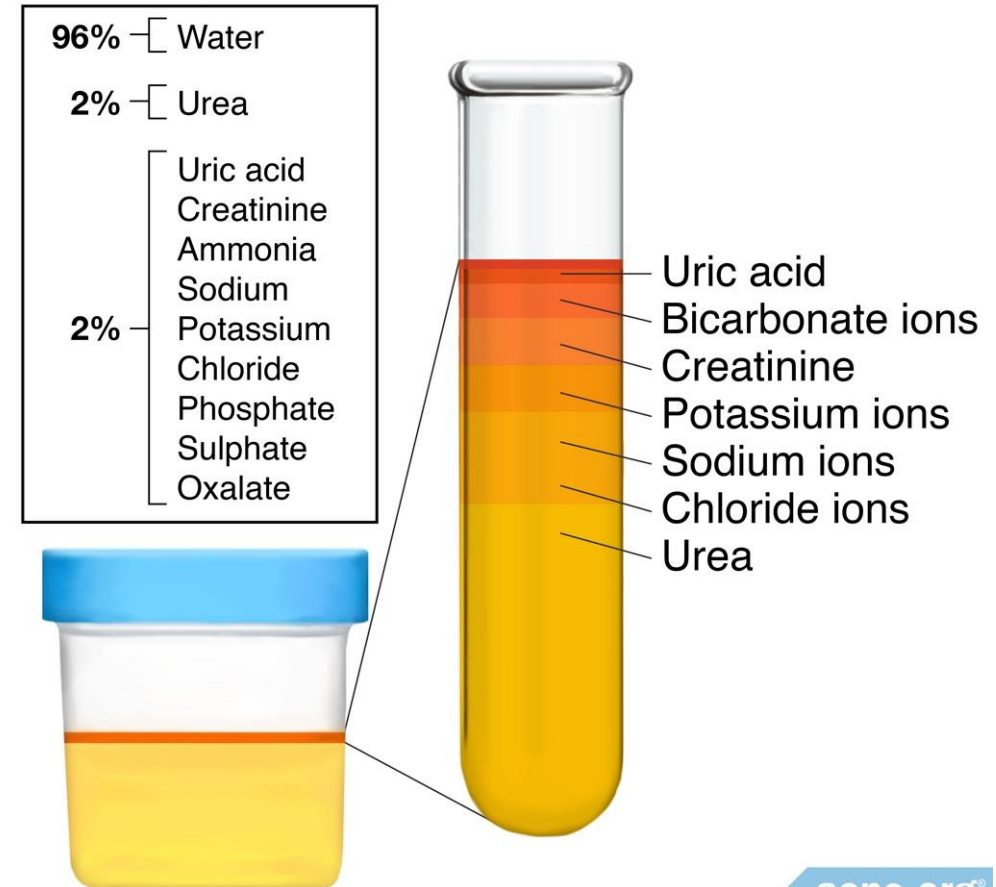
- The kidney has over 1 million functional units called nephrons.
- Each of these nephrons contains glomerulus and a tubule.
- The glomerulus acts as the filter system of the blood.
- The beauty is the kidney can filter out as well as retain certain elements large and small. Urine is the result, and is 95% H₂O.



Urine constituents

- Healthy urine consists of water, ammonia, potassium, hydrogen, a little sodium, a little creatine, a little uric acid and urea and a little bilirubin.
- If any of these substances are present in too great (or too little) a quantity, then it becomes unhealthy.

Composition of Normal Urine



Function of hormones on the kidneys

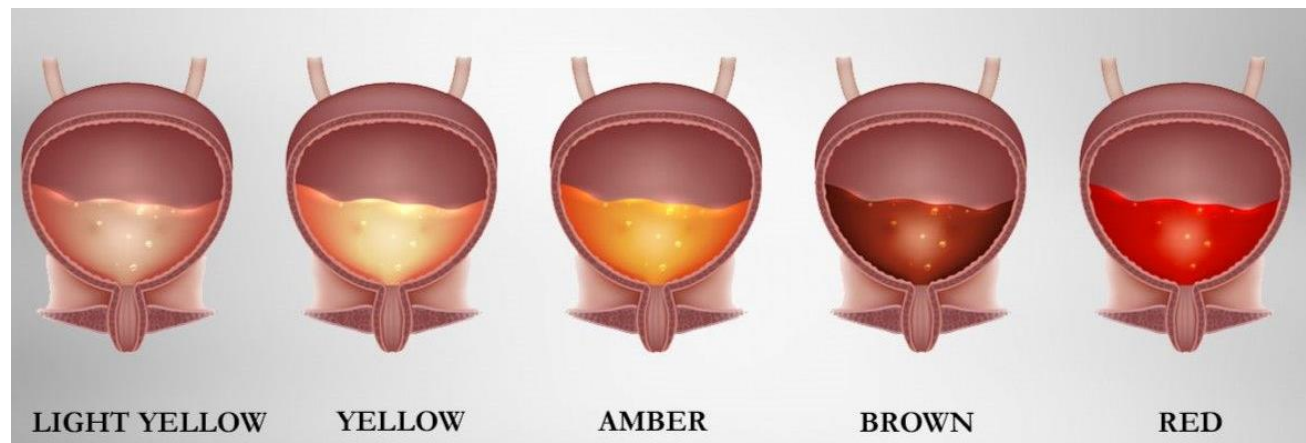
Anti-diuretic hormone (ADH):

- Changes permeability of water in the collecting tubules of the renal system. If high, permeability to water increases, causing urine to become more concentrated and output will decrease.
- If ADH is low, tubules are less permeable and urine output increases, and the concentration is more diluted.

Aldosterone

- Aldosterone controls water retention by way of Na^+ concentration. The higher the concentration the higher is the retention of Na^+ and H_2O .
- Lower concentration promotes Na^+ and H_2O excretion at the distal tubules.
- Aldosterone plays a role in potassium secretion or retention.
- These hormones play a role in fluid balance depending on osmoreceptors.

What Urine Color Means



Fizzy:
Normal, excess protein, kidney problem

Transparent Yellow:
normal

Dark Yellow:
normal, but in need of water soon

Brown:
severely dehydrated, liver disease

Pink / Red:
Eaten beets / blueberries
rhubarb, blood in urine

Clear:
excess water

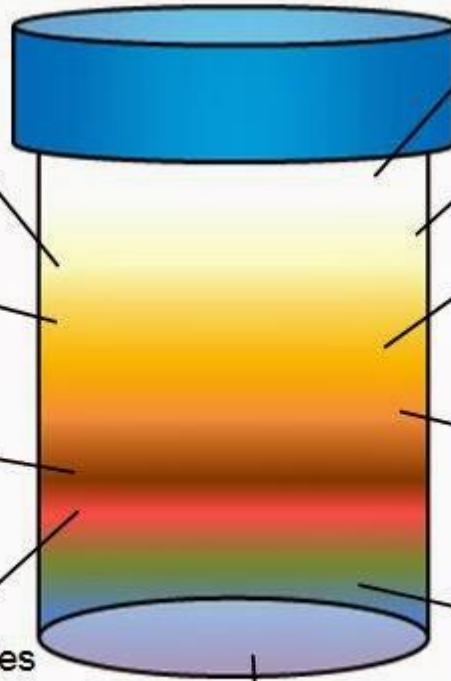
Pale Straw Yellow:
healthy

Honey/Amber:
dehydrated

Orange:
dehydrated, liver/ bile duct condition, food dye

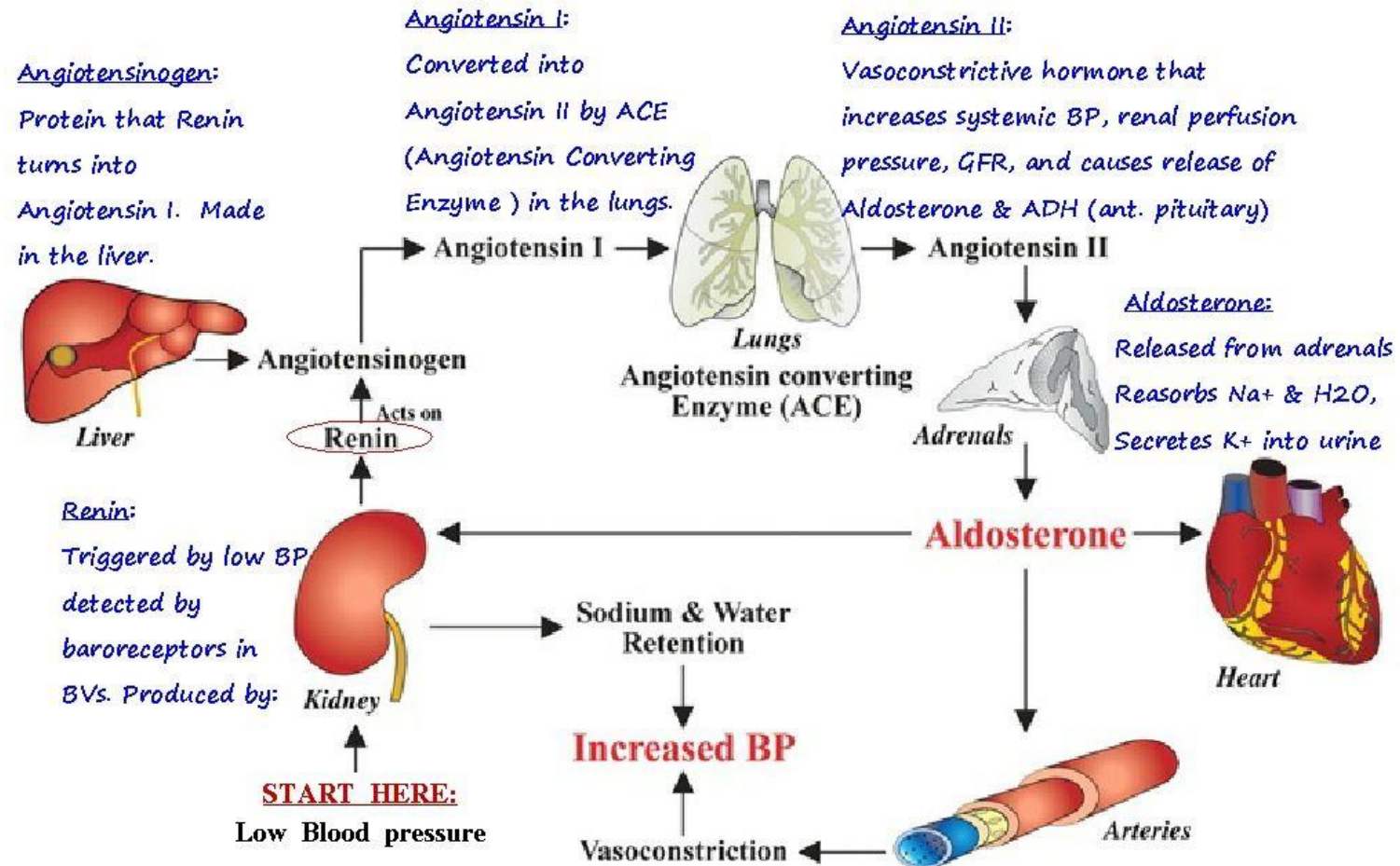
Blue / Green:
rare genetic disease, bacteria or medication, food dye

Purple:
does not exist



Kidneys and BP: renin, angiotension, aldosterone system

RAAS Renin-Angiotensin-Aldosterone System

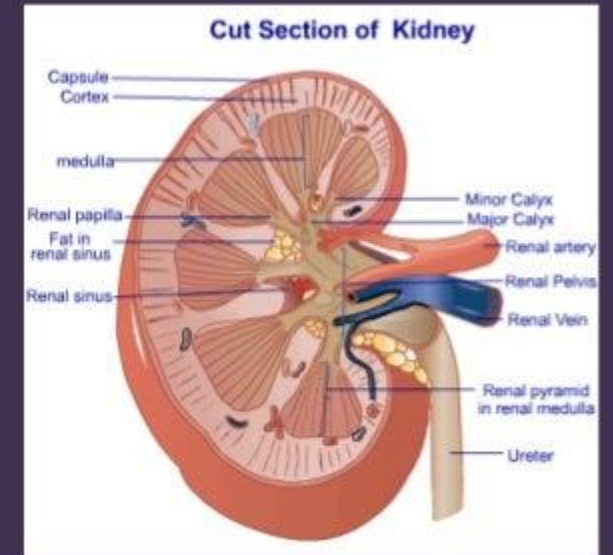


Effects of Aging:

- Functional changes:
 - Glomerular filtration rate (GFR) is key. It is an indication of rate of kidney filtration.
 - Blood flow decreases.
 - Decrease in GFR and fluid regulation.
 - Blood flow to kidneys and other structures decreases about 10% per decade from about 1200cc/min in younger adults to 600cc/min by 80 years of age.

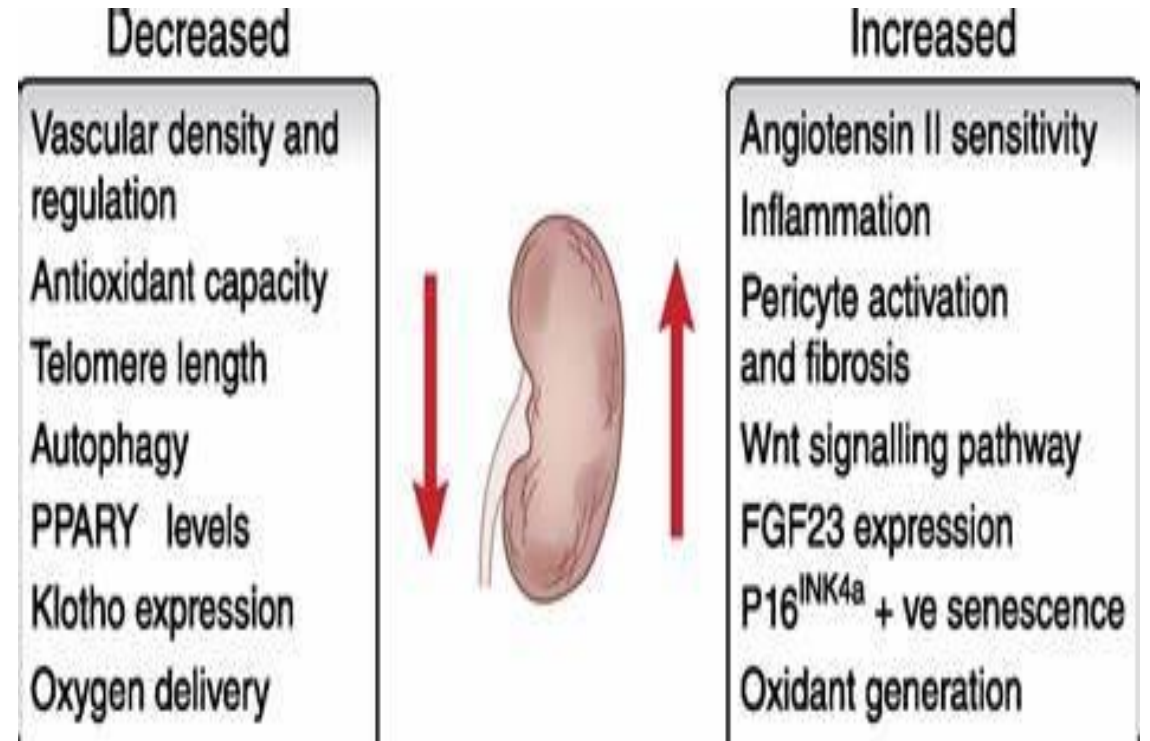
Effects of aging on the Kidneys and Renal System

- Anatomic changes:
 - Kidney size decreases
 - Number of glomeruli decreases
 - Renal tubules changes
 - Renal vasculature changes



Continued Changes in the renal system as we age

- As we age we can lose as much as 50% filtration capacity (nephrons) and yet experience little change in homeostasis.
- The problem is that as we age, we are susceptible to greater fluctuations in fluid and electrolyte balance because of structural damage, medications, or contrast dyes from diagnostic tests.
- Oddly enough, even normal kidneys will experience a reduced capacity due to many factors: Salt, H₂O, and fever.



Questions???????

- Part II to this will be given later in the month.
- It will include some of the common kidney dysfunctions that put the elderly population at risk.