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Question

1. Critically examine the renal function of desert dwellers and the anatomical basis of their unique adaptation.
2. Write extensively on the clinical importance of glomerular filtration barrier.

Answers

1. Desert dwellers are animals that live in desert. Where there is little supply of water or vegetation

The Renal of function of these animals are different from other animals that live where there is water.

Cortical nephrons and juxtamedullary nephrons. Cortical nephrons are those that have short loop of henle and are found mostly in cortex part of the nephron. They don't go deep into the medulla. While juxtamedullary are those that have longer loop of henle and they go deep into the medulla

In animals like us, There is more cortical nephrons to juxtamedullary that's why we produce diluted urine and excrete a lot of water.

The desert dwellers possess more of juxtamedullary nephrons and longer loop of henle which results in the production of concentrated urine.

They are able to adapt to their environment because they possess thicker medulla which contains many juxtamedullary nephrons. These animals get little water from their environment and if they keep excreting like us they'll die, but due to their high number of juxtamedullary nephrons and long loop of henle , when urine is being formed and it gets to the loop of henle, Because theirs is long, the urine will be there overtime, gets concentrated Resulting in little water being excreted so. It helps in conservation of water.

1. Damage to the glomerulus by disease can allow passage through the glomerular filtration barrier of red blood cells, white blood cells, platelets, and blood proteins such as albumin and globulin. Underlying causes for glomerular injury can be inflammatory, toxic or metabolic.These can be seen in the urine (urinalysis) on microscopic and chemical (dipstick) examination. Examples are diabetic kidney disease, glomerulonephritis, and IgA nephropathy.

Due to the connection between the glomerulus and the GFR, the GFR is of clinical significance when suspecting a kidney disease, or when following up a case with known kidney disease, or when risking a development of renal damage such as beginning medications with known nephrotoxicity.

IN THE CLINIC

A reduction in GFR in disease states is most often due to decreases in the ultrafiltration coefficient (Kf) because of the loss of filtration surface area. The GFR also changes in pathophysiologic conditions because of changes in the hydrostatic pressure in the glomerular capillary (PGC), oncotic pressure in the glomerular capillary (πGC), and hydrostatic pressure in Bowman’s space (PBS).

1. Changes in Kf: An increased Kf enhances the GFR, whereas a decreased Kf reduces the GFR. Some kidney diseases reduce the Kf by decreasing the number of filtering glomeruli (i.e., diminished surface area). Some drugs and hormones that dilate the glomerular arterioles also increase the Kf. Similarly, drugs and hormones that constrict the glomerular arterioles also decrease the Kf.
2. Changes in PGC: With decreased renal perfusion, the GFR declines because the PGC decreases. As previously discussed, a reduction in the PGC is caused by a decline in renal arterial pressure, an increase in afferent arteriolar resistance, or a decrease in efferent arteriolar resistance.
3. Changes in πGC: An inverse relationship exists between the πGC and the GFR. Alterations in the πGC result from changes in protein synthesis outside the kidneys. In addition, protein loss in the urine caused by some renal diseases can lead to a decrease in the plasma protein concentration and thus in the πGC.
4. Changes in PBS: An increased PBS reduces the GFR, whereas a decreased PBS enhances the GFR. Acute obstruction of the urinary tract (e.g., a kidney stone occluding the ureter) increases the PBS.