Exercise 9: Renal System Physiology: Activity 3: Renal Response to Altered Blood Pressure Lab Report

Pre-lab Quiz Results
You scored 100% by answering 4 out of 4 questions correctly.

1. If all other variables are kept constant, how does the afferent arteriole radius affect the rate of glomerular filtration (select all that apply)?
   You correctly answered: c. An increased afferent arteriole radius will increase the rate of glomerular filtration.  d. A decreased afferent arteriole radius will decrease the rate of glomerular filtration.

2. If all other variables are kept constant, how does the efferent arteriole radius affect the rate of glomerular filtration (select all that apply)?
   You correctly answered: a. An increased efferent arteriole radius will decrease the rate of glomerular filtration.  b. A decreased efferent arteriole radius will increase the rate of glomerular filtration.

3. If all other variables are kept constant, how does blood pressure affect the rate of glomerular filtration (select all that apply)?
   You correctly answered: b. If blood pressure goes up, the rate of glomerular filtration goes up.  d. If blood pressure goes down, the rate of glomerular filtration goes down.

4. In the absence of other renal processes (including tubular reabsorption and secretion), more glomerular filtration leads to a larger urine volume.
   You correctly answered: a. true
Experiment Results

Predict Question: What will happen to the glomerular capillary pressure rate and glomerular filtration rate if both of these arteriole radii changes are implemented simultaneously with the low blood pressure condition?

Your answer: c. Glomerular filtration rate and pressure will only increase to the levels measured in the constricted efferent arteriole experiment.

Stop & Think Questions:
If blood pressure were to drop (for example, as the result of blood loss), what changes in the nephron would allow the kidney to maintain its normal glomerular filtration rate (select all that apply)?

You correctly answered: a. afferent arteriole dilation  d. efferent arteriole constriction
Comparing the glomerular filtration rate and glomerular capillary pressure with the baseline values (from the first run), how effective was the increased afferent arteriole radius in compensating for the low blood pressure?

You correctly answered: c. The afferent arteriole dilation returned the low glomerular capillary pressure and filtration rate almost to baseline values.

Comparing the glomerular filtration rate and glomerular capillary pressure with the baseline values (from the first run), how effective was the decreased efferent arteriole radius in compensating for the low blood pressure?

You correctly answered: b. The efferent arteriole constriction improved the low glomerular capillary pressure and filtration rate marginally.

Experiment Data:

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<th>Afferent Radius (mm)</th>
<th>Efferent Radius (mm)</th>
<th>Beaker Press. (mm Hg)</th>
<th>Glomerular Press. (mm Hg)</th>
<th>Glom. Filt. Rate (ml/min)</th>
<th>Urine Volume (ml)</th>
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Post-lab Quiz Results
You scored 100% by answering 4 out of 4 questions correctly.

1. If all other variables are kept constant, when blood pressure decreases, glomerular filtration
   You correctly answered: c. decreases.

2. If afferent arteriole radius decreases in response to an increase in blood pressure, then glomerular filtration
   You correctly answered: b. remains approximately the same.

3. If all other variables are kept constant, when the efferent arteriole radius decreases, glomerular filtration
   You correctly answered: a. increases.

4. With blood pressure held at a constant value, which of the following combinations will raise the glomerular filtration rate
   above baseline values?
   You correctly answered: b. afferent arteriole dilation and efferent arteriole constriction
Review Sheet Results

1. List the several mechanisms you have explored that change the glomerular filtration rate. How does each mechanism specifically alter the glomerular filtration rate?

   Your answer:
   The glomerular filtration rate will change when increasing afferent radius or when decreasing the efferent radius. Blood pressure is also a mechanism changing the filtration rate.

2. Describe and explain what happened to the glomerular capillary pressure and glomerular filtration rate when both arteriole radii changes were implemented simultaneously with the low blood pressure condition. How well did the results compare with your prediction?

   Your answer:
   When both arteriole radii changes were implemented simultaneously, glomerul filtration rate and pressure rose above base line. It did not measure well with my answer.

3. How could you adjust the afferent or efferent radius to compensate for the effect of reduced blood pressure on the glomerular filtration rate?

   Your answer:
   The adjustment of the afferent arteriole will make the body compensate for the effect of reduced blood pressure on the glomerular filtration pressure. Dilation of the afferent arteriole will result in more blood allowed to enter the capillary beds. Reducing the radii of the efferent arteriole the blood will not be rmoved from the capillary beds as the normal rate, and thereby remaining the glomerular filtration rate normal.

4. Which arteriole radius adjustment was more effective at compensating for the effect of low blood pressure on the glomerular filtration rate? Explain why you think this difference occurs.

   Your answer:
   Increasement of the afferent radius has a greater impact than decreasing the efferent radius. This was seen by the greater increase in glomerular pressure.

5. In the body, how does a nephron maintain a near-constant glomerular filtration rate despite a constantly fluctuating blood pressure?

   Your answer:
   instrinct and extrinct mechanisms is resulting in changes to afferent and efferent arterioles to keep maintaining the GFR.