

Fluid Balance and Blood Pressure

by Sophia



WHAT'S COVERED

In this lesson, you will learn about how the kidneys help to regulate fluid balance and blood pressure. Specifically, this lesson will cover:

1. The Kidneys' Role

The kidneys can concentrate urine, and by concentrating urine, they allow for the regulation of blood volume and also blood pressure. Blood volume has a profound effect on blood pressure. The higher blood volume becomes, the higher blood pressure becomes and vice versa. If blood volume drops, then blood pressure will drop. Kidneys essentially concentrate urine or dilute it, depending on the body's needs and what levels blood volume and blood pressure are at.

2. The Hormone ADH

Hormones can help to adjust the amount of water that is in urine and thus help maintain blood volume and blood pressure. One hormone that plays a role in this is **antidiuretic hormone (ADH)**.

ADH is released when less water is taken in than is lost. ADH helps the kidneys conserve water in the blood, which in turn, makes the urine more concentrated. ADH acts on the distal tubules and connecting ducts of a nephron.

ADH secretion is an example of a negative feedback loop. If you remember, a negative feedback loop detects a stimulus and reverses it. Let's say your body is losing water; you're going to end up decreasing your blood volume and increase the sodium levels in your blood. ADH is released, stimulating the kidneys to absorb more water. More water being reabsorbed by the kidneys will cause an increase in blood volume. As blood volume increases, blood pressure will increase with it and cause the secretion of ADH to lower.

This is a negative feedback loop because our stimulus was our body losing water, causing our blood volume to decrease and sodium concentration to increase. This is our stimulus, and we detected this change causing ADH to be released to reverse the situation and maintain water homeostasis and blood pressure.



TERM TO KNOW

Antidiuretic Hormone (ADH)

A hormone secreted from the posterior pituitary gland that stimulates the kidneys to retain water.

The receptors for ADH are located on the distal convoluted tubules and collecting ducts. High levels of ADH cause a person's urine output to decrease and its color to become darker and more concentrated.

3. The Hormone Aldosterone

Aldosterone is a hormone that causes urine to become concentrated. It mostly targets collecting ducts and distal tubules. This causes cells in the distal tubules and collecting ducts to reabsorb sodium at a faster rate, which then indirectly causes the body to reabsorb more water. Causing an increase in sodium reabsorption will also cause the body to retain water because water follows salts. Aldosterone helps to concentrate urine like ADH, but it acts in a different part of the nephron.



TERM TO KNOW

Aldosterone

Nicknamed the "salt-retaining hormone," aldosterone stimulates the kidneys to retain sodium while simultaneously excreting potassium in the urine.

4. Diuretics

A **diuretic** is a substance that reduces the reabsorption of sodium and promotes loss of water in urine. By reducing sodium reabsorption, the body is losing more water because of the diuretic. Caffeine is a good example of a diuretic; you may notice that when you drink a lot of caffeine, you urinate more often.



TERM TO KNOW

Diuretic

A medication or substance that increases a person's urine output.

5. Renin

Renin is an enzyme released when the blood volume is reduced. If blood volume drops, then the blood pressure is also going to drop with it; this causes the enzyme renin to be released. Renin stimulates the secretion of a hormone that concentrates urine and increases the amount of water that's reabsorbed. Doing this increases blood volume again and therefore brings blood volume and blood pressure back to a normal level.



TERM TO KNOW

Renin

An enzyme found in blood that plays an important role in increasing blood pressure during hemorrhaging and diarrhea.



SUMMARY

This lesson has been an overview of **the kidneys' role** in fluid balance and blood pressure. Specifically, you looked at **the hormones ADH** and **the hormone aldosterone**. You also learned about **diuretics** and **renin**.

Keep up the learning and have a great day!

Source: THIS WORK IS ADAPTED FROM SOPHIA AUTHOR AMANDA SODERLIND



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