

Hormones and Cardiovascular Regulation

Hormones are important in regulating cardiovascular function these include:

- (1) antidiuretic hormone (ADH),
- (2) angiotensin II,
- (3) erythropoietin (EPO),
- (4) natriuretic peptides .

Although ADH and angiotensin II also affect blood pressure, all four are concerned primarily with the long-term regulation of blood volume.

Antidiuretic Hormone

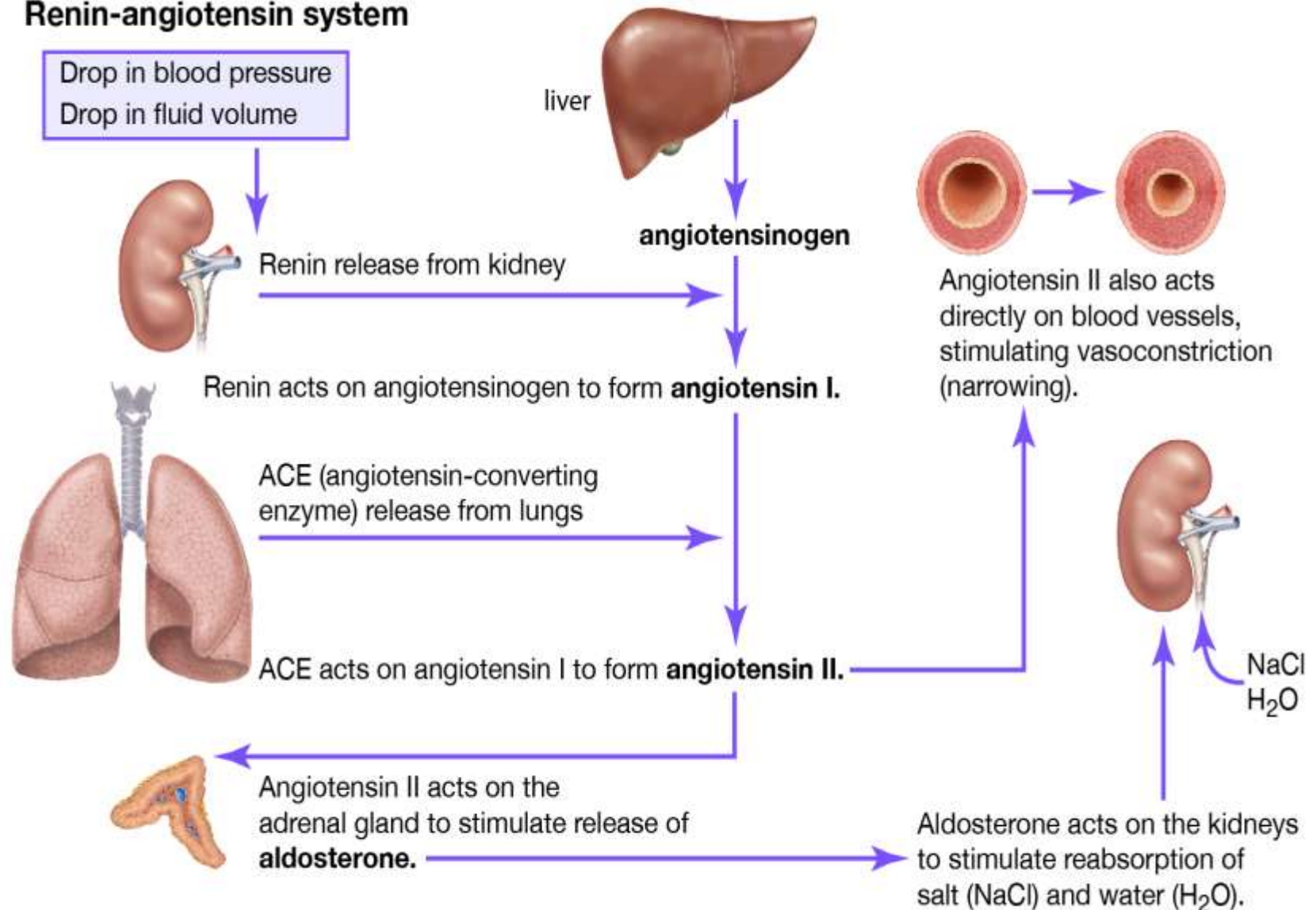
Antidiuretic hormone (ADH) is released at the posterior lobe of the pituitary gland in response to a decrease in blood volume, to an increase in the osmotic concentration of the plasma, or (secondarily) to circulating angiotensin II. The immediate result is a peripheral vasoconstriction that elevates blood pressure. This hormone also stimulates the conservation of water at the kidneys, thus preventing a reduction in blood volume that would further reduce blood pressure .

Angiotensin II

Angiotensin II appears in the blood after the release of the enzyme renin by juxtaglomerular cells, specialized kidney cells, in response to a fall in renal blood pressure .

Once in the bloodstream, renin starts an enzymatic chain reaction. In the first step, renin converts angiotensinogen, a plasma protein produced by the liver, to angiotensin I. In the capillaries of the lungs, angiotensin-converting enzyme (ACE) then modifies angiotensin I to angiotensin II, an active hormone with diverse effects.

Renin-angiotensin system



Angiotensin II has four important functions:

(1) It stimulates the adrenal production of aldosterone, causing Na^+ retention and K^+ loss at the kidneys;

(2) it stimulates the secretion of ADH, in turn stimulating water reabsorption at the kidneys and complementing the effects of aldosterone;

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(3) it stimulates thirst, resulting in increased fluid intake;
and

(4) it stimulates cardiac output and triggers the constriction of arterioles, in turn elevating the systemic blood pressure.

Erythropoietin

Erythropoietin (EPO) is released at the kidneys if blood pressure falls or if the oxygen content of the blood becomes abnormally low.

EPO stimulates the production and maturation of red blood cells, thereby increasing the volume and viscosity of the blood and improving its oxygen-carrying capacity.

natriuretic peptides

Atrial natriuretic peptide or ANP, is produced by cardiac muscle cells in the wall of right atrium in response to excessive stretching during diastole.

this hormone reduce blood volume and blood pressure.

As blood volume and blood pressure decline, the stresses on the walls of the heart are removed, and natriuretic peptide production ceases.