Renin Angiotensin Aldosterone System (RAAS) Regulators

The renin-angiotensin-aldosterone system (RAAS) is a hormone system that regulates blood pressure and fluid/electrolyte balance. This system is tightly regulated, and its primary function is to maintain normal blood pressure and perfusion of the vital organs. Activators of RAAS include hypotension, hypovolemia, and decreased NaCl delivery to macula densa cells in the distal convoluted tubule of the nephron. Sympathetic activation also results in the secretion of renin. Angiotensin II is a key mediator of RAAS, and it promotes the release of two other mediators: aldosterone and antidiuretic hormone. These key mediators reestablish homeostasis. Negative feedback is important as well, as it keeps RAAS in check if the blood pressure is too high. Atrial natriuretic peptide and brain natriuretic peptide promote natriuresis and suppress the activity of RAAS by inhibiting the secretion of renin.



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Activators

Hypotension
Hippo-BP
Hypotension activates renal baroreceptors, which results in the secretion of renin and consequent activation of the renin-angiotensin-aldosterone system (RAAS).

Hypovolemia
Hippo-volume-cup
Hypovolemia results in hypoperfusion of kidneys, activation of renal baroreceptors, and secretion of renin, which activates the renin-angiotensin-aldosterone system.

Decreased NaCl Delivery to Macula Densa
Down-arrow Salt-shaker Macula-Dracula in Den
Decreased NaCl delivery to the macula densa cells located in the distal tubule of the nephron results in the activation of the renin-angiotensin-aldosterone-system.

Sympathetic Stimuli
Up-arrow Simba
Sympathetic outflow stimulating B1-receptors results in the secretion of renin and activation of the renin-angiotensin-aldosterone-system.

Key Mediators

Angiotensin II
Angel-tennis in (2) Tutu
Angiotensin II is the key mediator of the renin-angiotensin-aldosterone system. It is synthesized in the pulmonary capillary endothelium. Angiotensin II promotes vasoconstriction and secretion of aldosterone, and antidiuretic hormone. It also activates Na reabsorption in the proximal convoluted tubule.

Aldosterone
Aldo-stereo
Aldosterone is a part of the renin-angiotensin-aldosterone system. It is a steroid hormone that affects water and salt regulation in the body. It increases Na and water reabsorption in the kidneys.

Antidiuretic Hormone
Anti-die-rocket Harmonica
Angiotensin II stimulates the release of antidiuretic hormone, which promotes the insertion of aquaporins in the collecting duct and induces reabsorption of the free water.

Negative Feedback

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Atrial Natriuretic Peptide and Brain Natriuretic Peptide

A-tree and Brain with Natural-red Haired Man

Atrial natriuretic peptide (ANP) is released in response to the distension of the atria of the heart (e.g., volume overload) while brain natriuretic peptide (BNP) is released in response to ventricular distension. These hormones increase renal sodium excretion (natriuresis) and inhibit renin secretion. Thus, they effectively suppress RAAS.

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