PHYSIOLOGY

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The outer zona glomerulosa secretes the C21 steroid aldosterone. The zona fasciculata secretes (C21 steroid) cortisol and the inner zona reticularis secretes (C19 steroid) androgens. Aldosterone regulates sodium–potassium homeostasis; it promotes sodium retention and potassium excretion. The target organs of aldosterone are the kidneys, the sweat and salivar y glands and the intestinal mucosa. The most important regulators of aldosterone secretion are the renin–angiotensin system and serum potassium concentration. Renin, produced by the juxtaglomerular cells in the kidneys, acts on its substrate angiotensinogen to generate angiotensin I. Angiotensin I is converted by angiotensin-converting enzyme (ACE) to the octapeptide angiotensin II, which is modified to angiotensin III. Both stimulate secretion of aldosterone from the adr enal cortex. A decrease in renal blood flow (haemorrhage, dehydration, salt depletion, orthostasis, renal artery stenosis) or hyponatraemia increases renin secretion, resulting in sodium retention, potassium excretion and an - increased plasma volume. Cortisol secretion by the cells of the zona fasciculata is regulated by adrenocorticotropic hormone (ACTH), which is produced by the anterior pituitary gland. The hypothalamus controls ACTH secretion by secreting corticotropin-releasing hormone (CRH). The serum cortisol level inhibits the release of CRH and ACTH via a closed-loop system (negative feed - back loop). Cortisol has numerous metabolic and immunological e ff ects. It increases gluconeogenesis and lipolysis, decreases - peripheral glucose utilisation, inhibits immunological response and, in time, reduces muscular mass. It a ff ects fat distribution, wound healing and bone mineralisation; it also alter s mood (causing euphoria or, rarely , depression) and brain cortical activity and alertness. Cells in the zona reticularis synthesise adrenal androgen dehydroepiandrosterone (DHEA) and its sulphate, DHEAS. Adrenal androgen accounts for about 20% of total male activity and is under the control of ACTH. Cells of the adrenal medulla synthesise mainly adrenaline (epinephrine; 80%) but also noradrenaline (norepinephrine; 20%) and dopamine. Unlike other adr energic neurones, those of the medulla express phenylethanolamine- N - methyltransferase (PNMT), which catalyses the conversion of noradrenaline to adrenaline. These catecholamines act as hormones as they are secreted directly into the circulation. Their e ff ects, which are mediated through α and β receptors on target organs, include - the cardiovascular system, resulting in an increase in blood pressure, heart rate and cardiac contractility; vasoconstriction of vessels in the splanchnic system and vasodilatation of vessels lysis in liver and muscles, all of which are necessary for the flight/fight response.

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