

# THE ADRENAL GLAND



## FUNDAMENTAL FUNCTIONS

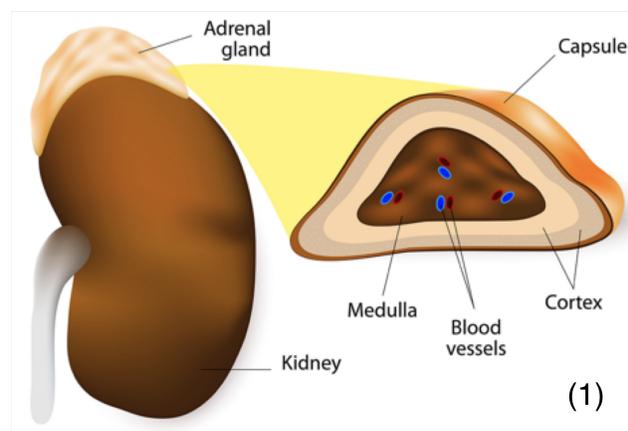
- › Involved in the manufacture and secretion of *hormones* (1)
- › Regulate blood pressure, the immune system, response to stress and the sleep/wake cycle

## OUTER ADRENAL CORTEX

- › Secretes two corticosteroid hormones: *cortisol* and *aldosterone* (2)

	CORTISOL	ALDOSTERONE
<b>REGULATION</b>	<ul style="list-style-type: none"> <li>› Body's use of fats and carbs</li> <li>› Suppression of inflammation</li> <li>› Sleep/wake cycles</li> </ul>	<ul style="list-style-type: none"> <li>› Blood pressure and pH (through electrolyte regulation in blood and urine)</li> </ul>
<b>PRODUCTION</b>	<ul style="list-style-type: none"> <li>› Hypothalamus (CRH) → pituitary gland (ACTH) → hormone release to promote cortisol secretion</li> </ul>	<ul style="list-style-type: none"> <li>› Signals from kidneys</li> </ul>

(2)



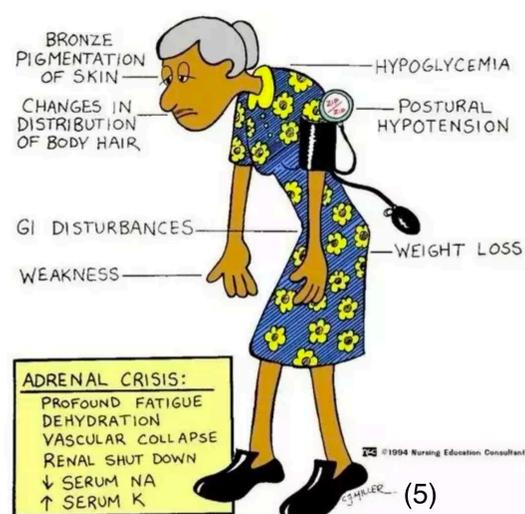
## INNER ADRENAL MEDULLA

- › Secretes *adrenaline* and *noradrenaline*
- › Adrenaline, produced by suprarenal glands, is involved in response to *external stress*
- › Adrenal glands trigger hypothalamus to promote production and secretion of adrenaline into bloodstream (2)

	ADRENALINE	NORADRENALINE
<b>EFFECT ON BODY</b>	<ul style="list-style-type: none"> <li>› Increase heart rate</li> <li>› Increase blood sugar levels</li> <li>› Airway's smooth muscles relax (promotes O<sub>2</sub> intake)</li> </ul>	<ul style="list-style-type: none"> <li>› Vasoconstriction, which leads to high blood pressure</li> </ul>

(2)

## ADDISON'S DISEASE



- › Occurs when adrenal glands fail to produce sufficient cortisol or aldosterone (3)
- › Symptoms often overlooked due to similarities in symptoms of other diseases as well as slow appearance (4)
- › Common symptoms include weight loss, weakness, abdominal pain, darker skin (knees, toes and lips) (4)
- › Most common diagnosis is through blood test (6)

### CAUSES (4)

- › Damage to adrenal glands (eg due to autoimmune diseases)
- › Infections or viruses (such as tuberculosis, HIV, AIDS)
- › Difficulties in the production of hormones due to genetics
- › Cancer cells in adrenal glands
- › Bleeding in adrenal glands

### ADRENAL CRISIS (7)

- › A life-threatening condition that occurs in patients who do not take regular medication, as well as those who have yet to be diagnosed
- › Triggered by highly stressful situations as adrenal glands fail to produce stress-managing hormones
- › Symptoms may include extreme weakness, mental confusion, extremely low blood pressure, dizziness...
- › Those experiencing Adrenal crisis must immediately be injected with corticosteroid in order to raise cortisol levels in blood (4)

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## TREATMENTS

- › Prior to 1930s, 80% of Addison's Disease patients died within two years (8, 10)

### EXISTING TREATMENT

- › *Glucocorticoids* replace the missing aldosterone and cortisol (8)
- › *Short-acting* glucocorticoids roughly mimic normal rhythm of cortisol release
- › *Long-acting* glucocorticoids have smoother physiological effects, avoiding marked changes in dose

	SHORT-ACTING	LONG ACTING
<b>PROS</b>	<ul style="list-style-type: none"> <li>› Dose can be adjusted</li> </ul>	<ul style="list-style-type: none"> <li>› More easily administered in those with non-compliant schedule</li> </ul>
<b>CONS</b>	<ul style="list-style-type: none"> <li>› True rhythm cannot be replicated</li> <li>› Symptoms of fatigue, nausea and headaches</li> </ul>	<ul style="list-style-type: none"> <li>› Correct dose is hard to determine</li> </ul>

### ALTERNATIVE TREATMENT

- › Transplantations of cortical adrenal tissue appeared in literature as early as 1951
- › Successful in experimental animals, yet to be achieved in humans (11)

### IMPLICATIONS (12)

- › Those suffering from adrenal insufficiency receive much higher levels of glucocorticoids than otherwise produced
- › May give rise to adverse effects on one's bones
- › Data gathered from UK, NZ and NO measuring bone mineral density in femoral neck and lumbar spine
- › Results show that bone mineral density was significantly lower in neck and spine of those with Addison's disease
- › Significantly lower in males compared to females
- › Similar trends found in hip and spine