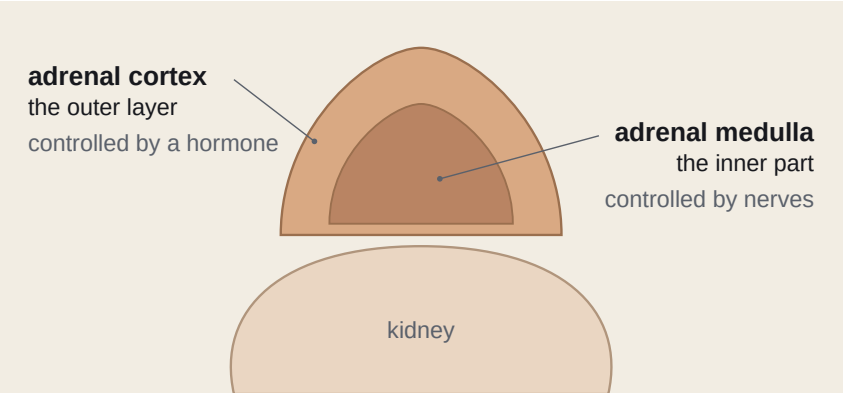
# A12 · Stress: epinephrine, cortisol and aldosterone · Completed notes

Goals: Name the two parts of the adrenal gland and say what controls each. Describe the short-term stress response and the effects of epinephrine. Trace the loop of ACTH and cortisol in the long-term stress response. State what aldosterone does. Explain how the nervous system and the endocrine system act together under stress.

These are the completed notes. The blanks are filled in and each question is worked.

## Slide 1 of 5 · The adrenal glands: two glands in one

In lesson A11, hormones controlled growth, metabolism and calcium. Today you see how the body deals with stress. The adrenal glands do most of the work.




### Key ideas

The inner part of an adrenal gland is the **adrenal medulla**. **Nerves** control it.

The outer layer is the **adrenal cortex**.

A **hormone** from the pituitary gland controls the adrenal cortex.

### Example

Name the part of the adrenal gland that is controlled by nerves.

1. It is the inner part.
2. It is the adrenal medulla.

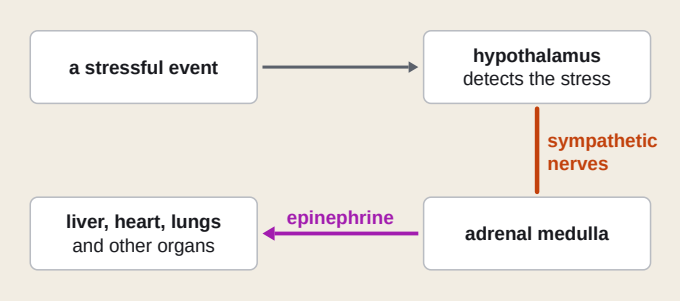
### Try it

Name the two parts of an adrenal gland. State what controls each.

1. The adrenal medulla is controlled by nerves.
2. The adrenal cortex is controlled by a hormone.

## Slide 2 of 5 · The short-term stress response: epinephrine

On the last slide, nerves controlled the adrenal medulla. That makes it the fast part of the gland.




| Epinephrine causes | How it helps |
|---|---|
| blood sugar rises | more fuel for the cells |
| heart rate rises | fuel and oxygen arrive faster |
| breathing rate rises | more oxygen is taken in |
| pupils dilate | more light enters the eyes |

### Key ideas

Sympathetic nerves carry a message to the **adrenal medulla**.

It releases the hormone **epinephrine**.

The liver changes glycogen into **glucose**. Blood sugar rises.

The heart rate and the **breathing rate** rise.

### Example

Explain why the short-term stress response starts within seconds.

1. Nerves trigger it.
2. A message along nerves is faster than a hormone in the blood.

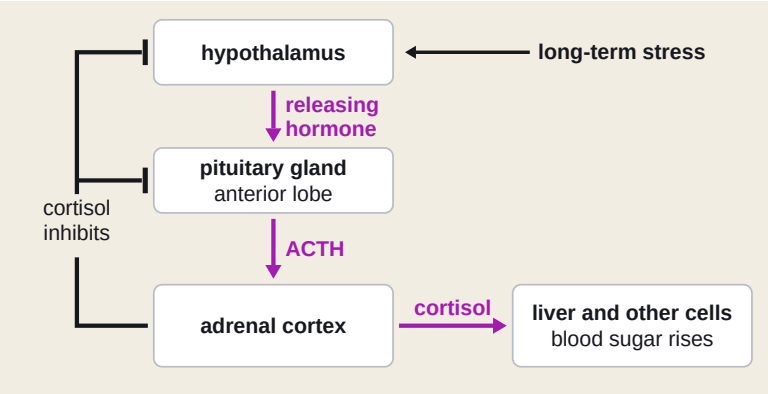
### Try it

Explain how epinephrine raises blood sugar.

1. It acts on the liver.
2. The liver changes stored glycogen into glucose.

## Slide 3 of 5 · The long-term stress response: ACTH and cortisol

On the last slide, epinephrine acted within seconds. If the stress goes on for hours or days, the adrenal cortex takes over.




### Key ideas

The pituitary gland releases **ACTH**.

ACTH makes the adrenal cortex release **cortisol**.

Cortisol raises **blood sugar**.

Cortisol **inhibits** the hypothalamus and the pituitary gland.

### Example

Name the hormone that makes the adrenal cortex release cortisol. Name the gland that releases it.

1. The hormone is ACTH.
2. The anterior lobe of the pituitary gland releases it.

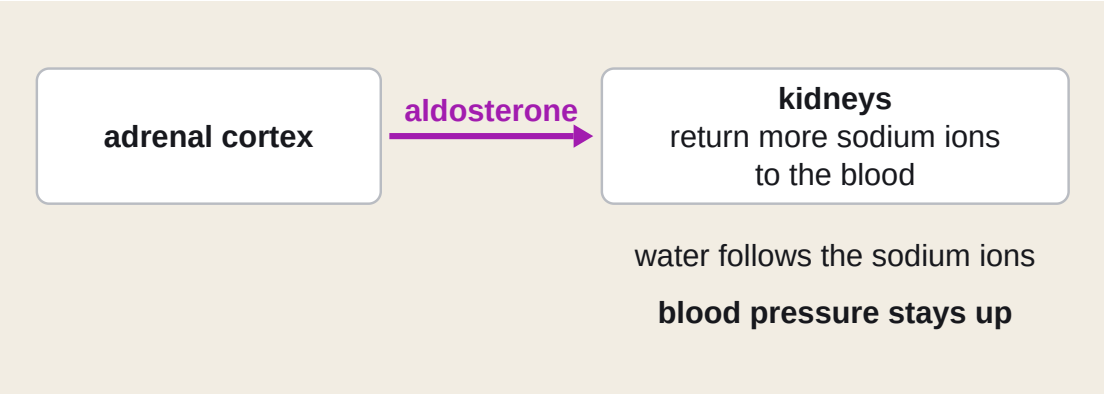
### Try it

Explain how cortisol limits its own release.

1. Cortisol inhibits the hypothalamus and the pituitary gland.
2. Less ACTH is released.
3. So less cortisol is released.

## Slide 4 of 5 · Aldosterone

On the last slide, the adrenal cortex released cortisol. It releases a second hormone that acts on the kidneys.




### Key ideas

The adrenal cortex also releases **aldosterone**.

It makes the kidneys return more **sodium ions** to the blood.

**Water** follows the sodium ions. Blood pressure stays up.

### Example

State what aldosterone makes the kidneys do.

1. They return more sodium ions to the blood.
2. Water follows.

### Try it

State the gland that releases aldosterone, and its target organ.

1. The adrenal cortex releases it.
2. Its target is the kidneys.

## Slide 5 of 5 · Two systems, two speeds

You have now seen two responses to stress. The table puts them side by side. It shows how the two control systems share the work.

| | Short-term response | Long-term response |
|---|---|---|
| Controlled by | nerves | a hormone, ACTH |
| Part of the gland | adrenal medulla | adrenal cortex |
| Hormone released | epinephrine | cortisol |
| Starts | in seconds | more slowly |
| Lasts | a short time | a long time |

### Key ideas

The short-term response uses nerves, the adrenal medulla and **epinephrine**.

The long-term response uses ACTH, the adrenal cortex and **cortisol**.

The **hypothalamus** starts both responses.

### Example

Sort into the short-term or the long-term stress response: epinephrine, and ACTH.

1. Epinephrine: short-term.
2. ACTH: long-term.

### Try it

Sort into the short-term or the long-term stress response: cortisol, and sympathetic nerves.

1. Cortisol: long-term.
2. Sympathetic nerves: short-term.