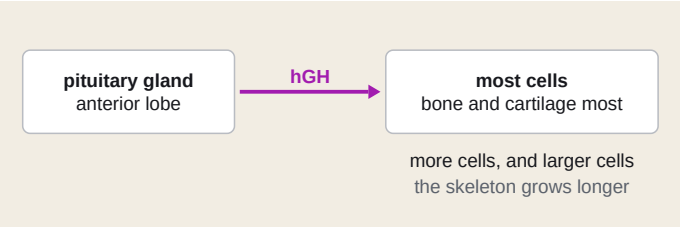
# A11 · Growth and metabolism: hGH, thyroxine and blood calcium · Notes

Goals: State what hGH does, and what happens when there is too little or too much. State what thyroxine does, and compare hyperthyroidism with hypothyroidism. Trace the loop of TSH and thyroxine. Explain how a lack of iodine causes a goitre. Predict hormone levels when one part of a loop fails. Explain how PTH and calcitonin control blood calcium.

Name: _____ Date: _____

## Slide 1 of 6 · hGH: the hormone for growth

In lesson A10, the anterior lobe of the pituitary gland released hGH, TSH and ACTH. Today you follow two of them: hGH first, then TSH.




| Amount of hGH | Result |
|---|---|
| too little, in childhood | dwarfism |
| too much, in childhood | gigantism |
| too much, in an adult | acromegaly: hands, feet and face grow |

### Key ideas

_____ is released by the anterior lobe of the pituitary gland.

It makes cells divide and grow larger. _____ cells and cartilage cells respond most.

Too little hGH in childhood causes _____.

Too much hGH in childhood causes _____.

### Example

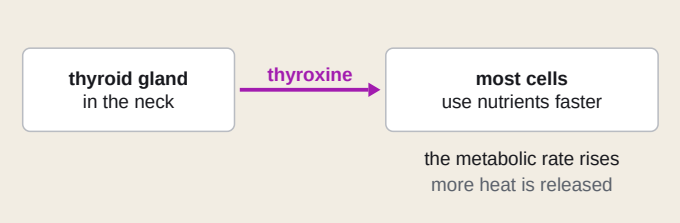
A child's pituitary gland releases too much hGH. Name the condition that results.

### Try it

State the gland that releases hGH and the main effect of hGH.

## Slide 2 of 6 · Thyroxine and metabolism

On the last slide, hGH controlled growth. The thyroid gland releases a hormone that controls how fast your cells use food.




| | Too much thyroxine | Too little thyroxine |
|---|---|---|
| Name | hyperthyroidism | hypothyroidism |
| Metabolism | fast | slow |
| Body mass | falls | rises |
| The person feels | warm and nervous | cold and tired |

### Key ideas

The thyroid gland releases _____.

Thyroxine raises the _____.

Too much thyroxine is _____. Too little is _____.

### Example

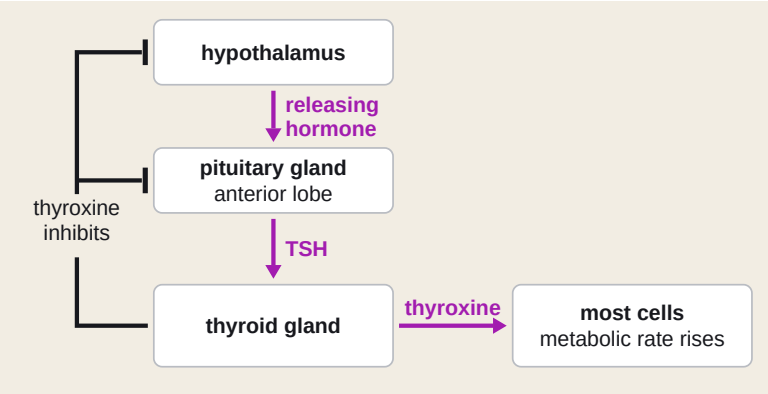
A person feels cold and tired and gains body mass. State if thyroxine is high or low, and name the condition.

### Try it

A person loses body mass and feels warm and nervous. State if thyroxine is high or low, and name the condition.

## Slide 3 of 6 · TSH and the thyroxine loop

On the last slide, thyroxine raised the metabolic rate. The thyroid gland does not decide by itself how much thyroxine to release.




### Key ideas

The hypothalamus sends a _____ to the pituitary gland.

The pituitary gland releases _____.

TSH makes the thyroid gland release _____.

Thyroxine _____ the hypothalamus and the pituitary gland.

### Example

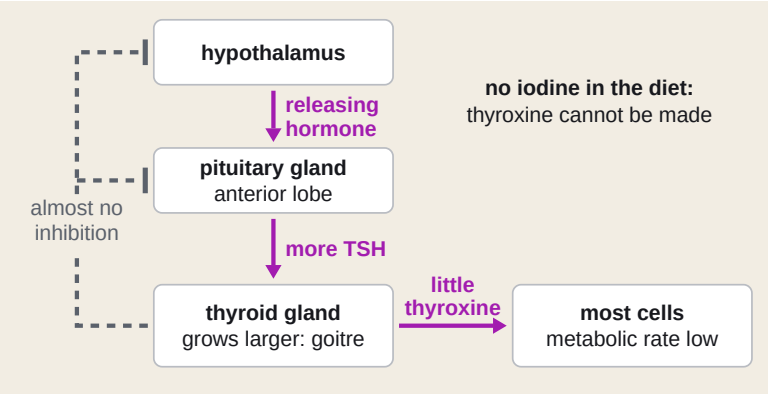
Thyroxine in the blood rises above normal. Predict what happens to TSH.

### Try it

List the three glands in the thyroxine loop, in order.

## Slide 4 of 6 · Goitre: when the loop breaks

On the last slide, thyroxine inhibited the pituitary gland and kept TSH in check. Here is what happens when thyroxine cannot be made.




### Key ideas

The thyroid gland needs _____ to make thyroxine.

With no iodine, little thyroxine is made. So _____ is released.

The thyroid gland grows larger. This is a _____.

### Example

In a person with a goitre from lack of iodine, state if TSH is high or low. Explain.

### Try it

Explain why iodine is added to table salt.

## Slide 5 of 6 · Method: predict hormone levels when a loop breaks

Goitre is one way a loop can break. Questions give many others. These four steps work for all of them.

1. **Write** the loop as a chain, from the first gland to the last hormone.
2. **Find** the part that has failed.
3. **State** that the hormone after the break falls.
4. **State** that inhibition is lost, so hormones before the break rise.




**Check: low after the break, high before it.**

Used again in: lessons A12 to A14

### Key ideas

Step 1: write the loop as a _____. Step 2: find the part that has _____.

Step 3: the hormone after the break _____.

Step 4: inhibition is lost, so hormones before the break _____.

### Example

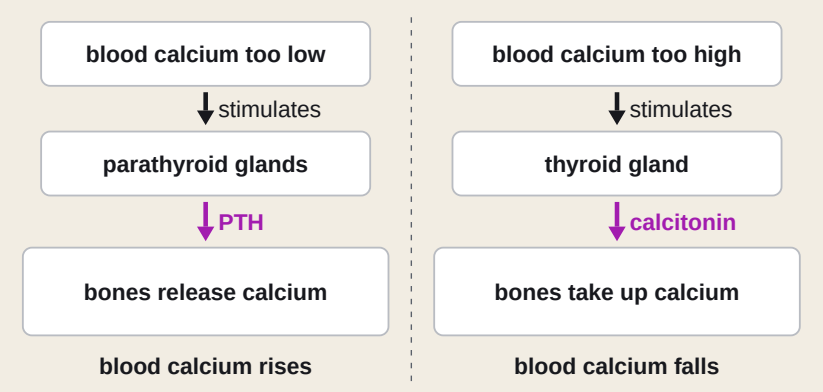
Use the four steps. A thyroid gland is removed. Predict the levels of thyroxine and TSH.

### Try it

Use the four steps. The cells that make TSH are destroyed. Predict the levels of TSH and thyroxine.

## Slide 6 of 6 · Blood calcium: PTH and calcitonin

So far each loop had one final hormone. Blood calcium is controlled by two hormones that pull in opposite directions.




### Key ideas

When blood calcium is too low, the parathyroid glands release _____.

PTH makes bones _____ calcium. Blood calcium rises.

When blood calcium is too high, the thyroid gland releases _____.

Two hormones with opposite effects are _____.

### Example

Name the hormone released when blood calcium is too high. State what it does.

### Try it

Name three places where PTH acts to raise blood calcium.