Pituitary Gland Disorders

This leaflet gives a brief overview of the pituitary gland and the hormones it makes. The pituitary gland is found at the base of the brain and is ‘pea-sized’. The pituitary gland is an overall controller of a number of other glands in the body, overseeing the function of these organs through hormones.

What is the pituitary gland?

The pituitary gland is located in the brain and is an endocrine gland. This means that it produces chemicals called hormones. Hormones are chemical messengers which help different organs in the body communicate with each other. The pituitary gland is one part of a messenger system. The pituitary gland helps to control your body's functions by releasing hormones into your bloodstream. These hormones are transported in your blood to their target. Here they usually cause the release of a second hormone. The target can either be specialised endocrine glands or other types of body tissue such as groups of cells.

The pituitary gland is sometimes called the master gland because it controls several other hormone-releasing glands. Some of the glands the pituitary gland controls are the thyroid gland, the ovaries, the testicles (testes) and the adrenal glands.

Where is the pituitary gland found?

About the size of a pea, the pituitary gland is found at the base of the brain, behind the bridge of your nose. The pituitary gland is very close to another part of the brain, called the hypothalamus.

The pituitary gland has two main parts:

- The part of the pituitary gland at the front, called the anterior pituitary.
- The part of the pituitary gland at the back, called the posterior pituitary.

These two parts release different hormones which are aimed at different parts of the body.

There is also a section between the two main parts, called the intermediate part, which releases a single hormone. The final part of the pituitary gland is the stalk, which connects the posterior pituitary to the hypothalamus.

How does the pituitary gland work?

Your body is in a constant state of change. Your heart rate, blood pressure and body temperature all change in response to what you do and your surroundings. Your body has systems that constantly monitor these and other vital functions. Not only must these systems monitor changes, they must also respond to the changes and help the body to restore balance.

Some of these systems involve the hypothalamus and the pituitary gland. The hypothalamus and the pituitary gland are part of several loops or circuits. The loops include other glands. The hormones produced by each gland complete the loops by travelling in the bloodstream between them.
The hypothalamus receives information from many sources about the basic functions of your body. It uses the information it receives to help regulate these functions. One of the ways the hypothalamus does this involves controlling the pituitary gland. The hypothalamus does this by using its own hormones to communicate with the pituitary gland.

Among the information monitored by the hypothalamus is the level of various hormones in the blood. The hypothalamus has special cells which receive information from the body indicating how much of each hormone is present in the bloodstream. When these hormones drop below a particular level this stimulates the hypothalamus to release hormones. These hormones travel to the pituitary gland, acting as the signal to the pituitary gland to produce one or more of its hormones. The hormones produced by the pituitary gland are released into the bloodstream. The bloodstream transports the pituitary hormones to other endocrine glands, such as the thyroid gland.

The pituitary gland hormones may then stimulate their target endocrine glands to produce their own hormones. These locally produced hormones do the actual work of regulating your body.

Take the example of the control of thyroid hormones from the thyroid gland in your neck. The hypothalamus produces a hormone called thyrotropin-releasing hormone (TRH). TRH travels to the pituitary gland and stimulates it to release thyroid-stimulating hormone (TSH). TSH travels to the thyroid gland and stimulates it to release thyroid hormones, T3 and T4. When levels of T3 and T4 get high enough, levels in the bloodstream are detected by the hypothalamus. The hypothalamus then knows to stop releasing more TRH. This last part of the loop is called negative feedback and prevents hormone levels from rising too high.

The anterior pituitary produces hormones that regulate a wide range of bodily activities, from growth to reproduction. Whether a hormone is released by the anterior pituitary is governed by the hypothalamus. There are at least seven different hormones secreted by the anterior pituitary. The posterior pituitary produces just two hormones.
### The anterior pituitary hormones

<table>
<thead>
<tr>
<th>Hormone released</th>
<th>Main target</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adrenocorticotrophic hormone (ACTH)</td>
<td>Adrenal glands</td>
<td>Stimulates the adrenal glands to produce cortisol. Cortisol is important in controlling your metabolism, blood sugar levels and blood pressure. It is also an anti-inflammatory agent and helps your body to resist certain stresses such as bleeding or fasting.</td>
</tr>
<tr>
<td>Follicle-stimulating hormone (FSH)</td>
<td>Ovaries - women, Testicles (testes) - men</td>
<td>Stimulates the ovaries to produce an egg (ovum) for fertilisation. Also causes an increase in the hormone oestrogen. Stimulates the testicles to produce sperm.</td>
</tr>
<tr>
<td>Growth hormone (GH)</td>
<td>Many different cells of the body</td>
<td>The most well-known effect in children is to increase height. In adults and children it helps to control the amount of muscle and fat in the body. It also helps to heal injuries and it promotes your immune system.</td>
</tr>
<tr>
<td>Luteinising hormone (LH)</td>
<td>Ovaries - women, Testicles - men</td>
<td>Triggers ovulation - the release of an egg (ovum) ready for fertilisation. Stimulates cells in the testes to produce testosterone.</td>
</tr>
<tr>
<td>Melanocyte-stimulating hormone (MSH)</td>
<td>Brain (not known for sure)</td>
<td>The exact role in humans is unknown. It may influence brain activity. When too much is present, it may cause darkening of the skin. This is also produced in the intermediate part of the pituitary gland.</td>
</tr>
<tr>
<td>Prolactin</td>
<td>Breasts</td>
<td>Together with other hormones, prolactin stimulates the breasts to produce milk. It is also found in women who aren't pregnant. Men also have prolactin but its function is not understood well.</td>
</tr>
<tr>
<td>Thyroid-stimulating hormone (TSH)</td>
<td>Thyroid gland</td>
<td>TSH stimulates the thyroid gland to produce its own hormones, triiodothyronine (T3) and thyroxine (T4). These hormones help to control many bodily functions, including heart rate, temperature and metabolism.</td>
</tr>
</tbody>
</table>

### The posterior pituitary makes and releases just two hormones

<table>
<thead>
<tr>
<th>Hormone released</th>
<th>Main target</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antidiuretic hormone (ADH)</td>
<td>Kidneys</td>
<td>Decreases urine production. (It causes more water filtered by the kidneys to be returned to the blood. This reduces the amount of urine.) ADH also causes a rise in blood pressure.</td>
</tr>
<tr>
<td>Oxytocin</td>
<td>Breasts and womb (uterus)</td>
<td>Stimulates contraction of the womb during childbirth. Helps breasts to release milk.</td>
</tr>
</tbody>
</table>

### Some disorders of the pituitary gland

Pituitary disorders generally occur when the pituitary gland is either too active or not active enough. Often there is a discrete piece of pituitary gland which leads to the problems, this is called a pituitary adenoma (if it is large it may be called pituitary macroadenoma). These are usually benign, non-cancerous tumours. Pituitary adenomas can cause problems through:

1. Releasing excess of one or more hormone.
2. Not releasing any hormones but pressing on the normal pituitary tissue and thus interfering with normal function; and/or
3. Causing pressure on nearby structures - for example, pressing on the nerve of the eye, leading to blurred vision or loss of part of the vision.

Conditions where the pituitary gland produces too much of one or more of its hormones include:

- Acromegaly
- Cushing’s syndrome
- Prolactinoma
Conditions where the pituitary gland fails to produce enough hormones include:

- Adult growth hormone deficiency.
- Diabetes insipidus.
- Hypopituitarism.
- Pituitary tumours.
- Tumours of, or injury to, the hypothalamus, having a knock-on effect on the pituitary gland.

How are pituitary disorders diagnosed?
The diagnosis usually involves hormone blood tests and also brain scans. Hormone blood tests can be taken randomly for some hormones, but others may require specialised testing with substances that should provoke the release or prevent release in certain conditions. This may require attendance at a day unit and having several hormone blood tests throughout the day. Usually an MRI scan of the pituitary gland is undertaken to look for pituitary abnormalities - eg, pituitary adenoma or cysts.

What is the treatment for pituitary disorders?
This will depend upon the cause. If there is hormone deficiency then this may need replacement with tablets. If a tumour is discovered as the cause of the problems then pituitary surgery may be required. This is usually via the nose. If there is a pituitary tumour which is found to be cancerous then radiotherapy may be needed after surgery. There may also be a need for lifelong hormone replacement following any treatment.

Further detailed information available free online

The Hypophysis Cerebri
From Gray’s Anatomy Online
Web: www.bartleby.com/107/275.html

Human Physiology/The endocrine system
From Wikibooks, the open-content textbooks collection
Web: https://en.wikibooks.org/wiki/Human_Physiology/The_endocrine_system

Additional reading information can be found in the ‘Further reading’ section, below.

Further reading & references

- How does the pituitary gland work?: The Institute for Quality and Efficiency in Health Care (IQWiG), 2018

Disclaimer: This article is for information only and should not be used for the diagnosis or treatment of medical conditions. Patient Platform Limited has used all reasonable care in compiling the information but makes no warranty as to its accuracy. Consult a doctor or other healthcare professional for diagnosis and treatment of medical conditions. For details see our conditions.
Ask your doctor about Patient Access

- Book appointments
- Order repeat prescriptions
- View your medical record
- Create a personal health record (iOS only)

Simple, quick and convenient.
Visit patient.info/patient-access
or search 'Patient Access'