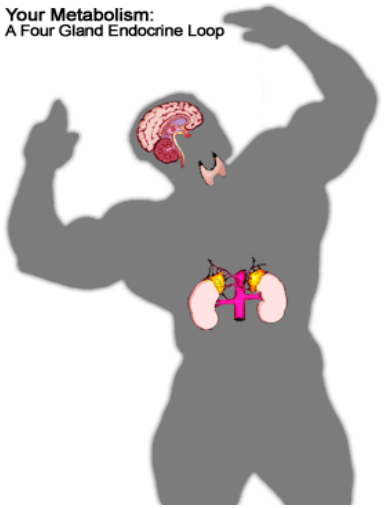
Vancouver
Neuropituitary Program

UBC Division of Endocrinology & Metabolism

Vancouver Coastal Health



Diagnostic Lab Tests: Hypopituitarism

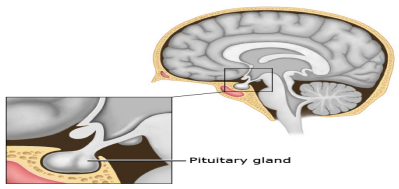
What is Hypopituitarism (HP)?

HP is a disorder in which the hormones produced by the pituitary gland- growth hormone, sex hormones, cortisol, thyroid, and anti-diuretic hormone, are not functioning properly. This can cause an imbalance or deficiency in important hormones in our bodies. With prolactin, another hormone produced by the pituitary, hypopituitarism actually causes an increase in the secretion of prolactin.

Note: Low levels of cortisol, or adrenal insufficiency, can be a medical emergency, especially during times of stress or illness. A medical alert bracelet should be worn and cortisol replacement therapy given immediately.

Pituitary Adenoma

A non-cancerous tumour in the pituitary gland is called a pituitary adenoma. Hypopituitarism is often encountered as a result of surgical treatment to remove this non-cancerous tumour. Other causes can be the result of an injury to the pituitary gland from head trauma or from cranial radiation therapy.



How is HP diagnosed?

If you have had pituitary surgery, cranial radiation treatment, or have had an injury to the pituitary gland, you may experience the following symptoms and could have HP:

- Low energy level
- Decreased physical activity
- Difficulty concentrating or loss of memory
- Moodiness or difficulty relating to others
- Withdrawal from friends and family
- Loss of interest in sexual activity

You should talk to your endocrinologist if you have these symptoms to further evaluate whether you have a pituitary hormone deficiency.

If HP is suspected, your doctor will order some blood tests to check your hormone levels. These tests include checking your growth hormone (GH) and/or IGF-1, thyroid (TSH/FT4), cortisol (24 hour urine cortisol and/or AM cortisol test), prolactin, and sex hormones (FSH/LH, testosterone or estradiol). The type of tests ordered will depend on your physical symptoms.

Follow-up: Other Tests

Sometimes after treatments for pituitary tumours such as surgery and/or radiation treatment, the body becomes deficient in hormones such as GH, thyroid, cortisol, testosterone, estradiol, and other sex hormones called FSH and LH. These hormones must be monitored regularly.

Types of Tests:

- **24 hour urine cortisol** (Urine-free Cortisol Test) (UFC)

The UFC tests only "circulating, free cortisol" levels in the blood.

How it's done:
Urine samples are collected throughout a 24-hour period. On the first morning, urinate and flush away the first urine you pass. Write down the date and time as the start date and time for the collection. Collect all urine you pass, day and night, for 24 hours. Use the lab container provided. Write down the date and time of the last urine sample. Do not allow toilet paper, stool, or anything else to be added to the sample. The sample may need to be refrigerated (check with the facility). When the 24-hour urine collection is complete, close the container

Supported by an educational grant from:
EMD Serono

Prepared by:
Crystal Gagnon, RN BScN,
Pituitary Nurse at St. Paul's Hospital and Vancouver General Hospital, June 2012.

Contact Us: Neuropituitary Clinics

Room 467, Comox Bldg, St. Paul's Hospital,
Vancouver, BC
PH: (604) 806-9156
Fax: (604) 806-8594

Vancouver General Hospital (VGH)
Gordon and Leslie Diamond Health Care Centre
2775 Laurel Street, Vancouver, B.C
PH: 604.875.5929
Fax: 604.875.5925

Pituitary Nurse: Crystal Gagnon
Ph: 604-682-2344 ext. 62413
Pager: 604-252-4832
cgagnon2@providencehealth.bc.ca

Also ask us for these materials:

- The Hypopituitarism record book
- Growth Hormone Deficiency workbook
- Medication Guidelines & coverage
- Adrenal insufficiency book
- Hypopituitarism lab tests
- Transsphenoidal Surgery
- Endocrine links & support groups
- Travel letter

and seal the lid tightly. Return the sample in the urine container to the facility or healthcare worker as instructed.

Special instructions:
During the 24-hour testing period, don't drink a lot of fluids or use glucocorticoid medicines or products, such as hemorrhoid or skin creams that contain steroids. This test needs to be done up to 3 times to be certain the results are accurate.

- **AM Cortisol Test**

Normally, cortisol levels rise during the early morning hours and are highest about 7 a.m. They drop very low in the evening and during the early phase of sleep. But if you sleep during the day and are up at night, this pattern may be reversed. If you do not have this daily change (diurnal rhythm) in cortisol levels, you may have overactive adrenal glands.

How to Prepare:

You may be asked to avoid strenuous physical activity the day before a cortisol test. You may also be asked to lie down and relax for 30 minutes before the blood test.

Many medicines may change the results of this test. Some medicines, such as steroids, can affect cortisol levels for some time even

after you stop taking the medicine. Be sure to tell your doctor about all the nonprescription and prescription medicines you take.

What Affects the Test

Reasons you may not be able to have the test or why the results may not be helpful include:

- Having physical or emotional stress.
- Being pregnant. This can cause urine cortisol levels to be high.
- Having low blood sugar (hypoglycemia).
- Eating, drinking, or exercising before the test.
- Taking medicines, such as birth control pills, estrogen, amphetamines, or corticosteroids.
- Having a radioactive scan within 1 week of a cortisol test.

How is the sample collected for testing?

Cortisol blood tests may be drawn at about 8 am, when cortisol should be at its peak, and again at about 4 pm, when the level should have dropped significantly.

Higher than normal levels may indicate:

the United States. However, a man's PSA level increases steadily as he ages, and some - not all - urologists advocate the use of age-related "normal" PSA cut-points, rather than using >4 ug/L for all. It is recommended that men should talk with their doctor in regards to PSA levels (Ontario Ministry of Health and Long-Term Care, 2008).

Although there is no confirmed direct link between testosterone replacement therapy and prostate cancer, a recent study suggests that it is important to monitor PSA levels in patients taking testosterone replacement than in average men of the same age.

Prostate-specific antigen (PSA) is a protein produced by cells of the prostate gland. The PSA test measures the level of PSA in the blood.

A blood sample is taken, and the amount of PSA is measured in a laboratory. Because PSA is produced by the body and can be used to detect disease, it is sometimes called a biological marker or a tumor marker.

The current recommendations for PSA screening is at least twice per year in patients receiving testosterone replacement therapy, **especially in men aged 50 and older** (Urology Times, 2008).

What is the "normal" PSA level?

A PSA value of >4 ug/L has often been defined in the literature as abnormal and is frequently used as a cut-off point by some jurisdictions including Ontario and

- The pituitary gland near the brain makes too much of the hormone ACTH (called Cushing's disease) because of excess growth of the pituitary gland, or a tumor in the pituitary gland or elsewhere in the body (such as the pancreas, lung, and thyroid)
- Tumor of the adrenal gland that is producing too much cortisol
- Tumor elsewhere in the body that produces cortisol

Lower than normal levels may indicate:

- Addison's disease, when the adrenal glands do not produce enough cortisol
- Hypopituitarism, when the pituitary gland does not signal the adrenal gland to produce enough cortisol

- **Insulin Tolerance Test**

Your doctor has requested a special test of your pituitary and adrenal gland function known as an insulin tolerance test (ITT for short).

The aim of the test is to measure the hormone response to the stress of a low blood sugar level.

The medication insulin is used in people with diabetes to control high blood sugar levels. When given to non-diabetic people it

may reduce blood sugar levels to lower than normal. The body recognizes that the sugar level is lower than it should be and responds by increasing the production of a number of hormones which act to increase the sugar level. Two of these are cortisol (produced by the adrenal gland, under control of a hormone called ACTH which is made by the pituitary gland) and growth hormone (made by the pituitary gland).

It has been well established how much cortisol and growth hormone should be made in response to a low blood sugar. Therefore this test will see if your pituitary and adrenal glands are working normally.

How is the test performed?
A fixed dose of insulin will be administered by injection into a vein after having nothing to eat or drink from midnight the previous night. Your blood sugar will soon begin to fall and should reach its lowest point 20 to 40 minutes after the injection. You may feel sweaty, drowsy, shaky, hungry and have trouble concentrating while your blood sugar is low.

These are expected effects. The blood sugar has to fall to less than 2.2 mmol/L for the hormone production to be stimulated. The symptoms are usually short lived and people start to feel better about an hour after the insulin, as the blood sugar starts to rise again.

Blood samples for glucose (sugar) and the hormones are taken every 15 minutes for the first hour and every 30 minutes for the second hour. You will be fed prior to leaving the Endocrine Test Center.

After the test:
It is a good idea to have an extra something to eat later in the day after completion of the test. There are groups of patients who should not have an ITT - people with epilepsy, people who have had strokes and people with known heart disease (heart attacks, angina, irregular heart rhythms). If you have any of these, please inform your doctor and/or the endocrine test nurses.

- **Other blood tests:** Blood can be drawn to detect other types of hormone deficiencies including growth hormone (IGF-1), estradiol or testosterone, thyroid (TSH and FT4), and prolactin.

Special monitoring tests: Testosterone replacement therapy

- **PSA lab test** (Prostate Specific Antigen test)