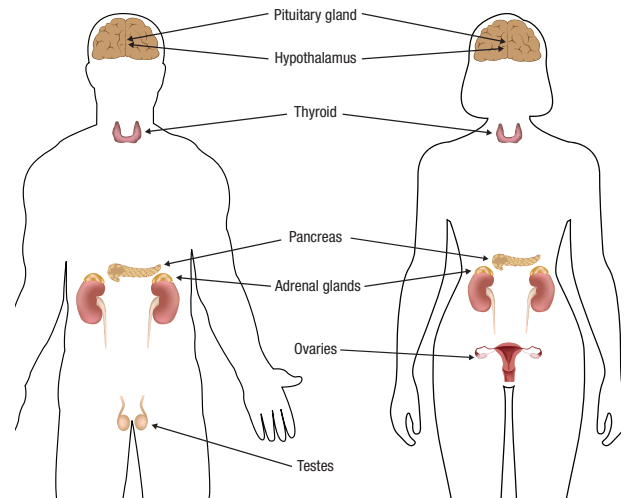


Hypopituitarism after Cancer Treatment

Some people who were treated for cancer during childhood may develop endocrine (hormone) problems as a result of changes in the function of a complex system of glands known as the endocrine system.

What is the endocrine system?

The endocrine system is a group of glands that regulate many body functions including growth, puberty, energy level, urine production, and stress response. Glands of the endocrine system include the pituitary, hypothalamus, thyroid, pancreas, adrenals, ovaries, and testes. The hypothalamus and pituitary are sometimes called the “master glands” because they control many of the other glands in the endocrine system. Unfortunately, some treatments given for childhood cancer can damage the endocrine system, resulting in a variety of problems.



What are hormones?

Hormones are chemical messengers that carry information from the endocrine glands through the bloodstream to the body's cells. The endocrine system makes many hormones (such as growth hormone, sex hormones, adrenal and thyroid hormones) that work together to maintain specific bodily functions.

What is hypopituitarism?

Hypopituitarism is the decrease or lack of one or more of the pituitary hormones. The lack of three or more of the pituitary hormones is referred to as panhypopituitarism.

Pituitary hormones include:

- **Growth hormone (GH)**—stimulates the growth of bone and other body tissues, and also affects how the body uses fat, makes muscle, strengthens bones, and generally influences overall health throughout life
- **Adrenocorticotropic hormone (ACTH)**—stimulates the adrenal gland to produce cortisol
- **Thyroid stimulating hormone (TSH)**—stimulates the thyroid gland to produce thyroid hormones
- **Reproductive hormones (gonadotropins)**, including **luteinizing hormone (LH)** and **follicle stimulating hormone (FSH)**—stimulate the testes and ovaries to make sex hormones
- **Antidiuretic hormone (ADH)**—helps to control the balance of water in the body by controlling urine output
- **Prolactin**—controls milk production during breastfeeding

What are risk factors for hypopituitarism?

Risk factors related to childhood cancer treatment include:

- Radiation to the brain, especially in doses of 30 Gy (3000 cGy/rads) or higher
- Surgical removal of the pituitary gland
- Damage to the hypothalamus or pituitary gland, which can occur during brain surgery, or can be caused by a tumor in or near the pituitary or hypothalamus
- Infections

- Severe head trauma
- Lack of development of the pituitary from birth

What are the symptoms of hypopituitarism?

The symptoms depend on the specific hormones that are lacking. One or more of the following hormones may be affected:

- **Growth hormone (GH) deficiency** - GH affects the growth of body tissues and bone as well as fat, muscle, and sugar metabolism. For more information about growth hormone problems, see the related Health Link: [Growth Hormone Deficiency after Cancer Treatment](#)
- **Adrenocorticotropic hormone (ACTH) deficiency** - The adrenal glands (located on top of the kidneys) are stimulated by ACTH to produce cortisol. If the pituitary gland doesn't make enough ACTH, then cortisol will not be made. Cortisol helps keep the body's blood sugar at a normal level and helps the body deal with physical stress, such as fever or injury. For more information about ACTH deficiency, see the related Health Link: [Central Adrenal Insufficiency after Cancer Treatment](#)
- **Thyroid Stimulating Hormone (TSH) deficiency** - TSH stimulates the thyroid gland to release thyroxine, which is important for brain development, growth, and metabolism. People with too little thyroxine may develop the following symptoms: tiredness, sleeping too much, weight gain, slow growth, poor appetite, cold intolerance, dry skin, constipation, or hair that is dry, coarse, and thin. For more information about thyroid problems, see the related Health Link: [Thyroid Disease after Cancer Treatment](#)
- **Gonadotropin (FSH, LH) deficiency** - LH and FSH control the production of sex hormones. LH and FSH stimulate the testicles to make testosterone, and the ovaries to make estrogen and progesterone, resulting in development of sexual characteristics during puberty. If the body doesn't have enough LH and FSH during puberty, there can be problems with pubertal development. For more information, see the related Health Links: [Testicular and Reproductive Health after Cancer Treatment](#) and [Ovarian and Reproductive Health after Cancer Treatment](#)
- **Antidiuretic Hormone (ADH) deficiency** - ADH (also known as "vasopressin") is a hormone produced in the hypothalamus and stored in the pituitary gland. When the amount of water in the body is low, the pituitary gland releases ADH, sending a message to the kidneys to conserve water. This slows down the production of urine. When there is not enough ADH, too much urine will be produced, resulting in a condition known as diabetes insipidus. Symptoms of **diabetes insipidus** include excessive thirst and frequent urination.

What screening is recommended?

All cancer survivors should have a yearly comprehensive health check-up including measurement of height and weight, assessment of their progression through puberty, and assessment of overall well-being. If hypopituitarism is suspected, your healthcare provider should refer you to an endocrinologist (hormone specialist) for further evaluation and treatment.

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Additional health information for childhood cancer survivors is available at
www.survivorshipguidelines.org

Note: Throughout this *Health Links* series, the term “childhood cancer” is used to designate pediatric cancers that may occur during childhood, adolescence, or young adulthood. Health Links are designed to provide health information for survivors of pediatric cancer, regardless of whether the cancer occurred during childhood, adolescence, or young adulthood.

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