

Endocrine Problems after Childhood Cancer: Hypopituitarism

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, adrenals, pancreas, ovaries (in females), and testes (in males). 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 in women who are breastfeeding

WHAT CAUSES HYPOPITUITARISM?

Risk factors related to childhood cancer treatment include:

- Radiation to the brain, especially in doses of 40 Gy (4000 cGy/rads) or higher
- Surgical removal of the pituitary gland

Other risk factors for pituitary problems include infections, severe head trauma, or the 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:

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.*

Growth hormone (GH) deficiency:

Growth hormone 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.*

Gonadotropin (FSH, LH) deficiency:

LH and FSH control the production of male and female hormones. In males LH and FSH stimulate the testicles to make testosterone, and in females LH and FSH stimulate 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 about male and female hormonal issues, *see the related Health Links: Male Health Issues after Childhood Cancer Treatment and Female Health Issues after Childhood Cancer Treatment.*

Thyroid Stimulating Hormone (TSH) deficiency:

TSH stimulates the thyroid gland to release thyroxin, which is important for brain development, growth, and metabolism. People with too little thyroxin

may develop the following symptoms: tiredness, sleeping too much, weight gain, slow growth, poor appetite, cold intolerance, dry skin, constipation, or coarse, dry thin hair.

WHAT SCREENING IS RECOMMENDED?

All cancer survivors should have a yearly physical examination including measurement of height and weight, assessment of their progression through puberty, and assessment of overall well-being. If a hormone problem, such as hypopituitarism is suspected, further tests may be done and a referral may be made to an endocrinologist (doctor who specializes in hormone problems).

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

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National Childhood Cancer Foundation
Children's Oncology Group