Hormone Therapy: The Basics

What are hormones?

Hormones are chemicals that are made in the endocrine system. The endocrine system is made up of the pancreas, pituitary, thyroid, and adrenal glands.

How do hormones work?

These chemicals move through the body in the bloodstream. They help each organ do its job. Hormones regulate almost every cell in the body. Some examples of hormones are estrogen, testosterone, insulin, thyroid hormone, cortisol, and epinephrine.

How are hormones used to treat cancer?

Some cancers need hormones to grow. Blocking the action of these hormones might stop the cancer from growing. There are a few ways this happens:

- Block the hormones from acting: Cells have "receptors" on their surface that certain hormones connect to and trigger activity inside the cells. By blocking the receptor, the hormone cannot connect to its receptor. If the hormone's normal spot on the cell is already taken, the hormone cannot attach to and activate the cell.
- Prevent the body from making the hormone: This can be done with medication to block the production of the hormone, or with surgery to remove the organ that makes it. For example, removing the ovaries decreases the amount of estrogen being made.
- Remove the hormone receptors on cells or change their shape: The hormone then cannot attach itself to the cell receptor to activate it, making the hormone unable to work.

Hormone therapy may be used as the first treatment or for patients who cannot have surgery or radiation therapy. Your care team will help you choose the best treatment for you.

Hormone therapy that is used to treat certain cancers is not the same as hormone replacement therapy. Hormone replacement therapy, which is not a cancer treatment, is when hormones are given to replace the ones the body no longer makes.

How is hormone therapy given?

Hormone therapy is most often used to treat breast and prostate cancers. Research is being done to see if hormonal therapy could be used to treat other cancer types. Hormone therapy can be given in a few ways:

- Oral medication – Taken by mouth.
- Injection – Given by an injection under the skin (subcutaneous) or in the muscle (intramuscular).
- Surgical intervention – Removal of the ovaries in women, or testicles in men, causes lower levels of hormones being made.

Hormone therapy is a "systemic" therapy, meaning that it travels throughout the body. Surgery and radiation therapy are "local" treatments.

What are the side effects of hormone therapy?

The side effects are caused by the lack of whatever hormone is being blocked or inactivated. For women, these effects are like those you have with menopause, which is when the body makes less estrogen as you get older. Side effects can include: hot flashes, night sweats, weight gain, vaginal dryness, and headache. Other side effects of hormone therapy include: nausea, hair loss or thinning, muscle aches, and joint pain, and, more seriously, blood clots and increased risk of uterine/endometrial cancer.

In men, the side effects can include hot flashes, tiredness, breast tenderness or enlargement, nausea, loss of sex drive, and impotence (not being able to get or sustain an erection).

This decrease in the body's natural hormones can put men and women at higher risk for osteoporosis. Bisphosphonate therapy may be used to treat this side effect. In addition, your healthcare provider may recommend taking steps to decrease the risk or severity of osteoporosis. This may include increasing calcium and vitamin D intake through diet or supplements, participating in weight-bearing exercise, and avoiding tobacco and alcohol use (which increases osteoporosis risk). Learn more about bone health and cancer.

How do I know if hormone therapy is working for me?

This depends on the type of cancer being treated. You may have tests such as:

- CT.
- MRI.
- PET.

These tests will show whether the tumor has shrunk, stayed the same, or grown.

Your care team may be able to follow your tumor with a tumor marker. A tumor marker is either made directly by the tumor, or by the body in response to the tumor, and can be measured with a blood test. If the therapy is working, one would expect the tumor marker level to decrease. In some cases, a decrease in a patient's symptoms may be able to signal if the medications are shrinking the tumor or not. Talk with your healthcare provider about your tumor marker levels.

Classes of Hormone Therapy

Anti-Estrogens

An antiestrogen or estrogen blocker works by blocking estrogen receptors in breast tissue. While estrogen may not cause breast cancer, it is needed for the cancer to grow in some breast cancers. With estrogen blocked, the cancer cells that feed off estrogen may not be able to survive.

Generic Name	Brand Name	Action
Tamoxifen	Nolvadex®	Anti-estrogen
Toremifene	Fareston®	Anti-estrogen
Fulvestrant	Faslodex®	Estrogen receptor antagonist

Side Effects

Every person reacts differently to medications, so it is hard to know what side effects each patient will have. The most common side effects of these medications include hot flashes, night sweats, weight gain, vaginal dryness, and nausea. Blood clots and endometrial cancers are rare but can happen with these medications.

Aromatase Inhibitors

In women who have gone through menopause, estrogen is mainly made by turning androgens (sex hormones produced by the adrenal glands) into estrogens. An enzyme called aromatase makes this happen. Aromatase inhibitors block this conversion, leading to less estrogen in the body.

Generic Name	Brand Name	Action
Anastrozole	Arimidex®	Aromatase inhibitor
Letrozole	Femara®	Aromatase inhibitor
Exemestane	Aromasin®	Aromatase inactivator

Side Effects

Common side effects of these medications are hot flashes, night sweats, headache, nausea, hair thinning, vaginal dryness, muscle aches, and joint pain.

Other Hormone Treatments Used for Breast Cancer

Hormone-sensitive breast cancers can also be treated with other hormone agents.

Generic Name	Brand Name	Action
Fluoxymesterone	Halotestin®	Androgen, works by opposing the activity of estrogen
Megestrol Acetate	Megace®	A form of progesterone, works by interfering with cell growth in ER+ cells.
Leuprolide	Lupron®	LHRH agonist, works by stopping production of leutinizing hormone by the pituitary gland. LH causes the ovaries to make estrogen.

Anti-Androgens

Most prostate cancers need testosterone to grow. Testosterone is an androgen made by the testes and adrenal glands. Testosterone can stop being made by surgically removing the testicles or through medication therapy. Anti-androgens work by blocking testosterone receptors and preventing testosterone from attaching to these receptors found in the prostate cancer cells. Without testosterone, the cancer cells may either grow more slowly or stop growing altogether. You may hear this treatment called androgen deprivation therapy or ADT.

Generic Name	Brand Name	Action
Bicalutamide	Cased®	Anti-androgen
Nilutamide	Nilandron®	Anti-androgen
Flutamide	Eulexin®	Anti-androgen

Side Effects

Every person reacts differently to medications, so it is hard to predict what side effects each patient will have. However, the common side effects for this category of medications include hot flashes, breast tenderness, nausea, loss of sex drive, and impotence.

There is also a second generation of these medications that block the androgen receptors more strongly and are more specific.

Generic Name	Brand Name	Action
Enzalutamide	Xtandi®	Anti-androgen
Apalutamide	Erleada®	Anti-androgen
Darolutamide	Nubeqa®	Anti-androgen

Luteinizing Hormone-Releasing Hormone Agonist (LHRH Agonist)

A hormone called luteinizing hormone, made by the pituitary gland, helps the testicles make testosterone. LHRH agonists stop the pituitary gland from making luteinizing hormone. This lessens the amount of testosterone in men. The cancer cells may then grow more slowly or stop growing. These are sometimes called gonadotropin-releasing hormone blockers (GnRH blockers). You may hear this treatment called androgen deprivation therapy or ADT.

Generic Name	Brand Name	Action
Goserelin	Zoladex®	LHRH agonist
Degarelix	Firmagon®	GnRH antagonist
Leuprolide	Lupron®	LHRH agonist

Side Effects

Common side effects of these medications are tiredness, breast tenderness, nausea, loss of sex drive, and impotence.

If hormone therapy is part of your treatment plan, talk with your care team about which medications or surgeries may be right for you.