Cancer and hormones

http://biochemistry4all.com/Taha/4.htm
What is a hormone?

- Hormones are naturally occurring substances that are produced in specific parts of our bodies and act as chemical messengers. They travel through the blood to control the functions of other tissues and organs.

- Some of the best known hormones are estrogen and testosterone. These are known as ‘sex hormones’ and perform a variety of functions all around our bodies.
Hormones affect growth and differentiation

Hormonal imbalance influence the incidence, location and rate of cancer growth

Hormonal imbalance may be produced by injecting hormones, explanting or destroying the endocrine gland or administering hormonal antagonists
So-called “DES daughters,” born to mothers who used the anti-miscarriage drug diethylstilbestrol during pregnancy, are at a substantially greater risk of developing breast cancer compared to women who were not exposed to the drug in utero.
DECREASE IN DAYLIGHT

Pineal gland

Hypothalamus

Melatonin

Pituitary Gland

Gonadotropin Releasing Hormone (GnRH)

Follicle Stimulating Hormone (FSH)

Luteinizing Hormone (LH)

TESTOSTERONE

supresses

ANTER HARDENING

ANTLER SHEDDING

Prolactin

Growth Hormone

Liver

INSULIN-LIKE GROWTH FACTOR (IGF)

ANTER GROWTH
How do hormones affect our risk of cancer?
What affects our hormone levels?

- Reproductive factors
- Lifestyle changes
- External sources
- Drugs that lower hormone levels
Reproductive factors

These ‘reproductive factors’ are linked to risks of hormone-related cancers, such as breast and womb cancer. They include:
• being pregnant
• having children
• the age at which a woman has her first child
• whether she breastfeeds
• the age at which she starts menstruating
• the age at which she goes through menopause
Lifestyle changes
Lifestyle changes

• Reproductive factors are very difficult to control. But this doesn’t mean that there is nothing you can do to prevent hormone-related cancers

• Maintaining a healthy bodyweight can help to keep hormone levels under control

• This is especially important in women after the menopause, whose ovaries have stopped making hormones

• When this happens, fat cells become the main hormone source.
• People who are overweight or obese have much higher levels of hormones such as estrogen, insulin and IGFs

• This may explain why they have higher risks of breast, bowel and womb cancers

• There is also some evidence that drinking too much alcohol and not getting enough physical activity could increase a woman’s levels of estrogen

• This may be why these things also increase the risk of breast cancer.
External sources
External sources

• The body makes its own hormones but external sources can also raise or lower your hormone levels

• These include:

• Hormone replacement therapy (HRT)

• The contraceptive Pill

• Environmental chemicals that mimic hormones
Drugs that lower hormone levels
Drugs that lower hormone levels

• Estrogen and testosterone can fuel the growth of breast and prostate cancer cells respectively

• So scientists have designed drugs to fight these cancers by lowering the levels of these hormones or blocking their action

• One of these drugs, tamoxifen, has greatly improved survival rates for breast cancer

• It works by blocking estrogen from interacting with a partner protein, just like a piece of gum can stop a key from fitting in a lock.
Estrogen

• Women with the highest levels of estrogen and related hormones have over twice the average risk of breast cancer and womb cancer

• They may also have higher risks of ovarian cancer
Breast Cancer:

- In female
- Castration of the animal before puberty
- Implantation of ovaries in castrated animals
- Injection of estrogen
- All endocrine imbalances that stimulate estrogen secretion

- Menopause and the development of breast cancer seem to be related
- Nursing and cancer?
- Forced drying of the breast after pregnancy?
- Estrogen administration after menopause?
- Virgins and nulliparae vs mother of many children
- Pregnant woman vs general female population of same age
Testosterone

• At the moment, it isn’t clear if high levels of testosterone in men increases the risk of prostate cancer

• But we do know that prostate cancer cells depend on testosterone in order to grow
Tumors of the Prostate:

- Common in man, rare in animal
- Two types: benign hypertrophy (disease of old age) and cancer of the prostate (testosterone)

Tumor of the Testicles:

- Observed in dogs, horses and mice
- Produced by administration of estrogen
- Develop in man between the age of 20-50
- Associated with excessive hormone production

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Insulin

- Insulin is most famous for controlling our bodies’ sugar levels, but it has many other functions.

- High levels of insulin have been linked to cancers of the bowel, womb, pancreas and kidneys.

- Insulin also affects the levels of another group of similar hormones called insulin-like growth factors or IGFs.

- High levels of IGF-1 could increase the risk of prostate, breast and bowel cancers.

- Many scientists are studying the links between insulin, IGFs and cancer but at the moment, they are still unclear.
Cancer of the body of uterus:

- Difficult to produce experimentally
- Estrogen administration
- Adenocarcinoma

Other Uterine Tumors:

- Leiomyoma, uterine polyps

Ovarian tumors:

- Produced experimentally through
- Administration of X-irradiation and implantation of organ in the spleen
Carcinoma of the Cervix:

- Estrogen in animal vs environmental factors in human
- Common among poor and prostitutes
- Rare among Jewish women and virgins (nuns)
- Frequency of coitus
  Cause repeated tumor injury to facilitate the introduction of carcinogenic substances into the uterus
- Role of pregnancy?
- Repeated pregnancies vs socioeconomic environment