Environmental Factors and Breast and Prostatic Cancer

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Abstract

Despite epidemiological evidence supporting a causal relationship between environmental factors and the development of breast and prostatic cancers, direct confirmation is unproven.

Differences in hormone profiles in cancer patients and in patients with an increasing number of potential risk factors together with differences in life style and diet, suggest a relationship between diet, hormonal metabolism, and these endocrine-associated cancers.

Modification of hormonal status by diet in men and women at different risk suggests that specific dietary components play a major role in these diseases.

During the last century, dietary patterns have changed in Western society and in Japan, with a marked increase in fat consumption. Concomitantly, the incidence of prostatic cancer and breast cancer have increased, with a greater increase in Japanese men and women (24).

Many studies of these endocrine-related diseases have reported hormonal change in patients. However, epidemiological evidence, which supports a causal relationship between environmental factors, such as diet, and hormonal status with the development of these diseases, requires experimental confirmation.

Increased risk of breast and prostatic cancers in migrants in high-risk areas (10) and lower incidence rates in men and women maintaining vegetarian diets (15) indicate that a Western diet and life style are associated with increased risk.

Comparison of food composition and the distribution of breast and prostatic cancers in Asian and Western societies and, more specifically, of food patterns within geographical areas (3, 20) supports an association between dietary factors and death rates from these diseases. However, if diet can increase the risk, it is necessary to show that diet alters hormonal status or, in conjunction with known risk factors, produces hormone profiles similar to those found in patients with breast and prostatic cancers.

With regard to the modification of hormone metabolism, dietary factors can alter hormone metabolism via change in neurotransmitters, biogenic amines, and the hypothalamic-pituitary axis, although few examples of a direct effect have been reported.

Breast Cancer

In a comparison of Caucasian women with one or more risk factors for breast cancer, Wang et al. (23) and Bulbrook et al. (4) reported lower levels of plasma dehydroepiandrosterone, dehydroepiandrosterone sulfate, androstenediol, and progesterone in patients with increasing risk. Likewise, different plasma PRL levels and abnormalities in PRL release occur in women with different risk factors (22).

Wang et al. (23) reported similar levels of plasma estrogens in Caucasian women who were matched for parity, age of menarche, age of first birth, and familial history. However, altered estrogen metabolism occurs in nulliparous women (5) and in postmenopausal women (9) with one or several risk factors, while different levels of estradiol in age-matched women who had a late first pregnancy have been reported (12).

Thus, comparison of the hormonal status in women with different risk factors and from high- and low-risk populations supports the conclusion that estrogen and androgen profiles (11, 14) differ among these women.

Diet modification on hormone profiles in white women and black South African women indicate that rural black South African women have higher plasma estradiol and lower testosterone, androstenedione, dehydroepiandrosterone, and PRL levels than those of white women (14). When women were fed a vegetarian diet, plasma PRL and the nocturnal release of PRL were reduced (Chart 1). This has been confirmed by Armstrong (2). On the other hand, plasma testosterone and PRL increased, and estradiol decreased in black South African women fed a Western diet (14).

In view of the higher fertility and lower risk for breast cancer in black South African women, it is of interest that the hormone changes in these women are concordant with hormone changes found in women with anovulatory cycles. Bulbrook et al. (4) and Kodama et al. (16) have suggested an association between anovulatory cycles and the risk of breast cancer.

Elevation of plasma PRL and testosterone in black South African women fed a Western diet is of physiological significance, because the slight elevation of PRL levels is associated with anovulation and infertility (7) and with breast cancer (19).

Chart 1. Effect of a vegetarian diet on the nocturnal release of prolactin in 4 white North American men and 4 white North American women. Significantly lower release of prolactin in the vegetarian versus the customary Western diet determined by area under curve.

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2 The abbreviation used is: PRL, prolactin.

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while elevated plasma testosterone levels are associated with infertility and with anovulation in women (8), girls (1), and breast cancer patients (16, 18). Furthermore, lower levels of estradiol are also associated with infertility (6).

While anovulatory and shortened menstrual cycles occur at all ages, it is important to note that the above changes can take place without noticeable change in the length of the menstrual cycle (17). To date, only urinary etiocholanolone levels have been correlated with anovulation and have been used as a discriminant for breast cancer (4). However, despite many comparable changes in hormonal status in women with anovulatory cycles and premenopausal women with breast cancer, the association is unproven.

**Prostatic Cancer**

Epidemiological studies of prostatic cancer have failed to find any association between socioeconomic and sexual habits and incidence of this disease, yet the marked increase in incidence on migration from low- to high-risk areas (10) has implicated environmental factors. In the United States, the incidence of prostatic cancer is closely related to the consumption of fat, in the form of meat and dairy products (3).

In patients with these endocrine-associated cancers, no distinct hormonal profile is presently evident (21). Problems involving the source of hormones, changes in steroid metabolism in the prostate, and confounding changes related to prostatic hyperplasia remain to be resolved.

However, with regard to diet and hormone status in healthy men, a Western diet fed to black South African men increased the urinary excretion of estrogens and androgens, while the excretion of estrogens and androgens decreased in black North American men fed a vegetarian diet (13). These data together with the decrease in nocturnal release of PRL (Chart 1) in white North American men fed a vegetarian diet indicate that diet can modify hormonal status.

Whether differences in hormonal status in men activate latent lesions of the prostate and thus explain the higher death rate of prostatic cancer in Western societies remains unclear.

Further study of specific dietary components and the effect of diets in healthy women, women with breast cancer, and men with prostatic cancer is required.

**References**

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