

## Blood hormone levels can predict long-term breast cancer risk

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Blood hormone tests can predict a woman's risk for developing postmenopausal breast cancer for up to 20 years, according to a study led by Xuehong Zhang, MD, Channing Division of Network Medicine, Brigham and Women's Hospital (BWH) Department of Medicine.

The findings will be presented at the 11th Annual American Association for Cancer Research (AACR) International Conference on Frontiers in [Cancer Prevention Research](#).

Using data from the Nurses' Health Study, Zhang , Susan Hankinson, ScD, Channing Division of Network Medicine, BWH Department of Medicine and colleagues analyzed 796 patients with postmenopausal [breast cancer](#) who had not received hormone therapy.

They conducted blood hormone tests at two time points: between 1989 and 1990 and between 2000 and 2002. Researchers matched each patient with two controls who were not diagnosed with breast cancer.

"We found that a single hormone level was associated with breast cancer risk for at least 16 to 20 years among postmenopausal women not using postmenopausal hormones," said Zhang. "We, and others, are now evaluating if the addition of [hormone levels](#) to current [risk prediction](#) models can substantially improve our ability to identify high-risk women who would benefit from enhanced screening or chemoprevention—if so, the current data suggest that hormone levels would not need to be measured in the clinic more than once every 10, or possibly 20, years."

Women with hormone levels in the highest 25 percent for estradiol, testosterone and DHEAS had a 50 percent to 107 percent greater chance for developing breast cancer compared with women in the lowest 25 percent. Relative risks for developing breast cancer were similar at one to 10 years vs. 11 to 20 years (also 16 to 20 years) after blood collection.

Researchers also investigated whether these higher levels were more closely linked to hormone-receptor positive breast cancers and if they predicted risk regardless of [tumor aggressiveness](#).

In the first case, they found that elevated levels of estradiol increase a woman's risk for hormone receptor-positive breast cancer, specifically estrogen receptor-positive (ER+) and progesterone receptor-positive (PR+) tumors.

In general, increased hormone levels, except for DHEAS, tracked closely with increased risk for receptor-positive breast cancer. Data on receptor-negative cancers were inconclusive and need additional, large studies.

Significantly, elevated hormone levels were also associated with aggressive breast cancer, which the study defined as recurrent or fatal cancer.

"The relationship was comparable or possibly stronger for recurrent and fatal breast cancer than it was for overall [breast cancer risk](#) although these results were based on relative small numbers of participants," said Zhang.

**More information:** B105 Postmenopausal plasma sex hormone levels and subsequent risk of breast cancer over 20 years of follow-up.

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## Abstract

**Background:** Although plasma estrogen and androgen levels are significantly positively associated with risk of postmenopausal breast cancer, it is unknown how long a single blood hormone measure can predict subsequent breast cancer risk as most prior studies have included less than 10 years of follow-up. If including hormone levels into current breast cancer risk prediction models improves discriminative ability, evaluating how the hormone/breast cancer association varies by years since blood collection can help determine the most relevant time period for hormone measures. In addition, whether the associations vary by tumor hormone receptor status is unclear.

**Methods:** We conducted a prospective nested case-control analysis within the Nurses' Health Study cohort. Blood samples were collected in 1989-1990 and then in 2000-2002. Among eligible postmenopausal women not using postmenopausal hormones (PMH) at blood collection, 796 cases were diagnosed through June, 2010. Two control subjects (n=1,583) were matched to cases on age and time of blood collection. We used unconditional logistic regression analyses to estimate the relative risks (RRs, 95% CIs) by controlling for breast cancer risk factors.

**Results:** The intra-class correlation coefficients for the two blood measures collected 10 years apart were 0.69 for estradiol, 0.71 for testosterone, 0.54 for dehydroepiandrosterone sulfate (DHEAS), and 0.74 for sex hormone-binding globulin (SHBG). Overall, women in the top 25% of levels of estradiol, free estradiol, testosterone, free testosterone, and DHEAS (compared to the lowest 25% of levels) were at a 50-107% higher risk of breast cancer (all p-trends $\leq$ 0.15). For example, comparing the highest with lowest (reference) quartile of hormones measured 10 year or less before breast cancer diagnosis, the multivariable RRs (95% CIs) for overall breast cancer were 2.0 (1.4-2.7; p-trend

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