Breast Cancer Risk Assessment Final Test Report

GeneType for Breast Cancer

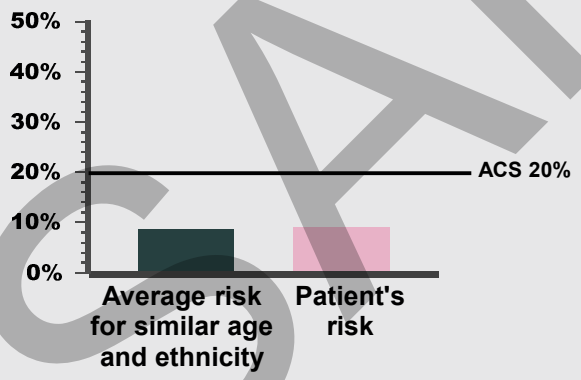
Laboratory Accession Number:	Patient Name:	Ordering Healthcare Provider:
Date of Specimen Collection:	Date of Birth:	
Date of Laboratory Receipt:	Patient MRN:	
Report Issued By:	Patient Address:	
Date of Report:		

SAMPLE

This patient is at AVERAGE risk of breast cancer

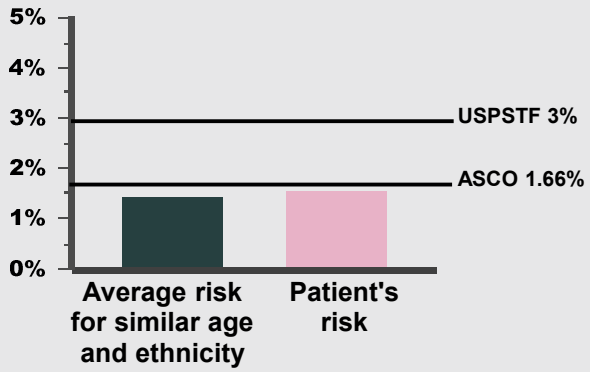
0.95	8.99%	1.51%
Patient's Polygenic Risk Score*	Patient's Lifetime Risk	Patient's 5 Year Risk

Lifetime Risk



<20%	Patient's Lifetime Risk	Average Risk

5 Year Risk



<1.66%	Patient's 5 Year Risk	Average Risk

*The Polygenic Risk Score is a relative risk calculated as the multiplicative product of the patient's risk alleles weighted according to ethnicity-specific allele frequencies and odds ratios.

Report continued on next page

Tested by Phenogen Sciences Laboratories
(ABN 60 050 029 279)
60-66 Hanover Street
Fitzroy, Victoria, 3065, Australia

CLIA Number: 99D2023356
Laboratory Director: Dr. Michael Christie
Accredited for compliance with NPAAC Standards
and ISO 15189 (NATA Accreditation No: 20432)

support@genetype.com
1300 Baxter Street, Suite 157
Charlotte, NC 28204
Tel 704 926 5700

GeneType for Breast Cancer

Patient Name: **Date of Birth:** **Laboratory Accession Number:**

Interpretation

This patient is at **average risk** of developing invasive breast cancer within her remaining lifetime (up to age 85). Her 8.99% is **less than** the 20% threshold recommended by ACS.

This patient is at **average risk** of developing invasive breast cancer within the next 5 years. Her 1.51% is **less than** the 1.66% threshold recommended by ASCO.

The risk scores are patient-specific and cannot be used to estimate risk in relatives. Modified screening and risk reduction recommendations exist for patients above 20% and 1.66%, respectively. The USPSTF uses a 5-year threshold of 3.0% to recommend risk reduction. These results should be interpreted by a healthcare provider in the context of the patient's full clinical history particularly for patients close to a threshold risk value and where any SNPs are undetermined.

Clinical Responses

Does the patient have a medical history of any breast cancer or ductal carcinoma in situ (DCIS) or lobular carcinoma in situ (LCIS)?	No
Does the patient have a mutation in either the *BRCA1* or *BRCA2* gene, or a diagnosis of a genetic syndrome that may be associated with elevated risk of breast cancer?	No
What is the patient's age?	47
What is the patient's race/ethnicity?	Caucasian
How many first-degree relatives have had breast cancer? (mother, sister, daughter)	0
What was the age of the youngest first-degree relative when they were diagnosed with breast cancer?	NA
How many second-degree relatives have had breast cancer? (aunts, nieces, grandparents, grandchildren, half-siblings, and double cousins)	0
What is the patient's height?	5 feet 9 inches
What is the patient's weight?	150 pounds
What is the patient's menopausal status?	Pre-Menopausal
Has the patient ever had a breast mammogram?	Yes
What was the patient's reported mammographic breast density?	52

About the Test

GeneType for Breast Cancer combines the major determinants of breast cancer risk into a single risk assessment test. Polygenic Risk Scores based on single-nucleotide polymorphisms (SNPs), mammographic density, age, family history of breast cancer, body mass index and menopausal status are combined with incidence and mortality data for breast cancer derived from the Surveillance, Epidemiology, and End Results Program (SEER), in a proprietary algorithm to provide an absolute estimate of the 5 year and remaining lifetime risk of developing breast cancer.

SAMPLE

Report continued on next page

Tested by Phenogen Sciences Laboratories
(ABN 60 050 029 279)
60-66 Hanover Street
Fitzroy, Victoria, 3065, Australia

CLIA Number: 99D2023356
Laboratory Director: Dr. Michael Christie
Accredited for compliance with NPAAC Standards
and ISO 15189 (NATA Accreditation No: 20432)

support@genetype.com
1300 Baxter Street, Suite 157
Charlotte, NC 28204
Tel 704 926 5700

GeneType for Breast Cancer

Patient Name: **Date of Birth:** **Laboratory Accession Number:**

Indication: GeneType for Breast Cancer is a breast cancer risk assessment test for women age 35 or older who lack hereditary status. The test is intended to better inform decision-making for breast cancer screening and preventative care.

Validation: GeneType for Breast Cancer is currently validated in women 35 years or older of Caucasian descent and relies on the patient correctly reporting their ethnicity. The risk model incorporates ethnicity-specific polygenic risk scores and population incidence data for patients of African American and Hispanic American descent derived from the Surveillance, Epidemiology, and End Results Program (SEER), however, the model has not been validated in these populations as yet.

Limitations: GeneType for Breast Cancer is a breast cancer risk prediction test only. An increased risk score does not mean that a patient will definitely develop breast cancer. A low risk score does not mean that a patient will definitely not develop breast cancer.

GeneType for Breast Cancer provides an estimate as to the likelihood that a woman will develop disease at some stage in the future. Cancer is a multifactorial disease and it is not possible to incorporate all potential risk factors into a risk prediction model.

Test results should be interpreted by a healthcare provider in the context of the patient's full clinical history. Medical management and decision-making for breast cancer screening and prevention practices should not rely solely on a patient's GeneType for Breast Cancer results.

Measurement of Uncertainty: Estimated potential variation in the polygenic risk score for varying numbers of undetermined SNPs are as follows: 1 = ± 3.92%, 2 = ± 5.77%, 3 = ± 7.16%, 4 = ± 8.33%. For patients that are very close to a clinical risk threshold, such variation may move the patient just above or just below that threshold, however the magnitude of the change is small and their overall risk remains as "close to threshold". Genotypes which are undetermined are assigned a risk score of 1.00.

Test Methodology: GeneType for Breast Cancer uses PCR arrays to determine the genotype of polymorphic breast cancer susceptibility loci; 77 loci for Caucasian women, 74 for African American women and 71 for Hispanic women. Genomic DNA is extracted from buccal swab samples using standard DNA extraction methods. SNPs are genotyped using Taqman® chemistry on a customized OpenArray™ system using a QuantStudio™ 12K Flex Real Time PCR platform. This test was developed and its performance characteristics determined by Genetic Technologies' Phenogen Sciences Laboratories. This test has not been cleared or approved by the United States Food and Drug Administration (FDA). The FDA does not require this test to go through pre-market FDA review. This test is used for clinical purposes. It should not be regarded as investigational or for research.

References and Resources

Mavaddat N, Pharoah PD, Michailidou K, et al. Prediction of breast cancer risk based on profiling with common genetic variants. J Natl Cancer Inst 2015;107(5):djv036

Dite GS, et al. Breast Cancer Risk Prediction Using Clinical Models and 77 Independent Risk-Associated SNPs for Women Aged Under 50 Years: Australian Breast Cancer Family Registry. Cancer Epidemiol Biomarkers Prev. 2016 Feb;25(2):359-65

Allman, R et al. SNPs and breast cancer risk prediction for African American and Hispanic women. Breast Cancer Res Treat. 2015 Dec;154(3):583-9

Monticciolo DL, Newell MS, Hendrick RE, et al. Breast cancer screening for average risk women: recommendations from the ACR commission on breast imaging. J Am Coll Radiol 2017; 14:1137-1143

Mainiero MB, Lourenco A, Mahoney MC, et al. ACR Appropriateness Criteria breast cancer screening. J Am Coll Radiol 2016; 13:R45-R49

Smith RA, Saslow D, Sawyer KA, et al. American Cancer Society guidelines for breast cancer screening: update 2003. CA Cancer J Clin 2003; 53:141-169 Oeffinger KC, Fontham ET, Etzioni R, et al. Breast cancer screening for women at average risk 2015 guideline update from the American Cancer Society. JAMA 2015; 314:1599-1614

American Cancer Society website. American Cancer Society recommendations for the early detection of breast cancer. www.cancer.org. Last Revised, October, 2017. Accessed February 11, 2019

Visvanathan K, Hurley P, Bantug E, et al. Use of Pharmacologic Interventions for Breast Cancer Risk Reduction: American Society of Clinical Oncology Clinical Practice Guideline. J Clin Oncol 2013; 31:2942-2962

NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®); Breast Cancer Screening and Diagnosis. Version 3.2018 - October 2018.

NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®); Breast Cancer Risk Reduction. Version 1.2019 - December 2018

Moyer VA. Medications to decrease the risk for breast cancer in women: recommendations from the U.S. Preventive Services Task Force recommendation statement. Ann Intern Med. 2013;159(10):698-708.

Nelson HD, Tyne K, Naik A, Bougatsos C, Chan BK, Humphrey L. Screening for breast cancer: systematic evidence review update for the U. S. Preventive Services Task Force. Ann Intern Med 2009; 151:727-737

For a full list of references supporting the GeneType for Breast Cancer risk assessment test, please visit www.genetype.com

Report continued on next page

Tested by Phenogen Sciences Laboratories
(ABN 60 050 029 279)
60-66 Hanover Street
Fitzroy, Victoria, 3065, Australia

CLIA Number: 99D2023356
Laboratory Director: Dr. Michael Christie
Accredited for compliance with NPAAC Standards and ISO 15189 (NATA Accreditation No: 20432)

support@genetype.com
1300 Baxter Street, Suite 157
Charlotte, NC 28204
Tel 704 926 5700

SAMPLE

GeneType for Breast Cancer

Patient Name: **Date of Birth:** **Laboratory Accession Number:**

Your Risk

Your risk of developing breast cancer is **AVERAGE** for a woman your age.

Your risk over the ***rest of your life*** is **8.99%.**
The risk for an average woman your age is **8.55%.** Any lifetime risk score less than 20% is considered average risk.

Your risk over the ***next 5 years*** is **1.51%.**
The risk for an average woman your age is **1.41%.** Any 5 year risk score less than 1.66% is considered average risk.

Understanding Breast Cancer Risk Factors

A risk factor is anything that may increase the chance of developing a disease. Some risk factors are strong and significantly increase your personal risk of the disease while others are weaker and only have a small impact on overall risk. Some risk factors can be modified by making changes to your lifestyle, while others are beyond your control.

Age: Increasing age is one of the strongest risk factors for breast cancer. Most breast cancers occur in women over the age of 50 years. It is important to maintain regular health checks as you get older.

Weight: Being overweight has been shown to increase the risk of breast cancer in post-menopausal women. Speak to your healthcare provider about how to maintain a healthy weight and help to reduce your risk.

Genetics: You are born with a set of genetic markers called Single Nucleotide Polymorphisms (SNPs). This test looks at your SNPs to help determine your risk of developing breast cancer.

Family History: If you have relatives who have been diagnosed with breast cancer, this will impact your risk of developing the disease. The more relatives with breast cancer, the more your risk increases. This test incorporates your extended family history of breast cancer into your final risk score.

Breast Density: Breast density often changes with age, hormonal fluctuation and weight. Women with dense breasts are at increased risk of breast cancer.

Estrogen: Estrogen is a female sex hormone that helps regulate a woman's reproductive system. Levels of estrogen fluctuate from adolescence through adulthood as a woman goes through changes such as menarche, childbirth and menopause. It is important to understand your medical history as it relates to estrogen. Estrogen is associated with the development of some types of breast cancer.

Hormone Replacement Therapy: Use of hormone replacement therapy, especially for longer periods, has been associated with a modest increase in risk of breast cancer. However, it is important to note that the benefits of these medicines may outweigh the risks for many women. If you are taking combined hormone replacement therapy, review your needs every six to twelve months with your healthcare provider.

Smoking: Smoking increases your risk of developing breast cancer. Talk to your healthcare provider about strategies to help you quit smoking as part of your preventative breast health plan.

Alcohol: Alcohol consumption has been associated with an increased risk of breast cancer in both pre- and post-menopausal women. In order to reduce your risk of breast cancer, it is best not to drink alcohol or, if you drink, limit consumption to 1 standard drink or less per day.

Physical Activity: Moderate physical activity of between 1.5 to 4 hours per week has been shown to reduce risk for breast cancer. Exercising for longer periods further reduces risk.

What You Can Do

A woman can develop breast cancer at any age, regardless of her level of risk. It's important to know the normal look and feel of your breasts and to perform regular self-examinations. See your healthcare provider if you detect a change in your breasts.

Even though you may not qualify for additional screening based on your GeneType for Breast Cancer results, be sure to keep your regular breast cancer screening appointments.

American healthcare guidelines recommend that all women over the age of 45 in the average risk category get a screening mammogram every year. Screening mammograms offer the most benefit in this age group.

Women aged 40-49 may also choose to start screening for breast cancer but should first consider whether the benefit outweighs the potential harm. While this age group can benefit from screening mammograms, the number of false-positive results and unnecessary biopsies is also higher. A false-positive result is one that indicates you have a particular condition or disease when you do not. Your healthcare provider can help you make an informed decision.

Screening mammograms are not recommended in women under the age of 40, as they are not effective in detecting breast cancer in this group.

Because risk factors can change over time, your healthcare provider should reassess your risk periodically, or when you have noticed a change in a clinical risk factor, such as your family history or menopause.

Maintaining a healthy lifestyle is a simple way to reduce your risk of breast cancer.

Report continued on next page

Tested by Phenogen Sciences Laboratories
(ABN 60 050 029 279)
60-66 Hanover Street
Fitzroy, Victoria, 3065, Australia

CLIA Number: 99D2023356
Laboratory Director: Dr. Michael Christie
Accredited for compliance with NPAAC Standards
and ISO 15189 (NATA Accreditation No: 20432)

support@genetype.com
1300 Baxter Street, Suite 157
Charlotte, NC 28204
Tel 704 926 5700

SAMPLE