

# Biomarker Research in Breast Cancer

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Breast cancer is a heterogeneous disease with vast differences between patients regarding treatment response and prognosis. Therefore, strategies for individualizing care are needed. The rapid developments in biomarker research in breast cancer are making personalized breast cancer therapy a reality. A biomarker is defined as an objectively measured characteristic that can be evaluated as an indicator of normal biologic processes, pathogenic processes, or therapeutic responses. Biomarkers can have prognostic or predictive value. A small group of individual biomarkers has been used in the management of breast cancer, including estrogen receptor, progesterone receptor, and human epidermal growth factor receptor 2. Advances in molecular biology and an increased understanding of tumor cell biology have led to the discovery of a vast array of promising new biomarkers, including cancer stem cells, circulating tumor cells, gene-expression profiles, individual response markers, disease subtypes, predictors of metastasis, and mutation markers. To be adopted into routine practice, these candidate biomarkers will require extensive clinical validation. The improved application of traditional biomarkers and the discovery of additional markers will undoubtedly change the face of breast cancer care.

**P**atients with breast cancer who share similar clinical profiles and receive similar treatments exhibit a variety of responses; the underlying reasons of which are not clear. Biomarkers have the potential to individualize an approach to treating breast cancer that would account for patient-specific characteristics. Oncology nurses should gain insight into biomarkers to better provide educational information and supportive care to patients with breast cancer.

A biomarker is an objectively measured characteristic that can be an indicator of normal biologic and pathogenic processes or therapeutic response (Oldenhuis, Oosting, Gietema, & de Vries, 2008). Biomarkers must have clinically validated independent and relevant prognostic or predictive value. Paired with clinical evidence, biomarkers can be used to identify patients who respond best to a particular therapy and when to administer that therapy in the disease course. Rapid developments in biomarker research related to breast cancer are making personalized therapy a reality. Improved understanding of available biomarkers and the identification of new markers facilitate better matching of treatments to individual patients with breast cancer (Dowsett & Dunbier, 2008).

## At a Glance

- ◆ Information provided by prognostic biomarkers (overall outcomes) and predictive biomarkers (the effect of a particular therapy) allows for better individualization of treatment, possibly resulting in improved clinical outcomes.
- ◆ Although familiar biomarkers continue to undergo additional characterization, tests for newer biomarkers and multigene signatures are in development.
- ◆ Information on breast cancer biomarkers is evolving, so nurses should be prepared to answer patients' questions on this topic and have a predetermined communication plan that encompasses the entire healthcare team when relevant.

After a discussion of traditional and emerging biomarkers for breast cancer and their application to clinical practice, a case study of L.C., a 42-year-old woman whose gene expression profile results helped determine the most appropriate treatment for her disease, will be provided.

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