Deconstructing Breast Cancer Heterogeneity: Clinical Implications for Women With Basal-Like Tumors

Nabila S. Rattani, BSN, RN, and Theresa Swift-Scanlan, PhD, RN

One in eight women in the United States will develop breast cancer in her lifetime, and breast cancer is the second leading cause of cancer death among women (DeSantis, Ma, Bryan, & Jemal, 2013). Breast cancer embodies several clinically distinct diseases that result from the interaction of varied genetic and environmental influences, many of which are not yet well understood. The inherent clinical and molecular heterogeneity of breast cancer poses a challenge for researchers and clinicians. Breast tumors consist of several pathologic subtypes with different clinical presentations and outcomes, and patients show a diverse range of responses to a given treatment (Sorlie, 2004). Because of the aggressive and treatment refractory nature of basal-like breast cancer (BLBC), the goal of the current article is to investigate BLBC in depth, with a particular focus on genetic and environmental risk factors and current clinical targets for this tumor subtype. A brief overview of the five main breast cancer subtypes will also be provided to understand BLBC within the broader context of breast cancer heterogeneity.

Historically, breast tumors were classified via immunohistochemical (IHC) protein staining for estrogen receptor (ER), progesterone receptor (PR), or human epidermal growth factor receptor 2 (HER2), but the advent of gene expression microarrays has made a more comprehensive molecular assessment possible (Litsas, 2013). Major breakthroughs in the understanding of breast cancer heterogeneity have been made by Perou et al. (2000) and Parker et al. (2009) by showing that multiple types of breast tumors exist, each with distinct prognosis and risk indicators defined by differential gene expression (see Table 1). The five main subtypes of breast cancer that reflect distinct gene-expression patterns are luminal A, luminal B, normal-like, HER2-enriched, and basal-like (Yehiely, Moyano, Evans, Nielsen, & Cryns, 2006). More than 95% of all breast cancers arise within the milk ducts of the breast (Tomaskovic-Crook, Thompson, & Thiery, 2009). The origin of the terms luminal and basal refer to the location of either secretory (inner lumen) or basal (outer lumen) epithelial cell types, which have distinct hormone responsiveness and gene expression patterns (Creighton, 2012; Millikan et al., 2008).