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# 916 – Development of biobanks for precision medicine in breast cancer: a platform for molecular and immunological biomarker research

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**Introduction:** Breast cancer exhibits marked biological heterogeneity that challenges conventional therapeutic strategies. Biobanks have emerged as critical infrastructures supporting precision oncology by integrating high-quality biospecimens with multidimensional molecular data, yet their current landscape and clinical impact remain incompletely characterized.

**Objective:** To systematically map the development, structure, and translational applications of breast cancer biobanks in precision medicine.

**Methods:** A scoping review was conducted using PubMed, Embase, Web of Science, and SciELO databases from 2019 to 2024. Eligible studies addressed biobank infrastructure, biospecimen management, and integration with clinical or genomic data. Following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses-Scoping Review (PRISMA-ScR) guidelines, 25 studies underwent qualitative synthesis.

**Results:** Contemporary biobanks have evolved into dynamic, interoperable platforms integrating tumor tissues, liquid biopsies, nucleic acids, and patient-derived organoids. These repositories enable comprehensive molecular profiling through next-generation sequencing, transcriptomics, and proteomics, facilitating biomarker discovery and therapeutic stratification. Integration with longitudinal clinical outcomes enhances predictive modeling for treatment response and resistance mechanisms. Key applications include the identification of actionable mutations, development of companion diagnostics, and validation of novel therapeutic targets. However, critical barriers persist: protocol heterogeneity that compromises data harmonization, limited interoperability across institutions, insufficient sustainable funding, and systematic underrepresentation of non-European populations. Ethical frameworks and regulatory standards remain inconsistent across jurisdictions, hindering international collaboration and data sharing.

**Conclusion:** Biobanks constitute foundational infrastructure for precision breast oncology, bridging discovery science and clinical implementation. Their capacity to integrate multi-omics datasets with functional tumor models positions them as essential drivers of individualized therapy. Realizing their full potential requires urgent prioritization of international standardization initiatives, equitable population representation, sustainable funding mechanisms, and harmonized ethical frameworks. These advances are critical to ensuring that precision medicine benefits reach diverse patient populations globally and translate into measurable improvements in clinical outcomes.

**Ethics:** Approved by the Research Ethics Committee (CAAE 52266121.0.0000.5335).

**Keywords:** biological specimen banks; breast neoplasms; precision medicine; biomarkers.