Intelligencia AI

World Breast Cancer Research Day

As August 18 marks World Breast Cancer Research Day, we studied our data at Intelligencia AI to better understand the current and potential future state of drug development for this disease.

Breast cancer is the most common malignancy among women worldwide. Reported global breast cancer incidence is about 58.5 per 100,000 person-years[1].

Early-stage, non-metastatic breast cancer is considered curable for 70-80% of patients, but advanced, metastatic breast cancer is considered incurable, and can only be treated (survival extension, symptom control)[2].

Breast cancer is a heterogeneous disease with multiple possible molecular subtypes: human epidermal growth factor receptor 2 (HER2)-positive, triple negative (hormone receptor (HR)-negative/HER2-negative), HR-positive/HER2-negative, and HR-positive/HER2-positive[2].

Overall, it has a five-year survival estimate above 95%: 99% for localized breast cancer, 86% for regional breast cancer and 31% for distant metastatic breast cancer[3].

HOW IS BREAST CANCER CURRENTLY TREATED?

Commonly used types of treatment[4]:

- Surgery
- Hormone therapy
- Radiation therapy
- Targeted therapy
- Chemotherapy
- Immunotherapy

In the past five years, the following drugs have received regulatory approval by the FDA: Atezolizumab, Sacituzumab Govitecan, Pembrolizumab, Herceptin Hylecta, Trastuzumab Emtansine, Trastuzumab Deruxtecan, Neratinib, Margetuximab, Phesgo, Ribociclib, Alpelisib, Abemaciclib, Elacestrant, Capivasertib, Tucatinib and Olaparib.

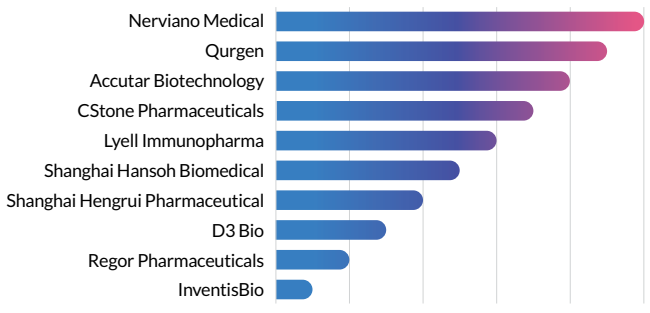
These approved drugs cover three separate modalities: antibody-drug conjugate (ADC), monoclonal antibody (mAb), and small molecule inhibitor (SMI). The ADCs target either HER2 or tumor-associated calcium signal transducer 2 (TROP2). The mAbs target either HER2 or the Programmed Cell Death Protein 1 (PD-1)/Programmed Cell Death Ligand 1 (PDL-1) pathway. The SMIs show more variety in their targets, with almost every single one having a different target than the rest, with the exception of Ribociclib and Abemaciclib, as both target Cyclin-dependent kinases 4 and 6 (CDK4/6).

DETAILS IN THE DATA: HERE'S WHAT WE LEARNED ABOUT BREAST CANCER DRUG DEVELOPMENT

In analyzing our data[5], we identified:

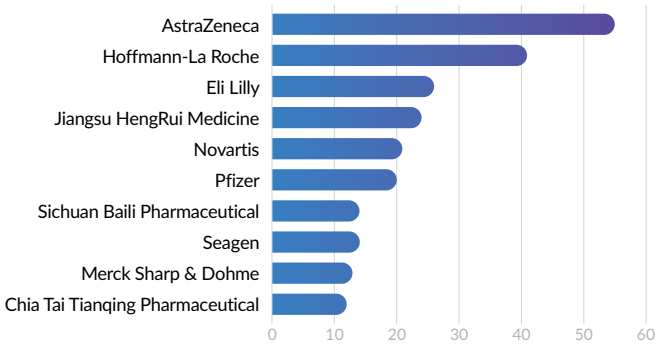
- 743 **ongoing** industry-led, FDA-track interventional clinical development programs* among which:
  - 276 are in Phase 1, or 1b,
  - 334 are in Phase 2, or 1/2 and
  - 133 are in Phase 2/3, or Phase 3.
- The programs noted above are conducted by 246 different primary sponsors, and correspond to 337 investigational drugs/drug combinations, covering 124 different drug modalities/modality combinations.

Top 10 Sponsors in Breast Cancer - Ranked by Intelligencia AI Pipeline Performance Score



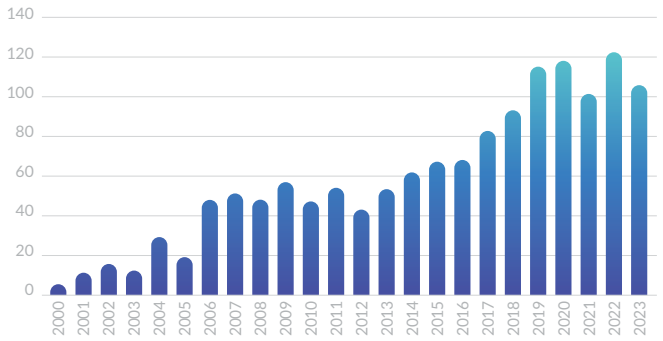
Our pipeline performance score leverages our patented AI-driven probability of technical and regulatory success (PTRS) assessments.

Sponsors With the Highest Number of Active Breast Cancer Clinical Programs



These are the top-ranking sponsors based on the number of ongoing breast cancer clinical programs.*

Distribution of Breast Cancer Clinical Programs by Year of Initiation Since 2000



While between 2006 and 2012, the number of initiated programs was relatively stable, an upward trend can be observed starting around 2013. This coincides with the establishment of immunotherapy as a new standard of care in breast cancer.

- Among industry-led, FDA-track historical programs, 36% transitioned from Phase 1 to Phase 2, and 15% from Phase 2 to Phase 3.
- 52 drugs (run by 45 different sponsors) have not received prior FDA approval in breast cancer, and are being tested in Phase 3 trials.
- The majority of these drugs fall under three different modalities (SMI, mAb, ADC), with SMIs being the most prolific.
- In terms of Mechanism of Action (MoA), all of the mAbs are targeting the PD1/PD-L1 pathway, with the exception of B013, whose mechanism remains undefined.
- All of the ADCs are targeting HER2, with the exception of three assets (Datopotamab Deruxtecan, ESG401, Sacituzumab tirumotecan) which are targeting TROP2.

PERSPECTIVE: WHAT DOES THIS ALL MEAN?

Early, localized breast cancer is considered curable, usually through a combination of surgery and chemotherapy. This is why the majority of breast cancer clinical research is focused on the metastatic stage, where extending survival and controlling symptoms is the extent of current options, and therefore constitutes an unmet need. The same targets that have proven successful in recent years are also the ones that are currently in the latest stages of development (HER2, TROP2, PD1/PD-L1). Despite the existence of approved treatments, there is still space for more development regarding these pathways, but there is also an imperative need for more biomarkers to be identified both for early detection, as well as treatment in advanced stages. It appears that for the foreseeable future, the majority of the industry focus will be pointed in the direction of already established targets and pathways.

About Intelligencia AI

Intelligencia AI™ leads the way in leveraging proprietary data, biomedical expertise and artificial intelligence (AI) with its patented technology to address significant challenges in the pharmaceutical industry. These challenges include lengthy drug development timelines, excessive costs, and unsustainable return on investment (ROI). Its suite of AI-powered solutions delivers actionable insights crucial in mitigating risks and enhancing decision-making associated with drug development by providing an accurate, unbiased assessment of a drug's probability of success. Founded in 2017, Intelligencia AI is headquartered in New York, NY, with offices in Athens, Greece, and employs 110 individuals globally. Visit intelligencia.ai to discover more.

References

1 Lei S, Zheng R, Zhang S, Wang S, Chen R, Sun K, Zeng H, Zhou J, Wei W. Global patterns of breast cancer incidence and mortality: A population-based cancer registry data analysis from 2000 to 2020. Cancer Commun (Lond). 2021 Nov;41(11):1183-1194. doi: 10.1002/cac2.12207. Epub 2021 Aug 16. PMID: 34399040; PMCID: PMC8626596.

2 Harbeck N, Penault-Llorca F, Cortes J, Gnant M, Houssami N, Poortmans P, Ruddy K, Tsang J, Cardoso F. Breast cancer. Nat Rev Dis Primers. 2019 Sep 23;5(1):66. doi: 10.1038/s41572-019-0111-2. PMID: 31548545.

3 https://www.cancer.org/cancer/types/breast-cancer/understanding-a-breast-cancer-diagnosis/breast-cancer-survival-rates.html

4 https://www.cancer.gov/types/breast/patient/breast-treatment-pdq

5 Data as of July 29, 2024

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**A program (also known as clinical pipeline or drug pipeline) is the clinical development of a drug (or a set of drugs in case of combination therapies) by a pharmaceutical company (alone or in collaboration with other partners) for an indication. A program consists of a set of clinical trials with the ultimate goal of approval for marketing. Each program has unique and specific parameters that can potentially justify a separate regulatory approval. Specifically, the definition of a clinical program is one of unique drug(s), drug dosage, mode of administration, adjuvant state, indication, sponsor, disease severity (e.g. stage of disease), line of treatment and biomarker information used as inclusion criteria.*