The Use of Biomarkers in Drug Development

Biomarkers are measurable substances that indicate a specific biologic state in an organism with broad utility in both healthcare and research settings. For example, blood glucose measurements are used to monitor for diabetes, while tumor biomarkers can be used to help researchers diagnose cancer and develop novel therapies to treat it. Biomarkers can be discovered and developed throughout the different stages of the drug development process and can:

- Potentially accelerate product development in certain disease areas
- Monitor the safety of a therapy
- Determine if treatments are having the desired effects
- Predict patients who may respond better to intervention from a safety or efficacy perspective
- Sometimes predict drug efficacy more quickly than conventional clinical endpoints (known as surrogate endpoints)
- Potentially enable cost and time savings in clinical trials

According to the US FDA's Center for Drug Evaluation and Research (CDER), new biomarkers may be integrated into drug development through two pathways: the drug approval process and the biomarker qualification program. Using biomarkers within the context of a specific drug development program is generally the most common pathway to integrate biomarkers into clinical use.

The Role of Biomarkers in Drug Development Lifecycles

Strategic implementation that incorporates biomarker analysis into the various phases of drug development is necessary to capitalize on the valuable information they can provide: from early discovery to late clinical drug development and all the way to post-market surveillance. Done properly, biomarker implementation enables informed decision-making and optimal study design. Particularly, in preclinical stages, pharmacokinetic and pharmacodynamic studies using biomarkers can help expose the drug's mechanism of action, as well as help to inform clinical trial dose selection.

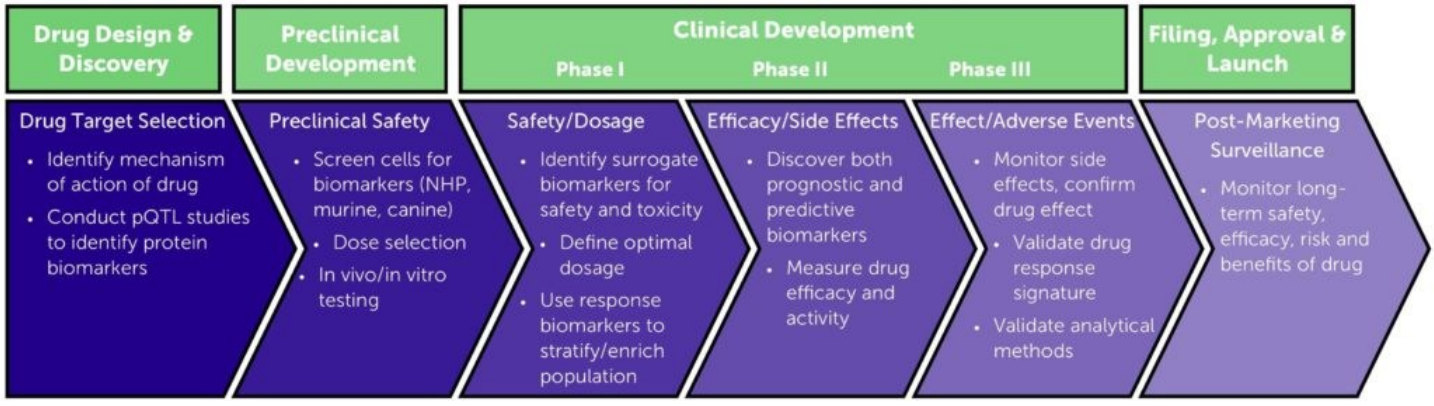

Figure 1. The Role of Biomarkers Throughout the Drug Development Lifecycle

Implementing a Fit-for-Purpose Approach to Analytical & Clinical Biomarker Validation

It is critical that biomarker concentration measurements are accurate and reliable when using biomarkers for regulatory decision-making. Once a biomarker is identified, it needs to undergo both analytical and clinical biomarker validation.

Since biomarkers serve a variety of uses during the drug development lifecycle, a fit-for-purpose approach is crucial. Analytical biomarker validation ensures the performance characteristics of the biomarker assay are fit-for-purpose and meet established criteria for accuracy, precision, specificity, robustness, and other performance criteria, while clinical biomarker validation ensures that the biomarker reflects the therapeutic outcome of interest during clinical research.

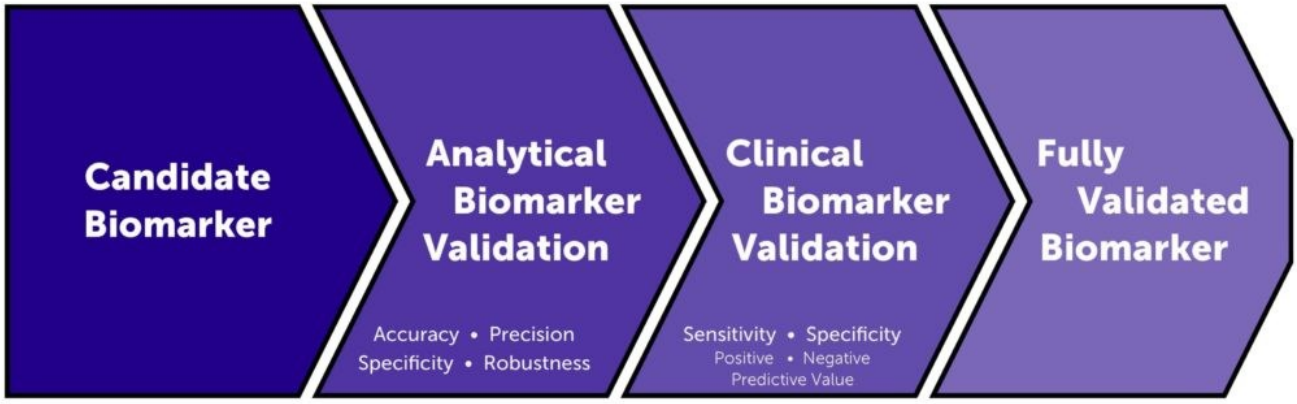

Figure 2. Biomarker Validation Progression Pathway

It is important to note that reliable biomarker analysis and quantitation in biological matrices is influenced by a number of factors, including sample preparation techniques, the removal of matrix interferences, and instrumentation platforms. Once a biomarker has been validated, it can be used to diagnose disease risk, presence, or prognosis, and can also serve as a tool in the establishment of patient treatment plans.

Biomarker Qualification for Drug Development

Biomarker qualification provides evidence that a specific biomarker is linked with a particular biological process and clinical endpoint. CDER's Biomarker Qualification Program (BQP) advances public health by encouraging efficiencies in innovation and drug development by working collaboratively with external stakeholders to develop biomarkers as drug development tools. Specifically, the BQP:

- Provides a framework that is compliant with the 21st Century Cures Act for the review of biomarkers for use in regulatory decision-making
- Qualifies biomarkers for certain uses that address specific drug development needs
- Supports the identification and development of new biomarkers by supporting outreach

The 21st Century Cures Act formally established an updated, multi-stage process for biomarker qualification, which consists of three submission stages: the Letter of Intent, the Qualification Plan, and the Full Qualification Package.

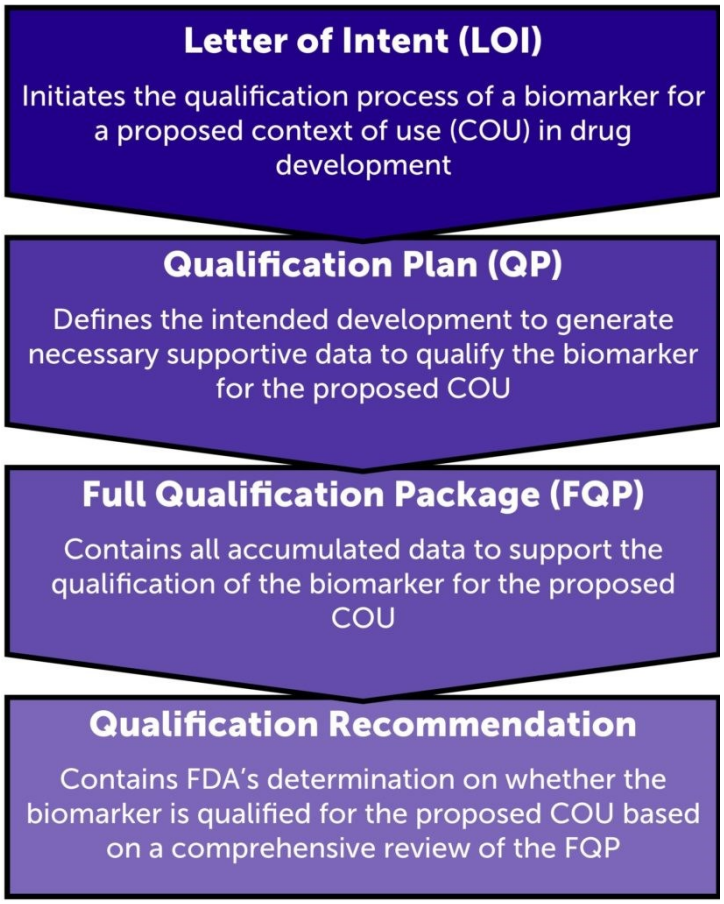

Figure 3. The US FDA's Biomarker Qualification Process for Drug Development

Oftentimes, multiple interested parties will work together in groups or consortiums to develop biomarkers for qualification, which enables resource sharing and lessens the burden on individual collaborators. Additionally, a collaborative approach allows for sharing of best analytical practices, data from different sources, new targets, and candidate compounds, as well as the standardization and pooling of data across trials and sponsors. Qualified biomarkers are posted and public, as transparency provisions are also incorporated into the 21st Century Cures Act.

Bioanalysis Provides a Solid Foundation for Drug Development

Collaborating with a CRO/CDMO with expertise in bioanalysis is often critical towards building a strong foundation for drug development. The concentration of target analytes, including biomarkers, is essential to the clinical implication of data generated throughout the drug development lifecycle. It is not possible to produce reliable and trustworthy clinical data that guides the development of safer and targeted therapies, monitors drug activity, and tracks therapeutic response without robust and reproducible bioanalytical methods. When you partner with Avomeen's experienced, consultative team of bioanalytical experts, a holistic approach to the drug development process can be taken, ensuring adequate data is available to support bioanalytical method validation and biomarker performance. Are you ready to start the conversation about how Avomeen can support your drug development efforts?

Request a quote or talk with an experienced scientist today.

Additional Resources

Learn more about biomarkers and FDA's BEST resource

Biomarkers are a critical tool for therapeutic drug monitoring (TDM) - know more

Why do we love biomarkers so much? Check out our top 3 reasons

Our featured expert is Kevin Gorman, Ph.D., Avomeen's Manager of Bioanalytics. Kevin's extensive knowledge of protein biochemistry and molecular biology enables him to provide clients with expert strategic and tactical guidance to help them reach their goals. Kevin has experience in analytical method development, validation, and optimization of test methods in cGMP settings per ICH guidelines. In addition, Kevin has experience developing in-vitro diagnostics, including a serology assay for COVID-19. He is listed as a co-inventor on three patents, and is highly skilled in several research techniques including LC-MS, HPLC, ddPCR, and ELISA.