Building the Drug Development Puzzle:

Key Analytical Tests and Practices for Success

Key Pieces of the Drug Development Puzzle

pK_a Analysis

The pK_a of a drug is a key physicochemical property to consider in the drug discovery process given its importance in determining a molecule's ionization state at physiological pH, influencing solubility, permeability, and absorption. For example, a non-ionized drug at pH 7.4 can more easily cross cell membranes, enhancing bioavailability.

LogP/D Profiling

LogP (partition coefficient) and LogD (distribution coefficient) quantify lipophilicity, critical for predicting membrane permeability and ADME (absorption, distribution, metabolism, excretion) properties. While LogP is a measure of lipophilicity and is defined as the ability of a compound to differentially dissolve in a mixture of water and lipids/organic solvents, LogD accounts for ionization at specific pH levels, offering a more physiologically relevant metric for drug design.

Solubility Optimization

Poor solubility is a major hurdle in drug development. Strategies like nanoparticle formulation, solid dispersions, and lipid-based carriers enhance solubility and bioavailability. High-throughput solubility screening during discovery helps identify viable candidates early, reducing downstream formulation challenges.

Why These Tests Matter

pK_a Analysis
Guides formulation pH adjustments and salt selection to optimize ionization.

LogP/D Profiling
Informs structural modifications to balance lipophilicity and solubility.

Solubility Optimization
Directs formulation strategies to overcome bioavailability barriers.

Pion's SiriusT3 measures pK_a, log P, log D, and solubility of ionizable drugs and small molecules, requiring only small amounts of sample. SiriusT3 instruments are widely used in laboratories supporting drug discovery, universities, biochemistry studies, and contract research organizations (CROs).

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