Abstract

Milena Nikolovska

Therapeutic drug monitoring (TDM) of tyrosine kinase inhibitors (TKIs) is critical for optimizing cancer treatment and minimizing adverse effects. Due to the low concentrations of TKIs in biological matrices and the presence of interfering compounds, accurate measurement requires sophisticated analytical techniques. This review highlights the importance of TDM in maintaining appropriate plasma concentrations of TKIs, which directly impact therapeutic efficacy and safety. Sample preparation methods, including solid-phase extraction (SPE), liquid-liquid extraction (LLE), and protein precipitation (PPT), are vital for isolating TKIs from biological fluids like plasma, serum, and urine. These methods help to enhance the sensitivity and accuracy of TKI detection. Liquid chromatography (LC), coupled with ultraviolet (UV) detection or mass spectrometry (MS), especially LC-MS/MS, is the preferred analytical approach due to its high sensitivity, selectivity, and ability to detect multiple TKIs simultaneously. While LC-MS/MS is the gold standard for analyzing small-molecule TKIs, its high cost limits its widespread use in clinical settings, where more accessible techniques like HPLC-UV may serve as practical alternatives. This review underscores the importance of robust sample preparation and precise analytical methods in TKI bioanalysis for improving TDM and ensuring successful cancer therapies.