



TRANSFORMING ENDOGENOUS BIOANALYSIS WITH ADVANCED SFC-MS/MS TECHNOLOGY

Accelerating Bioanalytical Performance Through Faster, Greener & High-Throughput Solutions

Type of Project

Bioanalytical Method Development, Transfer & Optimization

Successful development and transfer of a complex endogenous bioanalytical assay from conventional LC-MS/MS to Supercritical Fluid Chromatography coupled with Tandem Mass Spectrometry (SFC-MS/MS) for the simultaneous quantification of **unconjugated estrone and unconjugated estradiol in human plasma**.

Molecule Overview

Unconjugated Estrone and Unconjugated Estradiol

Estradiol & Estrone are endogenous estrogens widely measured in clinical pharmacology & bioanalytical studies. Due to their structural similarity, endogenous presence & ultra-low circulating concentrations, simultaneous quantification requires exceptional chromatographic selectivity & highly sensitive analytical methods.

Analytical Requirements

- Simultaneous quantification of Estradiol and Estrone
- Sensitivity at pg/mL concentration levels
- Excellent chromatographic resolution
- Robust and reproducible analytical performance
- High-throughput workflow suitable for regulated bioanalysis

Situational Analysis

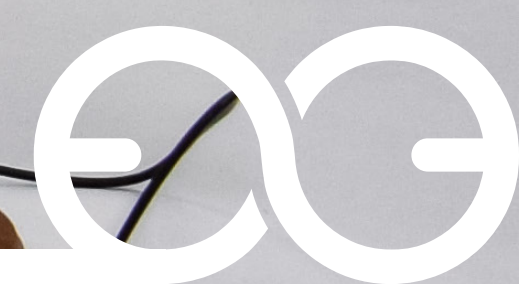
Conventional LC-MS/MS methods for unconjugated estrone and unconjugated estradiol analysis often require longer analytical run times and higher organic solvent consumption, limiting laboratory throughput.

To address these challenges, Veeda implemented advanced SFC-MS/MS technology to optimize analytical performance, improve efficiency, and deliver a greener, high-throughput bioanalytical workflow without compromising sensitivity or robustness.

Veeda's Bioanalytical Expertise

Veeda supported this project through:

- | Bioanalytical Method Development & Validation
- | Method Transfer & Optimization
- | Advanced SFC-MS/MS Method Development
- | Chromatographic Optimization
- | Quantitative Bioanalysis
- | High-Throughput Analytical Support



Highlights of Results Delivered

Achievement	Outcome
Method Transfer	Successfully migrated LC-MS/MS method to SFC-MS/MS
Analytical Runtime	Reduced from 21 minutes to 10 minutes
Laboratory Throughput	>50% increase in analytical efficiency
Analytical Sensitivity	Quantification achieved at 1 pg/mL
Analyte Separation	Simultaneous separation of Estradiol & Estrone
Chromatographic Performance	Improved resolution and peak symmetry
Sustainability	Significant reduction in organic solvent consumption

Major Challenges

- Simultaneous separation of structurally similar endogenous estrogens
- Achieving ultra-low quantification at pg/mL concentrations
- Reducing analytical runtime without compromising sensitivity
- Improving laboratory throughput
- Minimizing solvent consumption through sustainable analytical practices

Veeda's Solution

Veeda's bioanalytical scientists optimized the SFC-MS/MS method by:

- Selecting an optimized chromatographic system for enhanced selectivity
- Utilizing supercritical CO₂ as the primary mobile phase
- Fine-tuning chromatographic conditions for rapid analyte separation
- Improving peak symmetry and chromatographic resolution
- Delivering a faster, greener, and high-performance analytical workflow

Results

Performance Comparison

Achievement	Conventional LC-MS/MS	Veeda SFC-MS/MS
Runtime	21 Minutes	10 Minutes
Analysis Speed	Standard	>50% Faster
Sensitivity	High	1 pg/mL
Estradiol & Estrone Separation	Achievable	Simultaneous & Efficient
Peak Shape	Good	Excellent
Throughput	Standard	High
Sustainability	Conventional	Green Chemistry Platform

Business Impact

By successfully implementing advanced SFC-MS/MS technology, Veeda reduced analytical runtime from 21 to 10 minutes while achieving high sensitivity (1 pg/mL), improved chromatographic performance, and a more sustainable bioanalytical workflow. This capability enhances laboratory throughput and supports faster, high-quality bioanalytical services for global drug development programs.

Scientific Recognition

Veeda's advanced SFC-MS/MS capabilities were showcased by Dr. Chirag Patel, Lead Scientist – Bioanalytical Research, at the SFC/SFE Japan 2026 – Green Chemistry for Sustainability conference, highlighting Veeda's commitment to advancing innovative and sustainable bioanalytical solutions for global drug development.