Objective
To detect and quantify estradiol (E2) in human plasma at the low pg/mL concentration level without sample derivatization using the Agilent 6490 Triple Quadrupole LC/MS System with iFunnel technology.

Background
Estradiol or E2 is the major sex hormone in females that reaches peak concentrations during pregnancy. As a major steroid hormone, it affects many biological pathways and plays an important role in bone health and general gynecological development. Circulating levels of estradiol can range from the low to the high pg/mL, depending on age and clinical status.

Measurement of estradiol is routinely performed by immunoassay; however, these tests often have large variation in the results at low pg/mL levels. Improved analytical performance at the low pg/mL level can be achieved using GC/MS and a derivatized form of estradiol, or by dansylation of estradiol followed by LC/MS. However, many laboratories prefer to avoid sample derivatization in order to simplify sample preparation and minimize analysis times.

This note describes the direct determination of estradiol in human plasma using an Agilent 1290 Infinity LC and an Agilent 6490 Triple Quadrupole LC/MS System with iFunnel technology.

Determination of Estradiol in Human Plasma –
Agilent 6490 Triple Quadrupole LC/MS achieves low pg/mL Detection Limits without Sample Derivatization

Compound
• Estradiol in human plasma

Key Benefits
• The new 6490 Triple Quadrupole LC/MS System with iFunnel technology allows quantification of estradiol at a concentration as low as 1 pg/mL without chemical derivatization
• The LC/MS assay using the 6490 shows excellent linearity and precision for the analysis of estradiol in human plasma samples
• The most sensitive LC/MS method for underivatized estradiol when plasma volumes are limited
The Approach

The extreme sensitivity of the 6490 Triple Quadrupole provides quantifiable detection of estradiol in plasma down to a concentration of 10 pg/mL with just a 10 µL injection. Replicate injections of the 10 pg/mL calibrator showed excellent precision with an RSD of 3.9%. When mL volumes of prepared plasma are available to allow for injection volumes of at least 100 µL, an LOQ of 1 pg/mL estradiol is achievable.

The response was linear over the normal concentration range from 10 to 600 pg/mL of estradiol with a coefficient of determination equal to 0.9983.

Summary

The Agilent 6490 Triple Quadrupole LC/MS System with iFunnel technology allows detection and quantification of estradiol down to concentrations of 1 pg/mL in plasma without the need for chemical derivatization. Assay performance is well within accepted regulatory guidelines and superior to current immunoassay methods for estradiol.

References


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