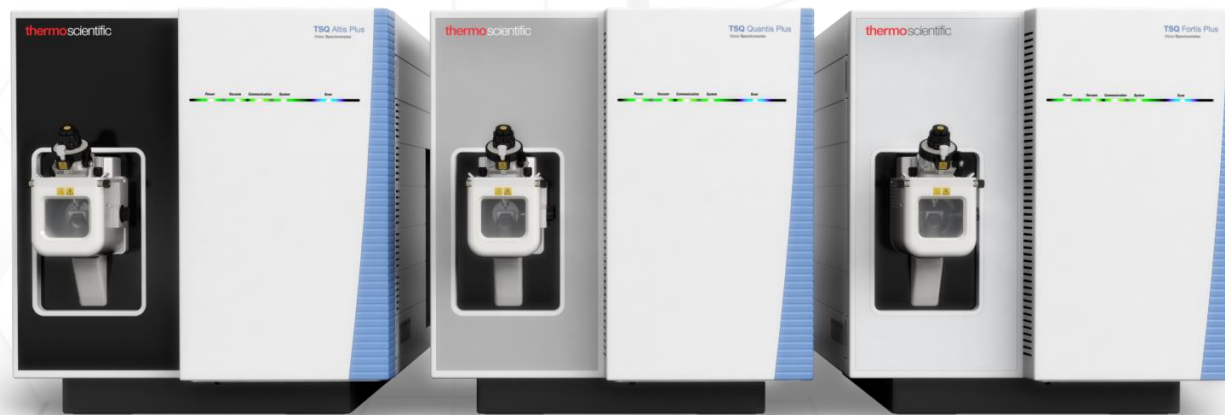


prnqolab

Hmotnostní spektrometrie pro klinické laboratoře

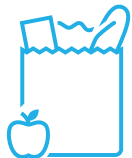
František Zaleš



Kvantitativní analýza je důležitou součástí mnoha oborů



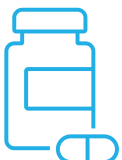
Výzkum



Analýza potravin



Ochrana životního prostředí

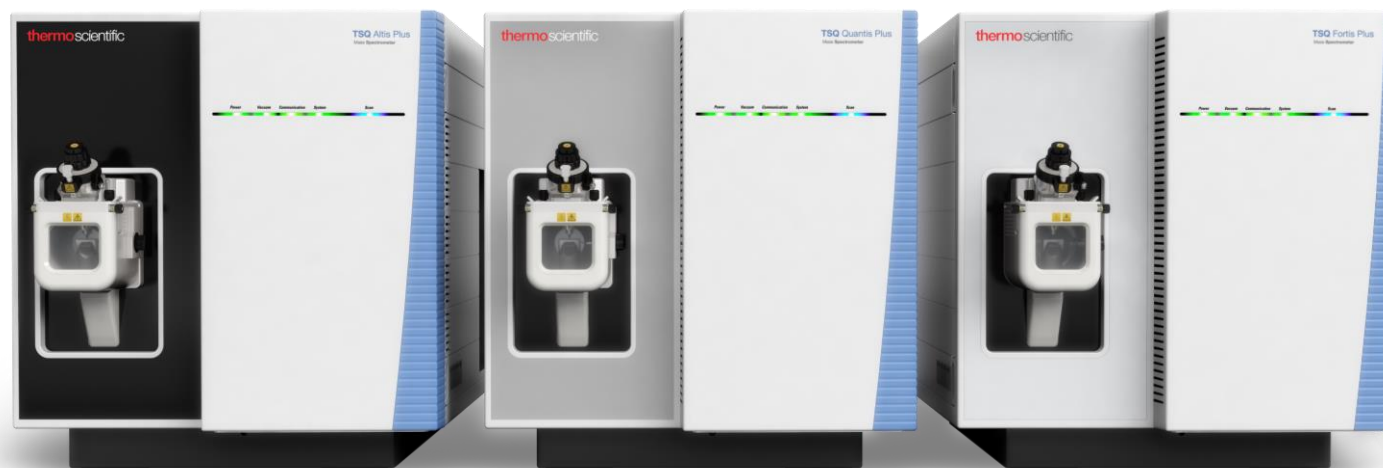


Farmacie a klinická analýza



Hmotnostní Spektrometry ThermoFisher z řady TSQ Plus vám nabídnou maximální výkonost a zlepšenou produktivitu

Hmotnostní Spektrometry řady TSQ Plus



	TSQ Altis Plus	TSQ Quantis Plus	TSQ Fortis Plus
Rozsah hmot	2 – 2010 m/z	2 – 3000 m/z	2 – 3000 m/z
Maximální rozlišení	0,2 FWHM	0,4 FWHM	0,4 FWHM
Citlivost	1 500 000:1	500 000:1	150 000:1
Rychlost skenování	600 SRM/sek	600 SRM/sek	600 SRM/sek
Lineární rozsah	6	>6	>5
Přepínání polarit	5 ms	5 ms	5 ms

Schéma přístroje



Vylepšená electron multiplier detekce
Vylepšená stabilita a přesnost, která vyžaduje méně častou kalibraci a zaručí větší produktivitu

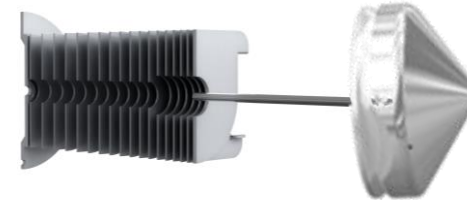


TSQ Fortis Plus
Ion transfer tube

Maximální robustnost a nenáročná údržba

Matrix separator ion guide (MSIG)

Maximalizuje robustnost a minimalizuje ztrátu iontů



TSQ Quantis Plus
Ion transfer tube

Maximální robustnost a nenáročná údržba

Stacked ring ion guide (SRIG)

Efektivní introdukce iontů, která minimalizuje fragmentaci a maximalizuje citlivost



Aktivní Reakční Kolizní Cella II (ARC II)
s DC axiálními poli

Umožňuje lepší přenos iontů s nízkou hmotou

Ion beam guide s blokátorem neutronů

Poskytuje robustní výkon a maximální citlivost díky blokaci neutronů a efektivnímu přenosu iontů

TSQ Altis Plus MS

Optimized high-capacity transfer tube (HCTT)

Maximalizuje introdukci iontů a udržuje robustnost

Electrodynamic ion funnel (EDIF)

Efektivní zachycení a přenos iontů z HCTT do vakua zaručí maximální citlivost

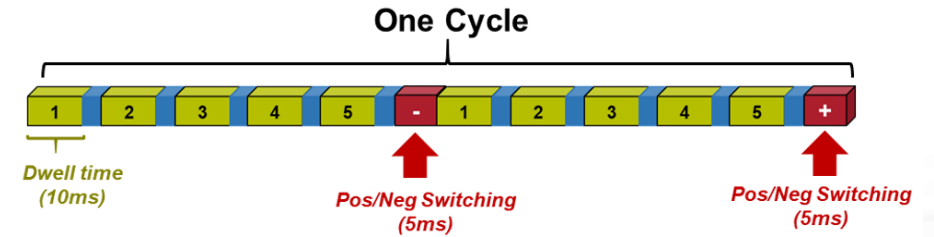


OptaMax NG Iontový Zdroj

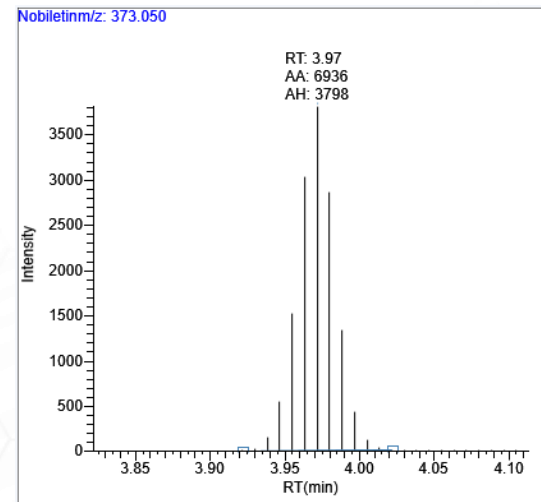
Automatizované připojení plynů a napětí pro maximálně snadné použití

Zvýšená produktivita díky novým vylepšením

- Nový zdroj napětí umožňuje rychlejší přepínání polarit – méně než 5 ms
- Rychlé přepínání polarit je skvělé pro UHPLC a HPIC separaci k maximální produktivitě a také řeší problémy při analýze velkého množství sloučenin
- Nová Aktivní Reakční Kolizní Cella (ARC II) umožňuje ultra rychlý sběr dat a vylepšuje přenos iontů s nízkou hmotou
- QR4 (Fortis, Quantis) a QR5 (Altis) segmentované kvadrupolové filtry hmoty vylepšují přenos a stabilitu iontů a tím zaručí vysokou citlivost a reprodukovatelnost

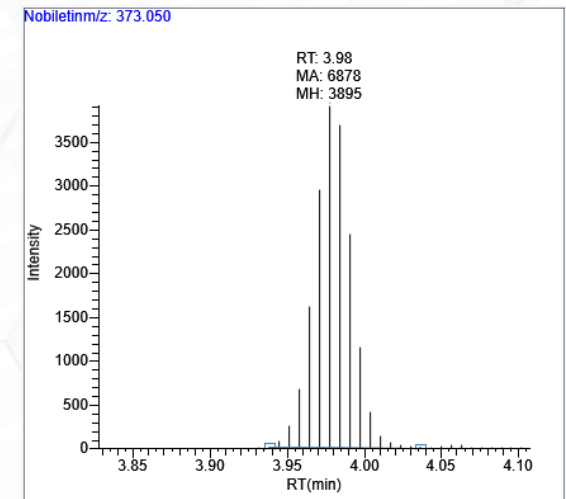


S přepínáním polarit



Nobiletin
Průměrná plocha = 6948
%RSD = 2.0

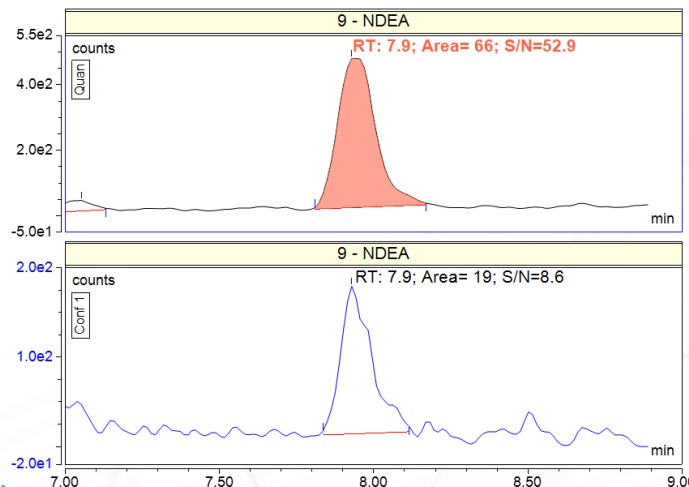
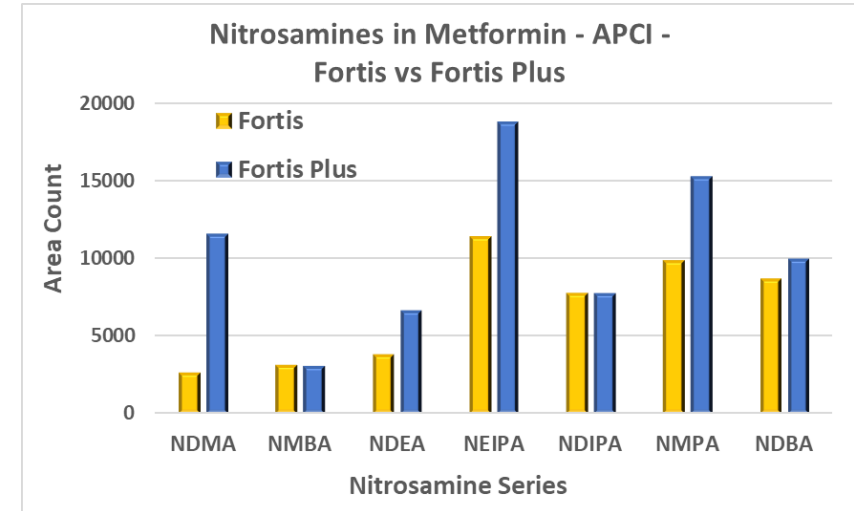
Bez přepínání polarit



Nobiletin
Průměrná plocha = 6858
%RSD = 1.9

Příklad vylepšení u řady Plus – Nitrosaminy v metforminu

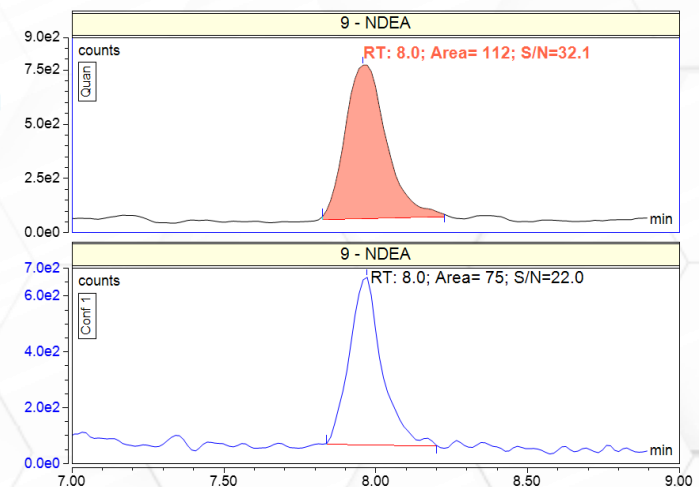
- Nitrosaminové nečistoty jsou skupinou kontaminantů, které jsou spjaty s genotoxickými a karcinogenními účinky
- Regulační orgány po celém světě neustále aktualizují pokyny pro kontrolu a omezení tvorby těchto sloučenin při výrobě léčiv
- Ke stanovení nitrosaminových nečistot v léčivech byly vyvinuty validované LC-MS a LC-MS/MS metody, které musí splňovat regulace
- Díky vylepšením u TSQ Plus dochází k lepší detekci iontů



1.7x větší plocha



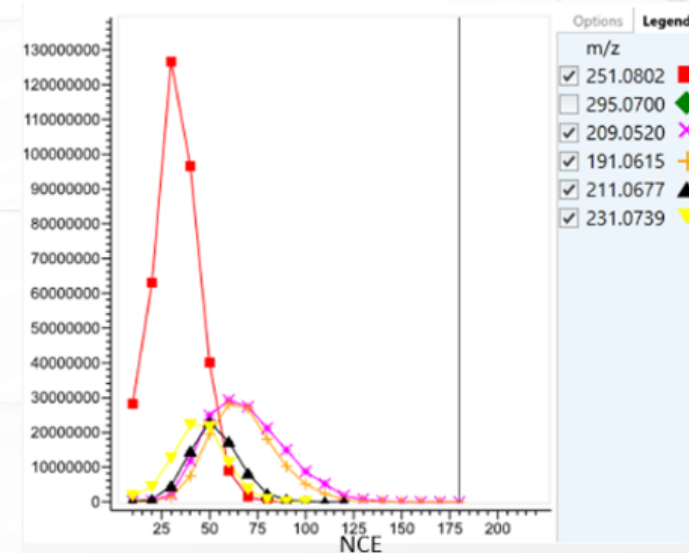
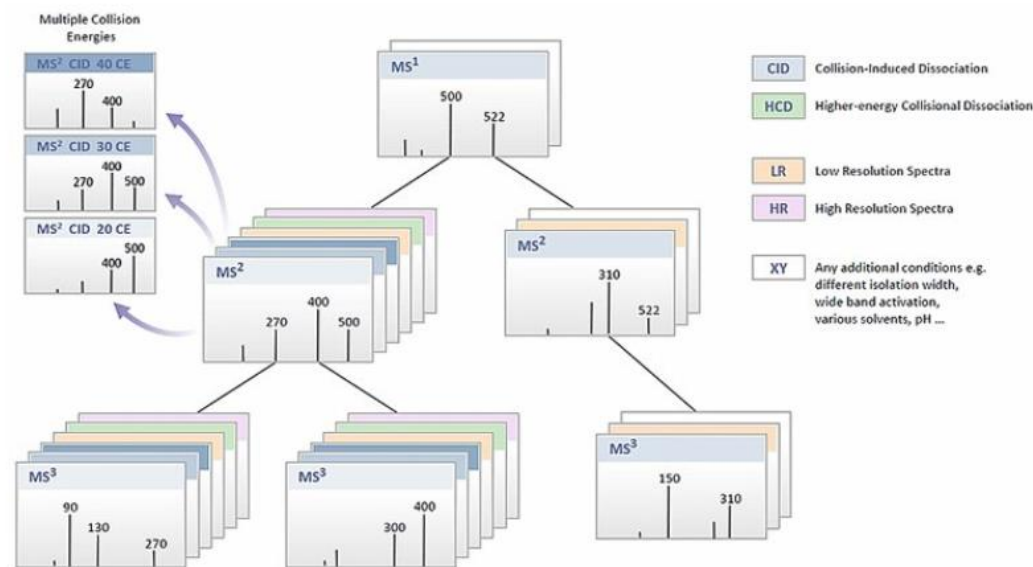
4x větší plocha



TSQ Fortis Plus MS analýza LOQ 5 ppb

Integrace mzCloud databáze

- Knihovna spekter mzCloud obsahuje kompletní informace o fragmentech u více než 19 000 sloučenin
- Analýza sloučenin je provedena na HRMS ThermoFisher Orbitrap
- Identifikace abundantních produktových iontů a optimální nastavení NCE je využito k vytvoření mzCloud databázi pro MS TQ Plus



Recipe Kits

RECIPE

- Spolupráce se společností RECIPE nám umožňuje nabízet společně s našimi přístroji kity pro stanovení například vitaminů, TDM či steroidů
- Kromě kompletních LC-MS/MS a HPLC Kitů, jsou k dispozici ještě kalibrátory či interní standardy pro maximální usnadnění práce
- ClinMass TDM 200 Kit Systém optimalizuje sledování hladin léků u pacientů. Tento kit obsahuje kolonu, na které se dá zanalyzovat široká škála látek, jako jsou například Benzodiazepiny, Antimykotika, Antidepresiva apod.
- ClinMass kity se také využívají při vývoji aplikací pro LC-MS/MS analýzu na našich přístrojích z řady TSQ Plus



BZP	Benzodiazepines	Neuroleptics	NLP
TCA	Tricyclic Antidepressants	Antimycotics	AMC
AED	Antiepileptic Drugs	Mycophenolic Acid	MPA
ADP	Antidepressants	Immunosuppressive Drugs	ISD

Aplikace v praxi

thermoscientific

TECHNICAL NOTE 73768

Quantification of free metanephrines in human plasma by LC-MS/MS for clinical research


Authors: Mariana Barcenas and Marie Calvet
Thermo Fisher Scientific, Les Ulis, France
Keywords: Metanephrines, online analysis, plasma, mass spectrometry, TSO Altis

Application benefits

- Accurate and confident results obtained by implementation of a comprehensive kit for sample preparation
- Robust, sensitive LC and MS platforms enable increased confidence in data

Goal
Implementation of an analytical method for the quantification of free metanephrines in human plasma on a Thermo Scientific™ TSO Altis™ triple quadrupole mass spectrometer.

Introduction
Plasma free metanephrines (PFM) are the most specific indicators for the diagnosis of extra-adrenal chromaffin tumors. Because catecholamines are metabolized within chromaffin cells to metanephrine or normetanephrine, these metabolites can be used to diagnose pheochromocytoma. The measurement of PFM (metanephrine (M), normetanephrine (NM), and 3-methoxytyramine (MT)) is challenging because of their polar nature, their low molecular weight, and their low physiological concentration in human plasma.



In this report, an analytical method for clinical research for the quantification of metanephrines in human plasma is reported. Samples were pre-processed by protein precipitation followed by online solid-phase extraction (SPE) and chromatographic separation on a Thermo Scientific™ Vanquish™ Flex Binary UHPLC system. Detection was performed on a TSO Altis triple quadrupole mass spectrometer with heated electrospray ionization (HESI) operated in positive ion mode by selected reaction monitoring (SRM). Method performance was evaluated using the ClinMass™ LC-MS/MS Complete Kit for Free Metanephrines in Plasma – online analysis from RECIPE Chemicals + Instruments GmbH (Munich, Germany) in terms of linearity of response within the calibration ranges, accuracy, and intra- and inter-assay precision for all analytes.

Thermo Fisher SCIENTIFIC

thermoscientific

TECHNICAL NOTE 73679

Quantitation of 25-OH Vit D in human plasma and serum for clinical research by LC-MS/MS


Authors: Zuzana Škrabáková,
Thermo Fisher Scientific, Hemel Hempstead, UK
Katharina Kern, RECIPE Chemicals +
Instruments GmbH, Munich, Germany
Keywords: 25-hydroxyvitamin D, online
SPE, human plasma, human serum, mass
spectrometry, TSO Fortis

Application benefits

- Simple offline sample preparation by protein precipitation followed by online SPE
- Robustness and sensitivity with entry level triple quadrupole MS

Goal
Implementation of an analytical method for quantification of 25-hydroxyvitamin D₃ and D₂ in human plasma and serum on a Thermo Scientific™ TSO Fortis™ triple-stage quadrupole mass spectrometer for clinical research.

Introduction
A robust LC-MS/MS analytical method for the quantification of 25-hydroxyvitamin D₃ and D₂ in human plasma and serum for clinical research is reported. Samples were extracted offline by protein precipitation with concomitant addition of the internal standard. Extracted samples were injected onto a Thermo Scientific™ Vanquish™ Flex UHPLC system configured for online solid-phase extraction (SPE). A TSO Fortis triple-stage quadrupole mass spectrometer



with atmospheric pressure chemical ionization operated in positive ionization mode was used for the detection of all analytes. Data were acquired by selected reaction monitoring (SRM) using D₃-25-hydroxyvitamin D₃ as the internal standard for both analytes. Method performance was evaluated using the ClinMass™ LC-MS/MS Complete Kit 25-OH-Vitamin D₃/D₂ in Plasma and Serum from RECIPE Chemicals + Instruments GmbH (Munich, Germany) in terms of linearity of response within the calibration ranges, carryover, accuracy, and intra- and inter-assay precision for both analytes.

Thermo Fisher SCIENTIFIC

thermoscientific

TECHNICAL NOTE 66005

Quantification of vitamins B1, B2, and B6 in human blood by liquid chromatography-tandem mass spectrometry for clinical research

Author: Mariana Barcenas,
Thermo Fisher Scientific, Les Ulis, France

Keywords: TSO Fortis MS, TSO Quantis MS,
Vanquish Flex Binary UHPLC, flavin adenine
dinucleotide vitamin B2, mass spectrometry,
pyridoxal phosphate vitamin B6, pyridoxal
vitamin B6, thiamine pyrophosphate vitamin
B1, whole blood

Goal
Development and implementation of a robust and reliable analytical method for quantification of vitamins B1, B2, and B6 in human blood using a Thermo Scientific™ TSO Fortis™ triple quadrupole mass spectrometer and a Thermo Scientific™ TSO Quantis™ triple quadrupole mass spectrometer.

Introduction
Active variants of B vitamins are found in varying concentrations in biofluids and tissues in both free and phosphorylated forms. A number of analytical approaches have been developed for the determination of B vitamins including microbiological assays, immunoassays, and HPLC coupled to electrochemical, ultraviolet, or fluorescence detection. However, most studies focus on analysis of individual or a small subset of vitamins. B vitamins are often extracted by acid and enzymatic hydrolysis and determined by the total content of vitamins, while the chemically distinct bioactive forms are not individually measured. Hence, there is a need to develop a comprehensive method to measure each of the native forms of the B vitamins in blood.



In this study, a robust and reliable analytical method for clinical research for quantification of vitamins B1, B2, and B6 in human blood is reported. Whole blood samples were extracted by offline internal standard addition and protein precipitation. Extracted samples were injected onto a Thermo Scientific™ Vanquish™ Flex Binary UHPLC system for LC separation. Detection was performed using either a TSO Fortis triple quadrupole mass spectrometer or a TSO Quantis triple quadrupole mass spectrometer with a heated electrospray ionization (HESI) source operated in positive mode by selected reaction monitoring (SRM). Method performance was evaluated using the ClinMass™ LC-MS/MS Complete Kit for Vitamins B1, B2, B6 in Whole Blood from RECIPE Chemicals + Instruments GmbH (Munich, Germany) in terms of linearity of response within the calibration ranges, accuracy, and intra- and inter-assay precision for all analytes.

Thermo Fisher SCIENTIFIC

Aplikace v praxi

thermoscientific

TECHNICAL NOTE 66059

Quantification of eight antimycotics in human plasma by liquid chromatography-tandem mass spectrometry for clinical research

Authors: Gaëtan Renoulin¹, Claudio De Nardi²
¹Thermo Fisher Scientific, Les Ulis, France
²Thermo Fisher Scientific, Reinach, Switzerland

Keywords: TraceFinder software, TSQ Quantis MS, Vanquish Flex UHPLC, antifungals, antimycotics, offline sample preparation, plasma

Application benefits


- Robust, sensitive hardware enables increased confidence in data
- Simple offline sample preparation by protein precipitation
- Eight antimycotics drugs in a single 3.6-minute quantitative method

Goal

Implementation of an analytical method for the quantification of eight antimycotics in human plasma on a Thermo Scientific™ TSQ Quantis™ triple quadrupole mass spectrometer.

Introduction

Antifungals, also known as antimycotics, typically refer to a class of pharmaceutical fungicides used to treat and prevent mycosis, ranging from athlete's foot to ringworm to serious infections, such as cryptococcal meningitis. Voriconazole, posaconazole, fluconazole, ketoconazole, and other similar antimycotics are used to treat life-threatening fungal infections along with prevention of infections in immunocompromised individuals. The narrow



Thermo Fisher SCIENTIFIC

thermoscientific

TECHNICAL NOTE 64973

Quantitative analysis of estradiol and testosterone in plasma for clinical research using the TSQ Altis triple quadrupole mass spectrometer

Authors: Xiaoli Xie, Kristine Van Natta, Niloni Wijeratne, Claudia Martins
Thermo Fisher Scientific, San Jose, CA

Goal

To develop a sensitive LC-MS/MS method for quantitative analysis of estradiol and testosterone in plasma for clinical research using liquid chromatographic separation coupled to a triple quadrupole mass spectrometer.

Introduction

Analysis of estradiol and testosterone in plasma samples for clinical research requires a sensitive analytical method. Liquid chromatography coupled with tandem mass spectrometry (LC-MS/MS) has been widely adopted as an analytically sensitive and selective technique for estradiol and testosterone analysis in complex matrices such as human serum or plasma.

Keywords

Estradiol, LC-MS/MS, LLE, testosterone, TSQ Altis MS

Experimental

Sample preparation

To prepare the samples, 10 µL of spiking solution (final concentration range: 0.5–10 ng/mL) and 20 µL of internal standard (2 ng/mL testosterone-¹³C₃ and 20 ng/mL estradiol-d₅) were added to 400 µL of plasma. Then 2 mL of MTBE were added and the sample was vortexed. After liquid-liquid extraction (LLE), the MTBE layer was evaporated under nitrogen, and 200 µL of 50:50 methanol:water were added to reconstitute. From this, 10 µL were injected in triplicate for LC-MS/MS analysis.

Thermo Fisher SCIENTIFIC

thermoscientific

TECHNICAL NOTE 66052

Quantification of 15 tricyclic antidepressants in human plasma by liquid chromatography-tandem mass spectrometry for clinical research

Authors: Gaëtan Renoulin¹, Mariana Barcenas¹ and Claudio De Nardi²
¹Thermo Fisher Scientific, Les Ulis, France
²Thermo Fisher Scientific, Reinach, Switzerland

Keywords: TraceFinder software, TSQ Quantis MS, Vanquish Flex UHPLC, LC-MS, mass spectrometry, offline sample preparation, plasma, tricyclic antidepressants

Application benefits

- Robust, sensitive hardware enables increased confidence in data
- Simple offline sample preparation by protein precipitation
- Fifteen tricyclic antidepressants in a single quantitative method

Goal

Implementation of an analytical method for the quantification of 15 tricyclic antidepressants in human plasma on a Thermo Scientific™ TSQ Quantis™ triple quadrupole mass spectrometer.

Introduction

Tricyclic antidepressants (TCAs) are a group of psychoactive drugs that are mainly used to alleviate symptoms of anxiety, endogenous depression, and pain.



In this report, an analytical method for clinical research for the quantification of 15 tricyclic antidepressants in human plasma in eight minutes is presented. The samples were prepared offline by protein precipitation. Extracted samples were chromatographically separated on a Thermo Scientific™ Vanquish™ Flex Binary UHPLC system. Detection was performed on a TSQ Quantis triple quadrupole mass spectrometer with heated electrospray ionization (HESI) operated in positive ionization mode. Method performance was evaluated using the ClinMass® Add-on Set for TCAs, including LC-MS/MS calibrators, controls, and internal standards from RECIPE Chemicals + Instruments GmbH (Munich, Germany) in terms of linearity of response, lower limit of quantification (LLOQ), accuracy, and intra- and inter-assay precision for all analytes.

Thermo Fisher SCIENTIFIC

Maximální produktivita

- Udržení standardu, který udaly hmotnostní spektrometry z řady TSQ
 - ✓ Bezkonkurenční robustnost
 - ✓ Rychlý sběr dat
 - ✓ Jednoduchá údržba
- Nové klíčové vlastnosti hmotnostních spektrometrů z řady TSQ Plus, které posouvají kvantitativní analýzu o krok dále
 - ✓ Nová kolizní cela pro lepší přenos nízkých hmot
 - ✓ Nový zdroj napětí pro rychlejší přepínání polarit
 - ✓ Nové kvadrupólové filtry hmoty pro lepší stabilitu hmoty
 - ✓ Integrace databáze mzCloud pro přímý přístup k více než 19 000 sloučeninám
 - ✓ Zjednodušená kontrola a kalibrace přístroje
 - ✓ Integrované workflow řešení od jednoho prodejce



QqQ Hmotnostní Spektrometry z řady TSQ Plus pro maximální výkon a zvýšenou produktivitu



EVUSEP

Děkuji za pozornost

+RECIPE