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Application News

No.C124

Liquid Chromatography Mass Spectrometry

High-Speed Analysis of Mycophenolic Acid in Plasma Using Triple Quadrupole LC/MS/MS (LCMS-8050)

Mycophenolate mofetil is an immunosuppressive drug used to treat a refractory rejection after renal transplantation.
This article introduces an example of high-speed analysis of mycophenolic acid in plasma using the LCMS-8050 high-sensitivity triple quadrupole mass spectrometer. Although a simple method of sample pre-treatment was used that involves only deproteinization, the quantitative results obtained were excellent in terms of accuracy and precision.

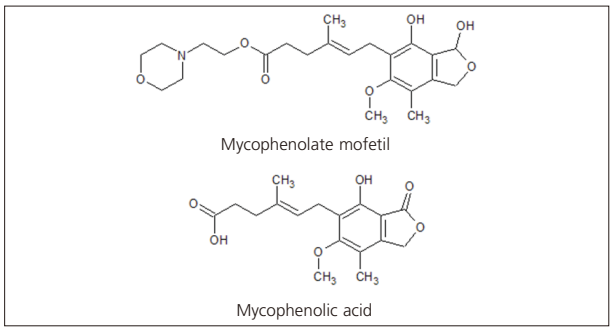

Fig. 1 Structural Formula of Mycophenolate Mofetil and Mycophenolic Acid

Sample Pretreatment

The pretreatment workflow is shown in Fig. 2.
Standard (STD) samples with concentration of 0.2, 0.6, 2, 6, and 20 µg/mL in plasma were prepared to create a calibration curve, and QC samples with concentration of 0.5, 5, and 15 µg/mL in plasma were prepared to validate the analysis results. An internal standard solution and acetonitrile were added to these standard samples and QC samples, and the deproteinized supernatant was then diluted in water and used for analysis. The stable isotope-labeled compound of mycophenolic acid (mycophenolic acid-d3) was used as the internal standard solution.
The pretreatment method used is simple and requires no labor-intensive steps such as solid phase extraction, which allows pretreatment to be performed at low cost and in a short period of time.

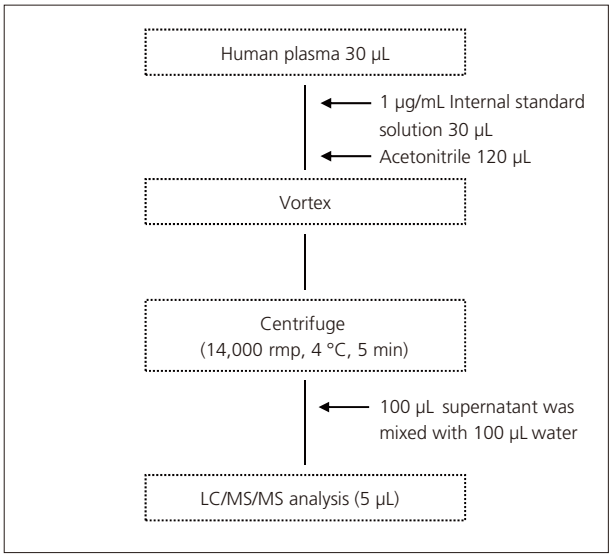

Fig. 2 Pretreatment Workflow

LC/MS/MS Analytical Conditions

LC/MS/MS analytical conditions are shown in Table 1, and MRM transitions are shown in Table 2. A Shim-pack GIS column was used, and separation was performed in reverse-phase mode. Electrospray ionization (ESI) was used as the method of ionization, and MRM measurements were performed in positive ion mode.

Table 2 MRM Parameters

Compound Name	Polarity	MRM Transition
Mycophenolic acid	+	321.40 > 207.30
Mycophenolic acid-d3	+	324.40 > 210.30

Table 1 Analytical Conditions

Column	: Shim-pack GIS (75 mm L. × 2.1 mm I.D., 3 µm)
Mobile Phase	: 1 % Acetic acid in water / Acetonitrile = 1 / 1
Analysis Time	: 4 min
Flowrate	: 0.3 mL/min
Column Temperature	: 40 °C
Injection Volume	: 5 µL
Probe Voltage	: +4.0 kV (ESI-positive mode)
DL Temperature	: 150 °C
Block Heater Temperature	: 200 °C
Interface Temperature	: 400 °C
Nebulizing Gas Flow	: 3 L/min
Drying Gas Flow	: 5 L/min
Heating Gas Flow	: 15 L/min

Analysis Results

The calibration curve for mycophenolic acid in plasma is shown in Fig. 3, and the chromatograms for blank sample and each sample used for calibration are shown in Fig. 4.
Good linearity was obtained over the 0.2 to 20 µg/mL range of sample concentration in plasma, with a correlation coefficient of 0.999 or higher.

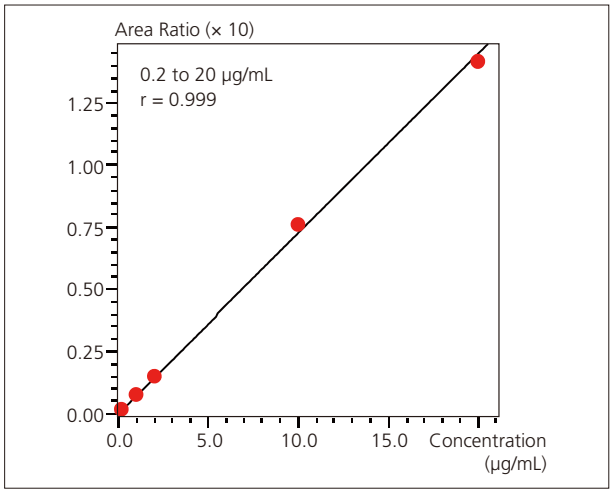

Fig. 3 Calibration Curve for Mycophenolic Acid

The accuracy and repeatability of each point on the calibration curve for mycophenolic acid concentration in plasma is shown in Table 3. Good results were obtained for all points on the calibration curve, with repeatability of 5 % or below and accuracy within 100 ± 10 %.

Table 3 Measurement Results of Standard Sample in Plasma

	Concentration in Plasma (µg/mL)	Accuracy (%)	Concentration Repeatability (%)
STD1	0.2	94.9	3.68
STD2	0.6	101.8	4.38
STD3	2	101.1	3.55
STD4	6	104.7	3.05
STD5	20	97.5	3.22

QC sample measurement results are shown in Table 4. The results obtained were sufficiently precise and accurate, with repeatability of 5 % or below and concentration accuracy of 100 to 110 %.

Table 4 Measurement Results of QC Samples

	Concentration in Plasma (µg/mL)	Accuracy (%)	Concentration Repeatability (%)
QC 1	0.5	108.5	1.60
QC 2	5	104.9	3.66
QC 3	15	103.5	2.55

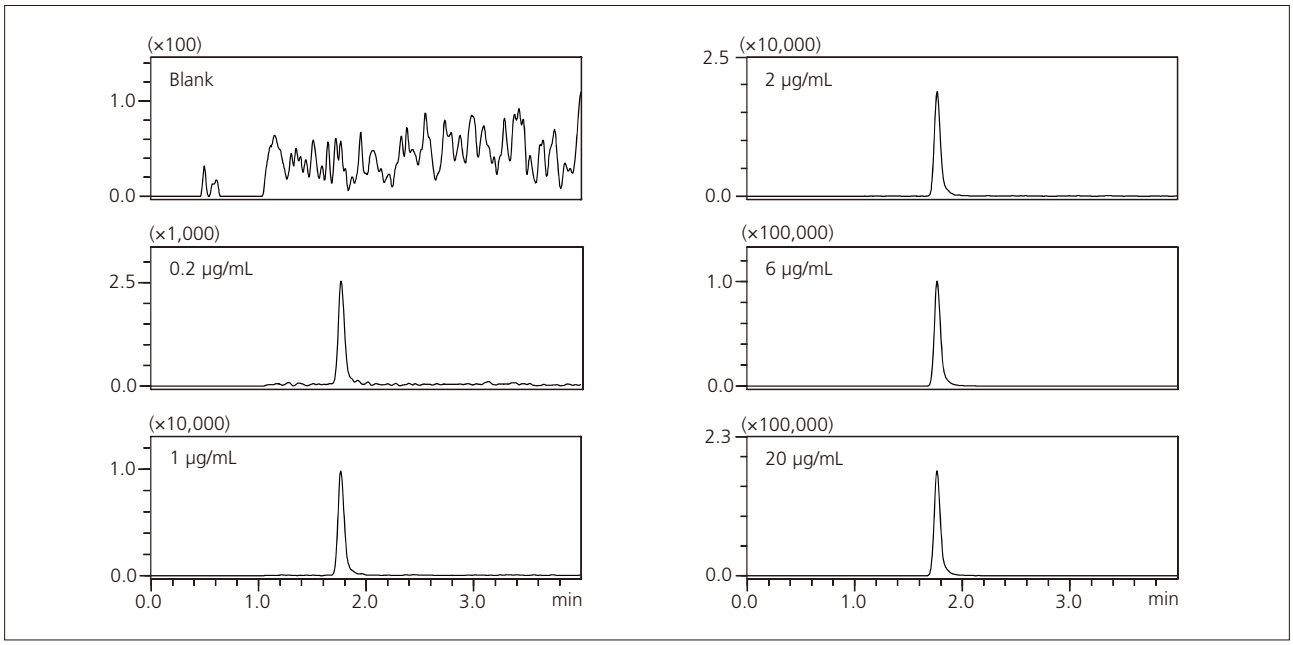

Fig. 4 Chromatograms for Blank Sample and Samples with Mycophenolic Acid Spiked at Each Concentration in Plasma

This Application News was created with the cooperation of the Pharmaceutical Sciences Department of Tohoku University Hospital.

Notes: · The products mentioned in this article have not received approval for use as medical devices based on the Pharmaceutical and Medical Device Act.
· The analytical methods mentioned in this article cannot be used for diagnostic purposes.

First Edition: May. 2016

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