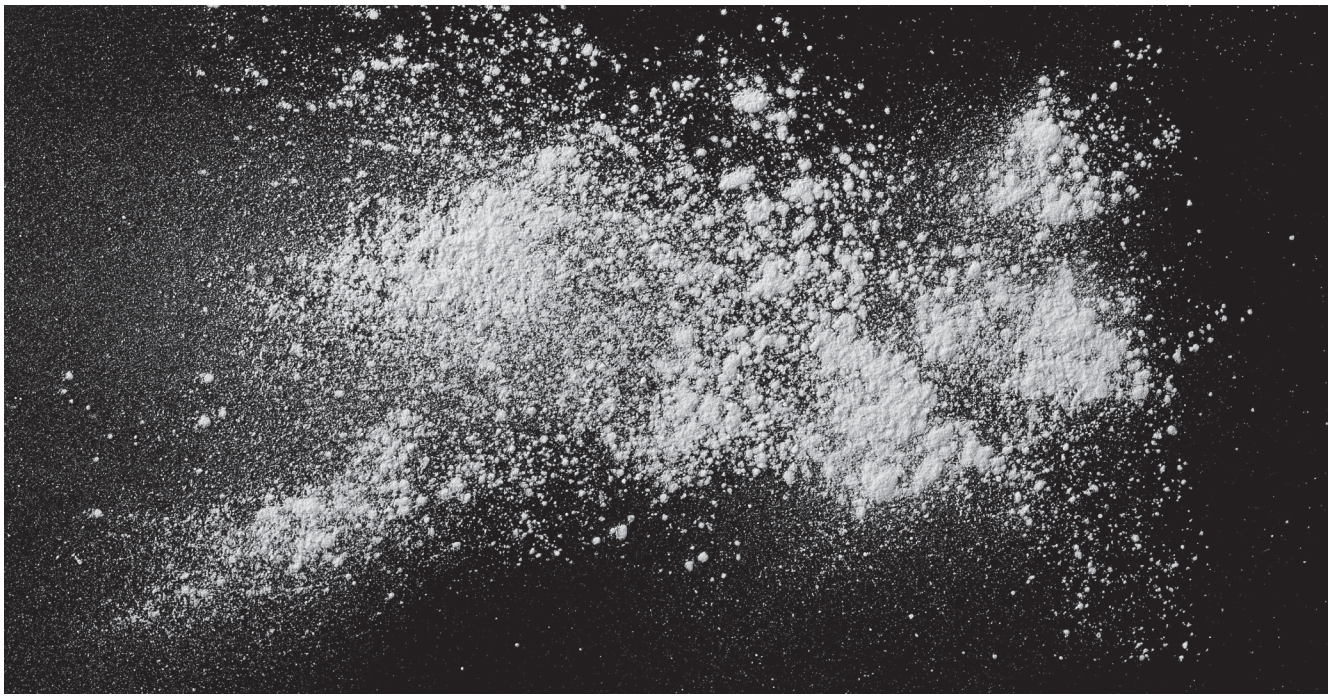
APPLICATION NOTE

Analysis of antineoplastic drugs from wipe samples using MicroLC

Antineoplastic drugs are highly effective in the field of cancer therapy. But the high toxicity also is a significant risk to exposed workers, making careful workplace monitoring essential. Detecting contamination at very low but potentially harmful concentrations requires both reliable and extremely sensitive analytical methods.



Liquid chromatography coupled with tandem mass spectrometry is ideal as this combination ensures highly sensitive detection. The further development to MicroLC-MS goes a decisive step further. This makes even higher sensitivities, faster separation and shorter cycle times possible. This significantly increases the precision and also the sample throughput in routine analyses.

The separation of 11 antineoplastic drugs shown in this example demonstrates the highly efficient qualification and quantification of real samples [1].

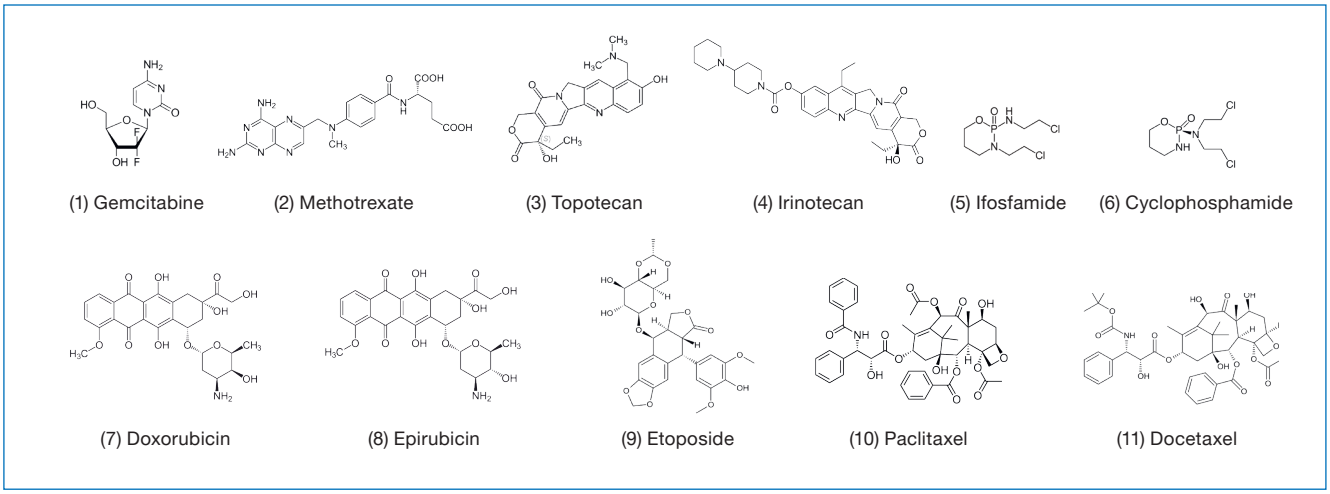


Figure 1: 11 antineoplastic drugs analysed in this application.

Table 1: Chromatographic conditions [1].

Column:	YMC-Triart C18 (1.9 µm), 50 x 0.3 mm ID
Part No.:	TA12SP9-05H0AU
Eluents:	A) Water + 0.1% formic acid
	B) Acetonitrile + 0.1% formic acid
Gradient:	10–50%B (0–1.6 min), 50–99%B (1.6–2.5 min)
Flow rate:	25 µL/min
Temperatures:	40 °C
Injection:	4.25 µL
Detection:	SCIEX QTRAP 6500, ESI
Sample:	(1) gemcitabine, (2) methotrexate, (3) topotecan, (4) irinotecan, (5) ifosfamide,
	(6) cyclophosphamide, (7) doxorubicin, (8) epirubicin, (9) etoposide, (10) paclitaxel, (11) docetaxel (1 ng/mL)
LC system:	Eksigent ExpressLC ultra system

Method development and validation was conducted with standard samples containing 11 antineoplastic drugs (figure 2). As the German substance-independent reference value for wipe samples is 0.1 ng/cm² the method was optimised to a LOQ (limit of quantification) of 0.01 ng/mL. This allowed identification of all 11 antineoplastic drugs to be achieved with high method stability. Retention time variability was very low, and recoveries between 80 and 120% could be reached. A LOQ and limit of detection (LOD) of approximately 10 pg/mL is accomplished for almost every compound.

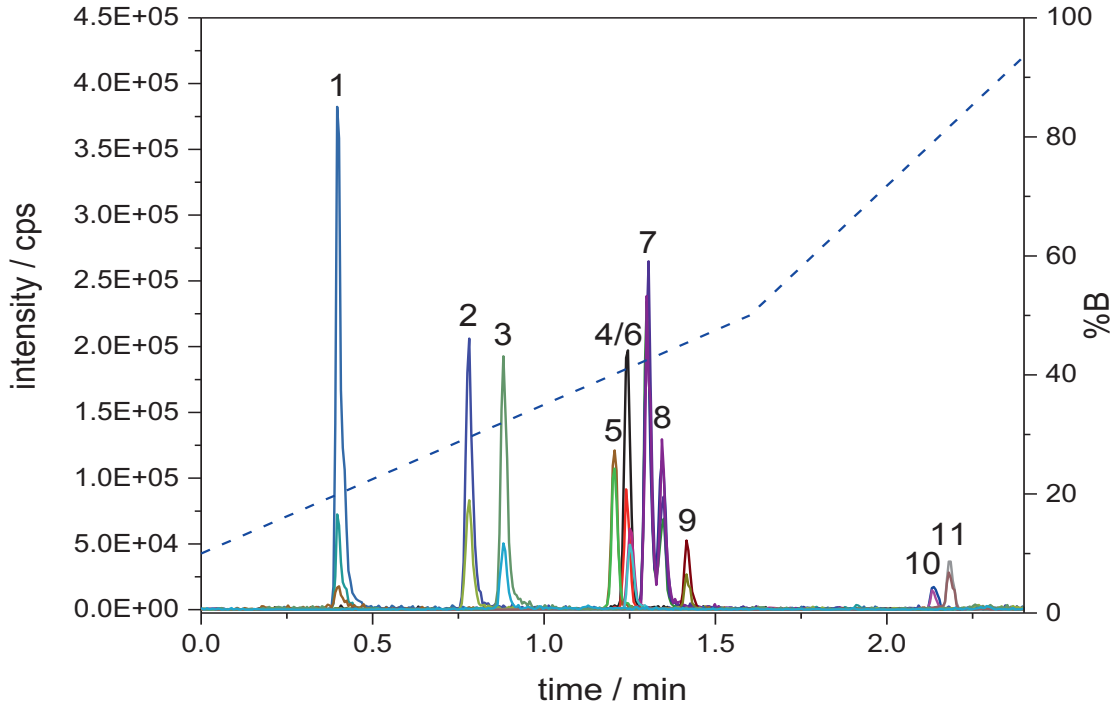


Figure 2: Separation of 11 antineoplastic drugs in a standard with concentrations of 1 ng/mL [1].

In the second step the method was applied to the analysis of three wipe samples taken from different locations in a hospital and application areas in hospital wards (figure 3). In the wipe samples mainly gemcitabine, ifosfamide, cyclophosphamide and paclitaxel were found at a maximum concentration of 29 ng/mL. This analysis demonstrates the applicability of the developed method for real samples and the possibility to use this method in the daily life of the pharmaceutical sector.

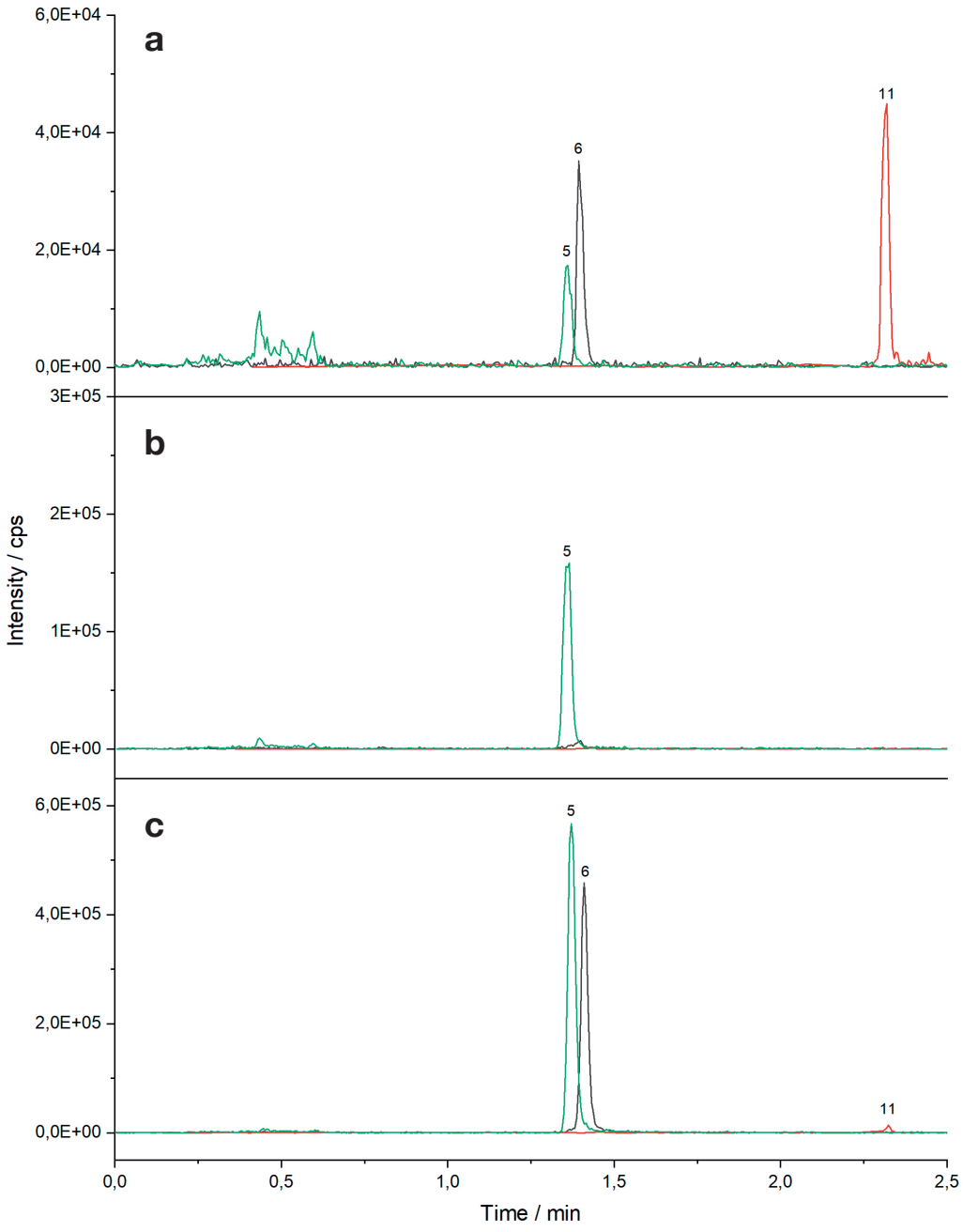


Figure 3: Chromatograms corresponding to three wipe samples taken from various exposed worksites.

Literature:

[1] T. Hetzel, et al., Micro-liquid chromatography mass spectrometry for the analysis of antineoplastic drugs from wipe samples, Anal. Bioanal. Chem. (2016)

**Application data by courtesy of: Thorsten Teutenberg, IUTA-Institut für Energie- und Umwelttechnik e. V., Duisburg, Germany.*