

# Interfacing a Compact Capillary Liquid Chromatograph to a Small Footprint Triple Quadrupole Mass Spectrometer

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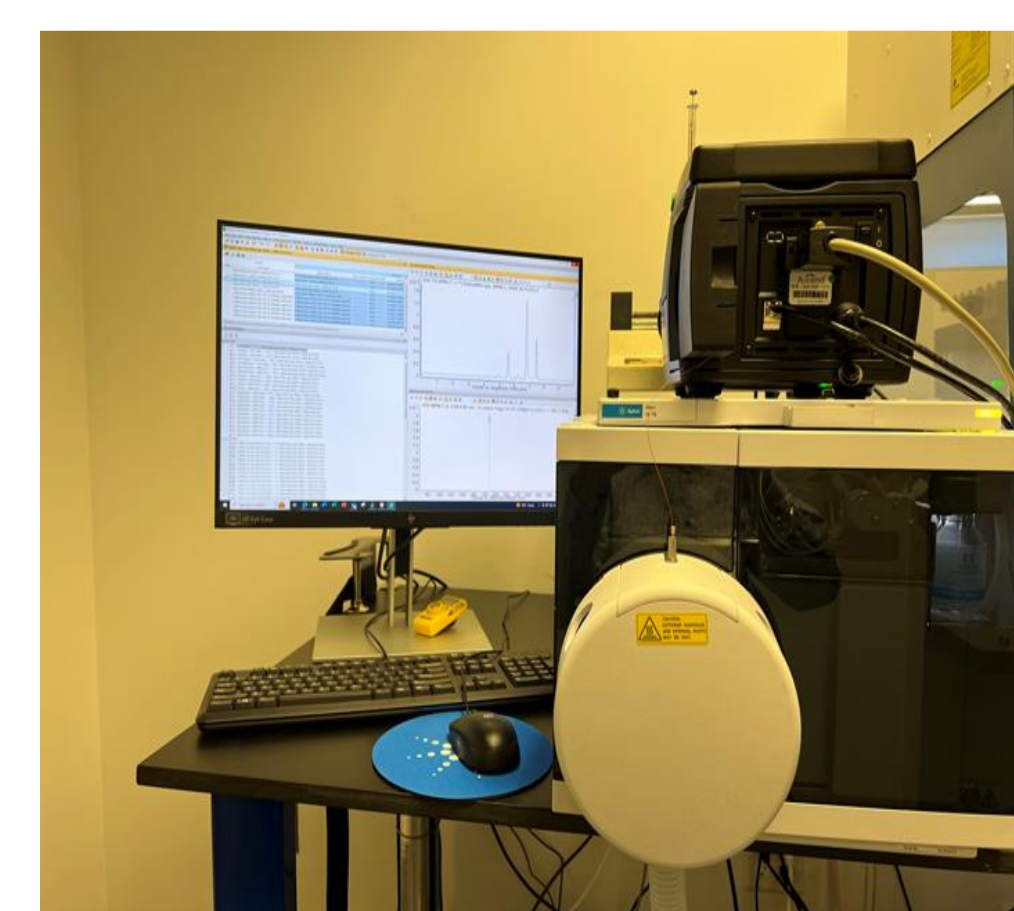
## Introduction

The compact, portable Axceed Focus LC (Axceed, Provo, UT, USA) comes equipped with either an on-capillary or miniature flow-cell UV-absorbance detector and is suitable for in-field applications as an autonomous instrument.<sup>1,2</sup> It can also be used in a laboratory setting as a stationary compact liquid chromatograph (LC). In the latter case, the sensitivity and identification capabilities of the instrument can be enhanced by interfacing it with a suitable mass spectrometer (MS).

In this work, we interfaced an Axceed Focus LC to an Agilent Ultivo, which is among the smallest footprint commercially available triple quadrupole mass spectrometers.

## Experimental Details

The regular nebulizer in the electrospray ion source was replaced with an Agilent microflow nebulizer. A 25 cm, 25  $\mu\text{m}$  ID, 360  $\mu\text{m}$  OD PEEKsil tubing (Trajan, Melbourne, Victoria, Australia) served as a transfer line, which was connected to the end of the capillary column using a PEEK zero-dead-volume 360  $\mu\text{m}$  reducing union with a 50  $\mu\text{m}$  bore hole (VICI Valco Instruments, Houston, Texas, USA). The other end of the tubing was connected to the microflow nebulizer using a stainless steel 1/16" to 360 mm zero dead volume reducing Union with a 100  $\mu\text{m}$  bore hole (VICI Valco Instruments). With these modifications, the LC and MS were compatible in terms of mobile phase flow rate, which typically was 1  $\mu\text{L}/\text{min}$ .

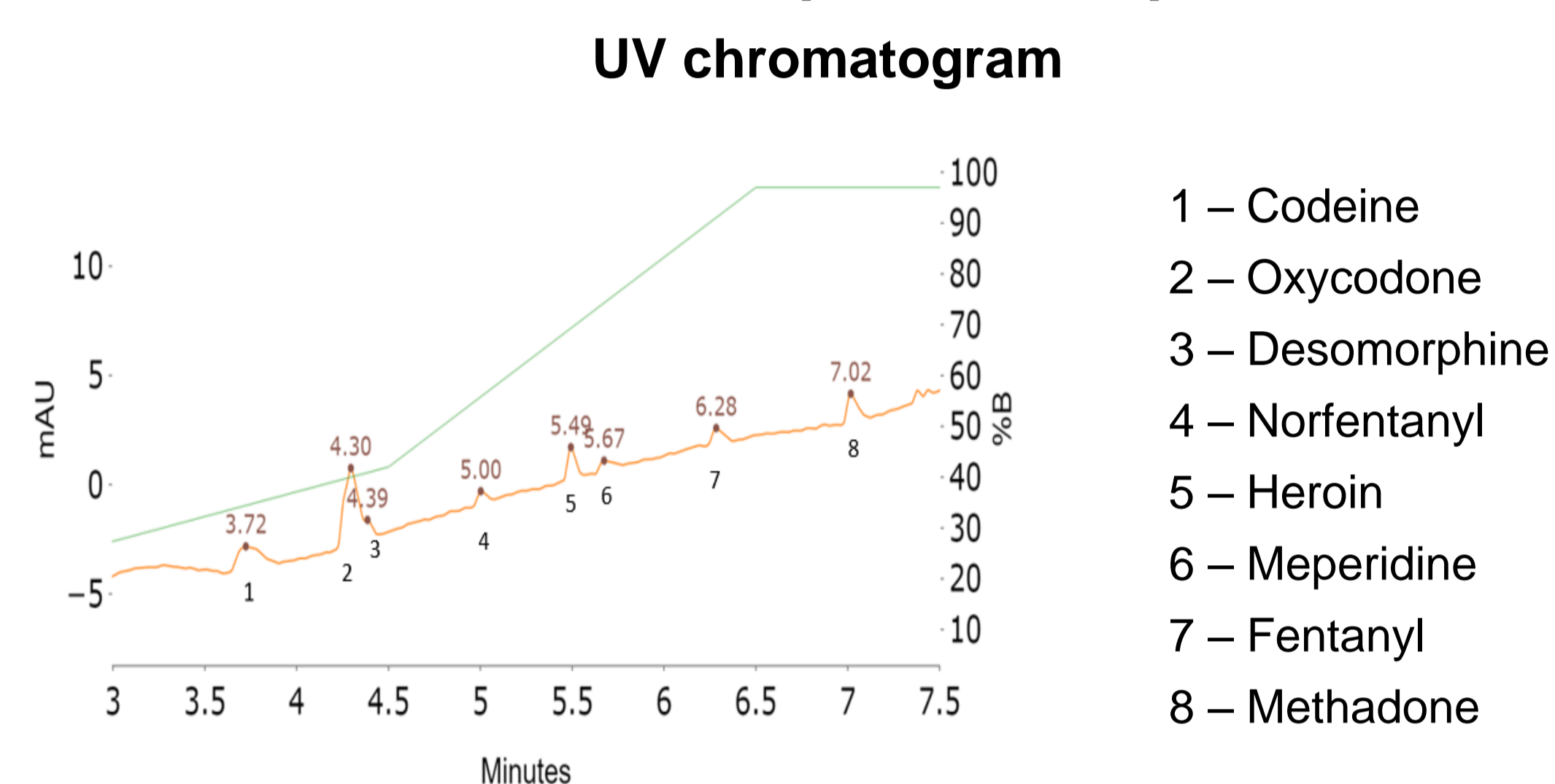


### Chromatographic conditions

Capillary column: CoAnn C18, 10 cm X 150  $\mu\text{m}$ , particle diameter 1.8  $\mu\text{m}$ . Solvent A: 97% water, 3% acetonitrile, 0.1% formic acid. Solvent B: 97% acetonitrile, 3% water, 0.1% formic acid. Detection wavelength: 235 nm.

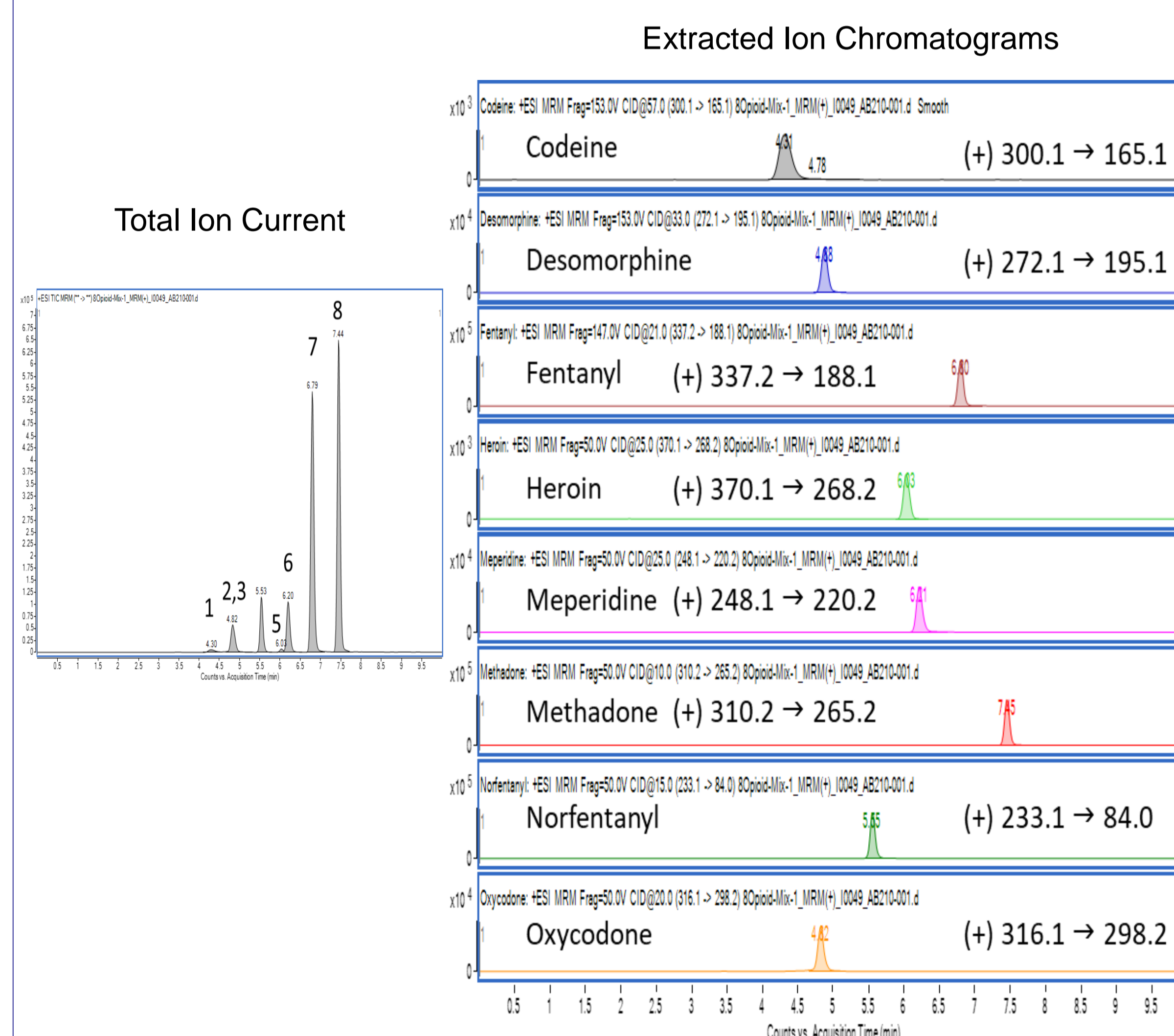
## Results

### Capillary LC-UV-MS/MS Analysis of Opioids in Model Aqueous Samples

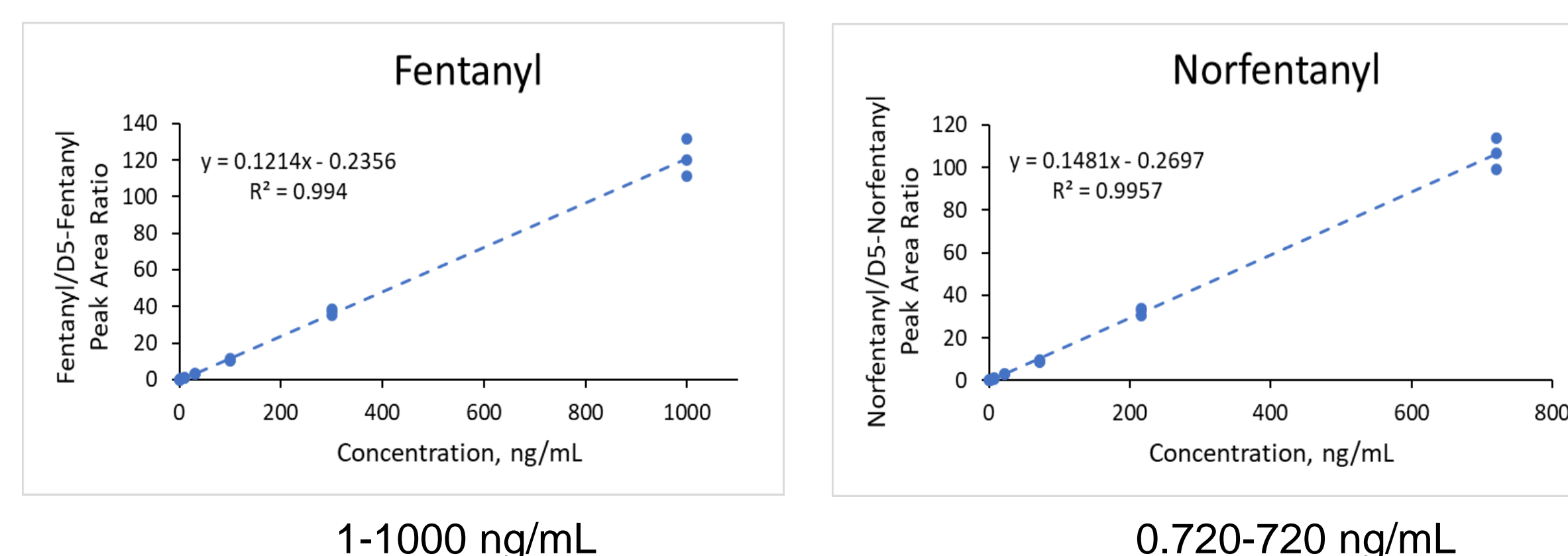


Sample: 1  $\mu\text{g}/\text{mL}$  each analyte in water. Injection volume: 200 nL. Flow rate: 1  $\mu\text{L}/\text{min}$ .

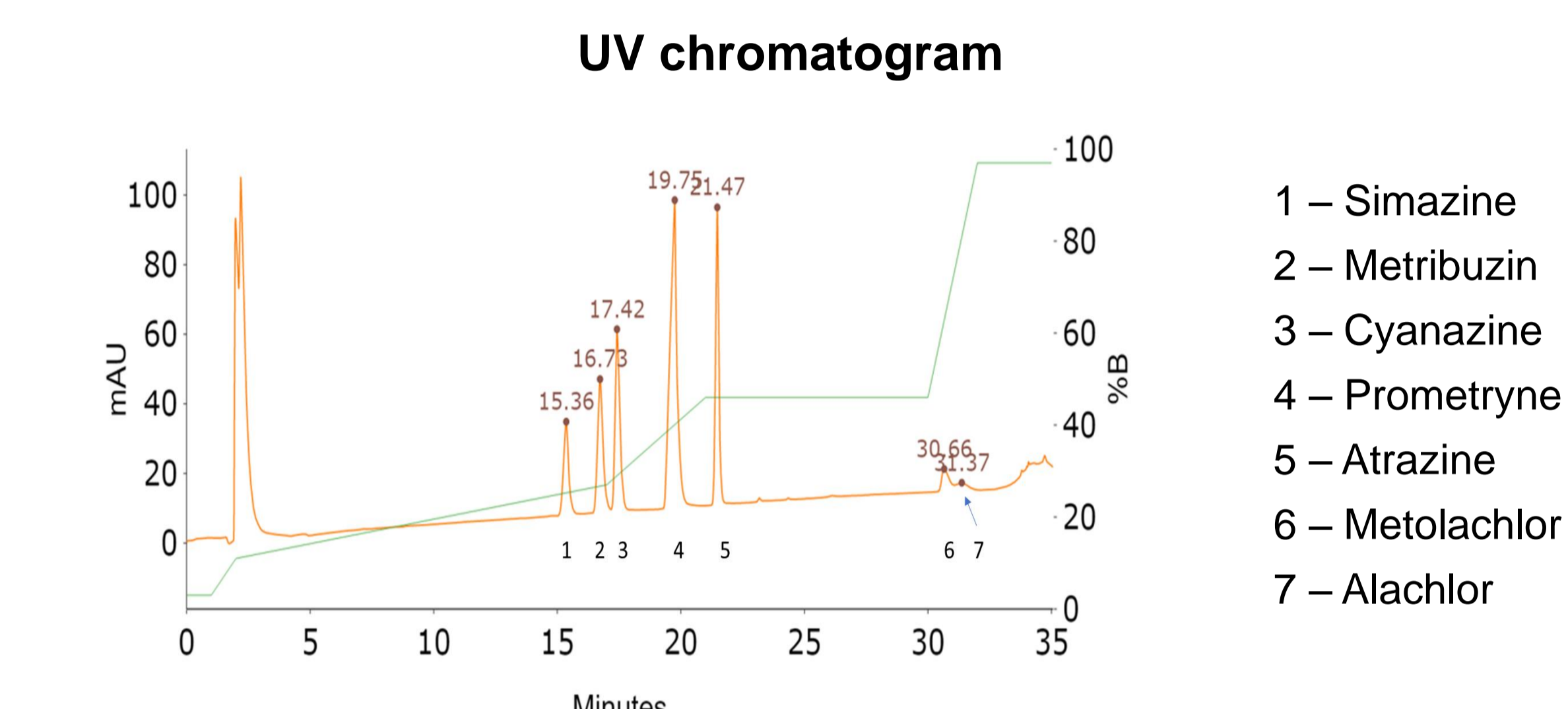
### MS chromatograms



### Quantification

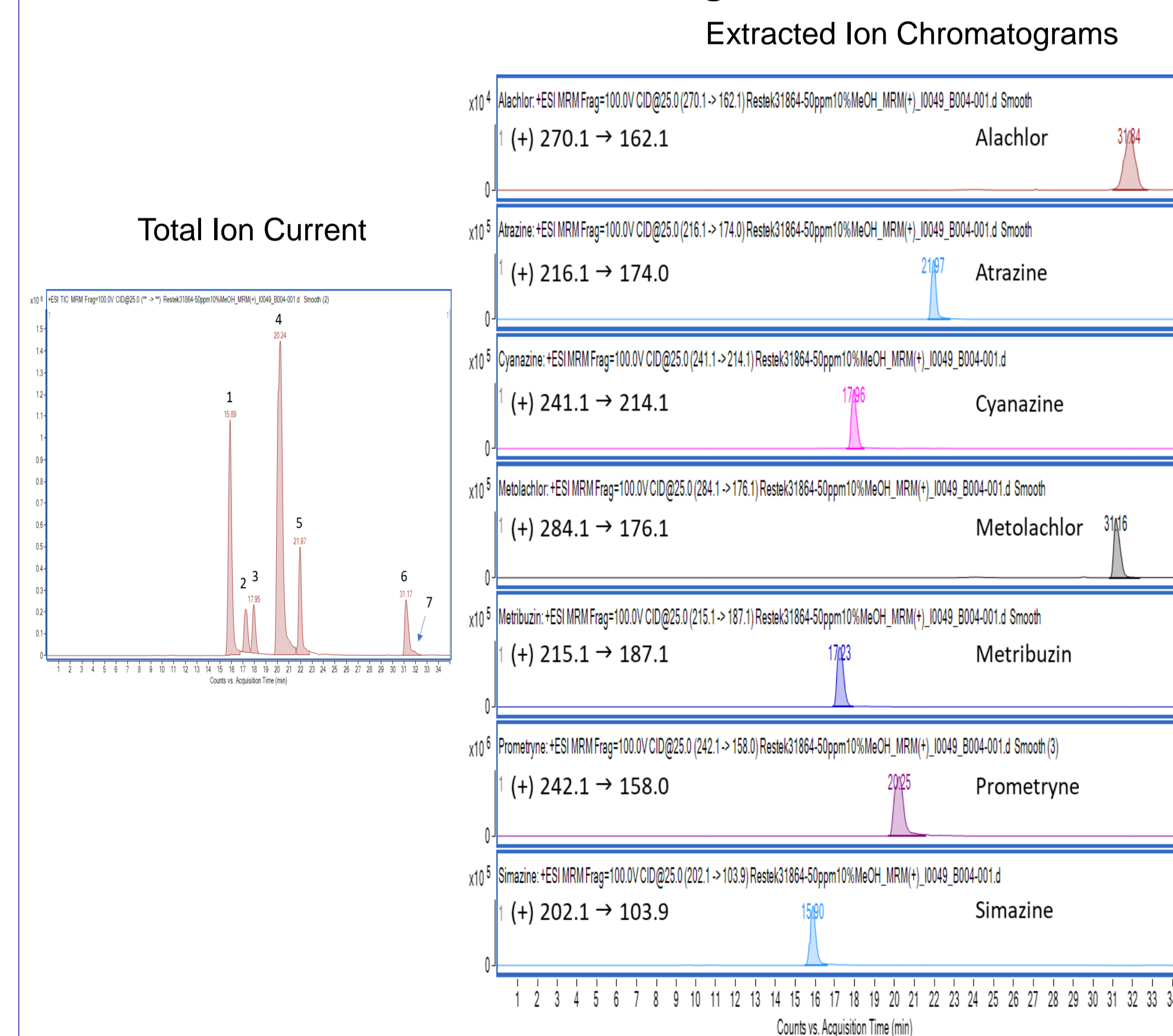


### Capillary LC-UV-MS/MS Analysis of Triazine Herbicides in Model Aqueous Samples

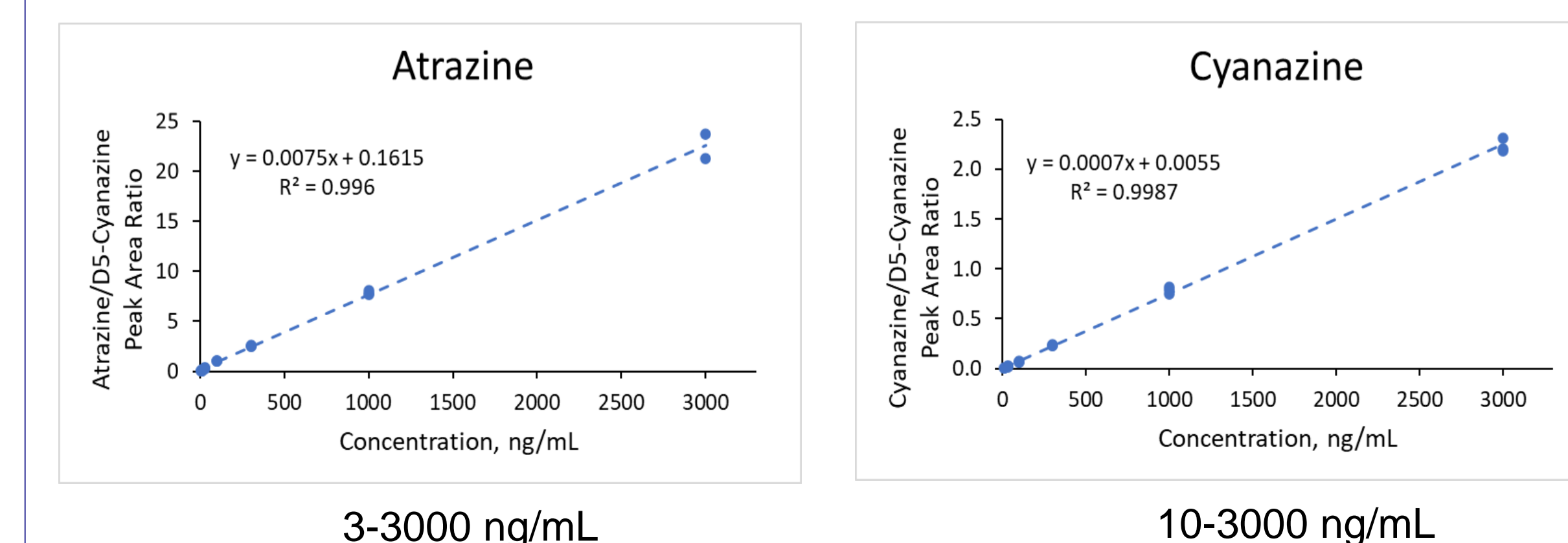


Sample: Restek Reference Mixture 31864 (7 components), diluted to 30  $\mu\text{g}/\text{mL}$  each in water. Injection volume: 250 nL. Flow rate: 1  $\mu\text{L}/\text{min}$ .

### MS chromatograms



### Quantification



## Conclusions

- Coupling capillary liquid chromatograph Axceed Focus LC to triple quadrupole mass spectrometer Agilent Ultivo equipped with a microflow nebulizer provided a compact and efficient platform for qualitative and quantitative LC-MS/MS analysis.
- Identification and simultaneous quantification of 8 opioids and, respectively, 7 triazine herbicides in model aqueous samples was successfully accomplished.
- Calibrations curves with a regression coefficient  $R^2$  above 0.99 were obtained for every analyte in mixtures of 8 opioids and 7 triazine herbicides, respectively. The covered concentration ranges typically extended over a range of 2 to 3 orders of magnitude.
- The analytical results for opioids and triazine herbicides in model aqueous samples can serve as a basis for further method development towards quantification of these analytes in complex matrices.

## References

- (1) Foster, S. W.; Xie, X.; Pham, M.; Peadar, P. A.; Patil, L. M.; Tolley, L. T.; Farnsworth, P. B.; Tolley, H. D.; Lee, M. L.; Grinias, J. P. Portable Capillary Liquid Chromatography for Pharmaceutical and Illicit Drug Analysis. *J Sep Sci* 2020, 43 (9-10), 1623–1627.
- (2) Foster S. W.; Xie, X.; Hellmig, J. M.; Moura-Letts, G.; West, W. R.; Lee, M. L.; Grinias, J. P. Online Monitoring of Small Volume Reactions Using Compact Liquid Chromatography Instrumentation. *Sep Sci Plus* 2022, 5 (6), 213-219.

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