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アプリケーションノート

Delivering Repeatable, Linear, and Accurate Injection Volumes for UPLC and HPLC

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This is an Application Brief and does not contain a detailed Experimental section.

Abstract

One of the most important goals of a quantitative chromatographic analysis is to achieve accurate and repeatable results. The ACQUITY UPLC H-Class System delivers this in a flexible format across the range of UPLC and HPLC injection volumes

Benefits

The ACQUITY UPLC H-Class System uses a flow-through-needle injector design (SM-FTN) to achieve the largest injection volume range, to maximize sample recovery, and to provide precise injection performance.

Introduction

All chromatographic systems are designed to precisely deliver samples to a chromatographic column for repeatable quantification. However, the range of injection volumes that produce acceptable precision can vary dramatically across instrument designs depending on the style and mode of the injector. For a system to be compatible with both UPLC and HPLC methods and columns, the system needs to have a wide injection volume range that can easily run multiple applications without changing the instrument configuration. In addition to precision and linear range, the accuracy of sample delivery is also important for quantification. Ensuring that the requested sample volume and composition is delivered to the column for analysis decreases the susceptibility to method induced precision issues.

Results and Discussion

The ACQUITY UPLC H-Class System uses a flow-through-needle injector design (SM-FTN) to achieve the largest injection volume range for maximum flexibility. A mixture of three anesthetics was used to assess linearity and repeatability. The injection volume range evaluated extends across two orders of magnitude to allow injection volumes suitable for both HPLC and UPLC methods without a change to the instrument configuration (See Figure 1). The correlation co-efficient for linearity (R^2) across this injection volume range exceeds 0.99999, demonstrating the true flexibility of the injection design. The repeatability of six replication injections across this same range was below 0.2% for all components and typically below 0.1% (Figure 2). In addition to injection precision and linearity, accuracy (both volume and composition) also

plays an important role in performance. Figure 3 not only demonstrates the accuracy of withdrawal of the SM-FTN but also accurate sample delivery, an important advantage of the flow-through-needle design. Recovery was measured by collecting the eluent at the outlet of the chromatographic system after injection and comparing it to a known standard. Excellent accuracy was observed at both injection volumes.

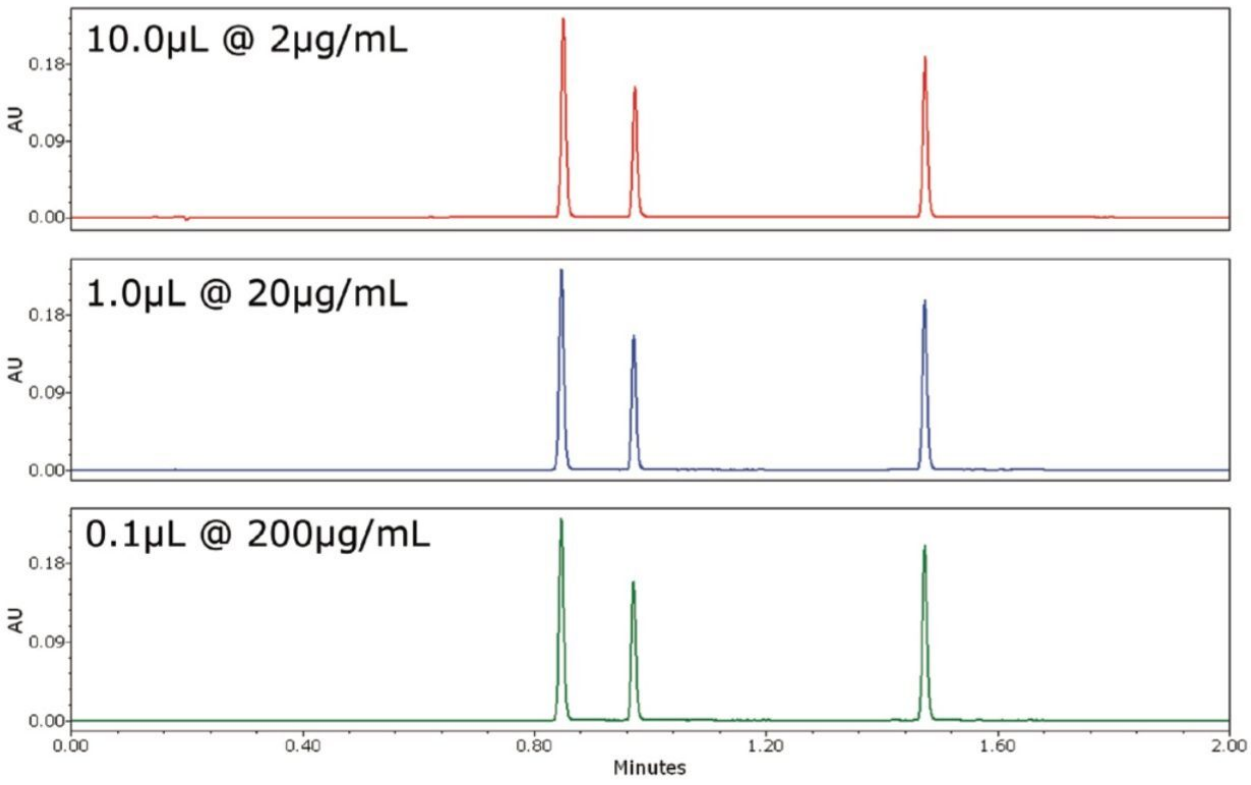

Figure 1. The ACQUITY UPLC H-Class System makes it possible to inject the same mass load on column with injection volumes across 2 orders of magnitude and to achieve the same performance for these anesthetics without method or instrument re-configuration.

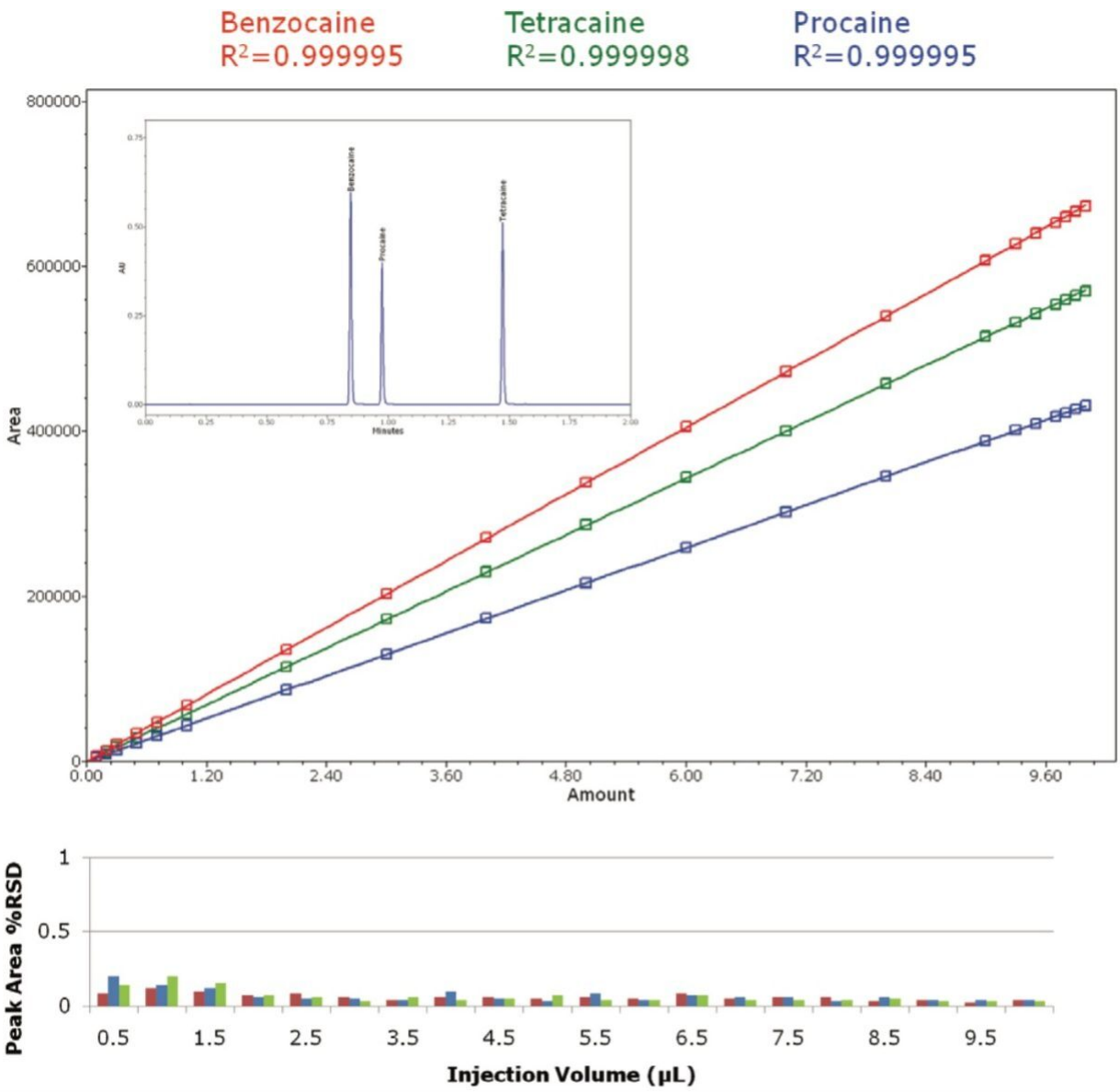

Figure 2. Injection linearity and repeatability for a series of anesthetics. Six replicate injections were performed at each volume, ranging from 0.1 to 10.0 µL. Correlation coefficients were derived from a 1/x weighting.

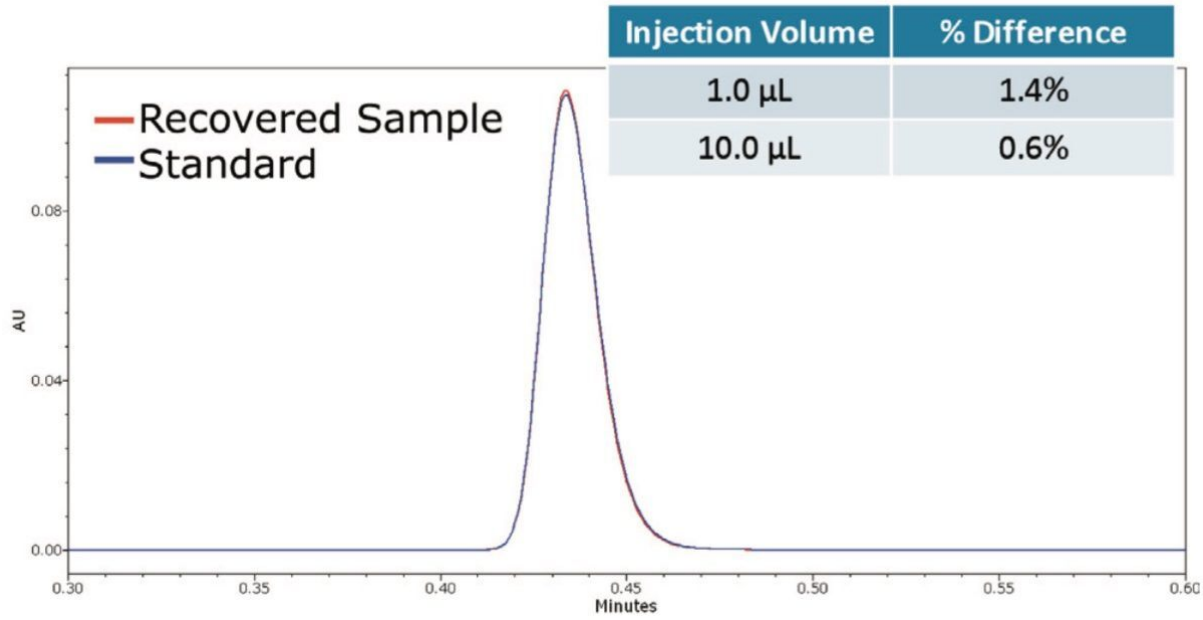

Figure 3. The accuracy of injection delivery for 1.0 µL and 10.0 µL injection volumes. Overlay of the recovered 10.0 µL sample and a standard shows the overall injection accuracy.

Conclusion

The design of the ACQUITY UPLC H-Class System was aimed at method development and routine analysis. Both of these areas require a sample delivery design that is highly repeatable, linear, and accurate. The flow-through-needle sample manager provides this performance in a highly flexible format ideal for both HPLC and UPLC applications.

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ACQUITY UPLC H-Class PLUS System <https://www.waters.com/10138533>

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