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Application Note

Successful Achievement of Ultra Low Injector Carryover of Benzyl Alcohol Using Arc HPLC

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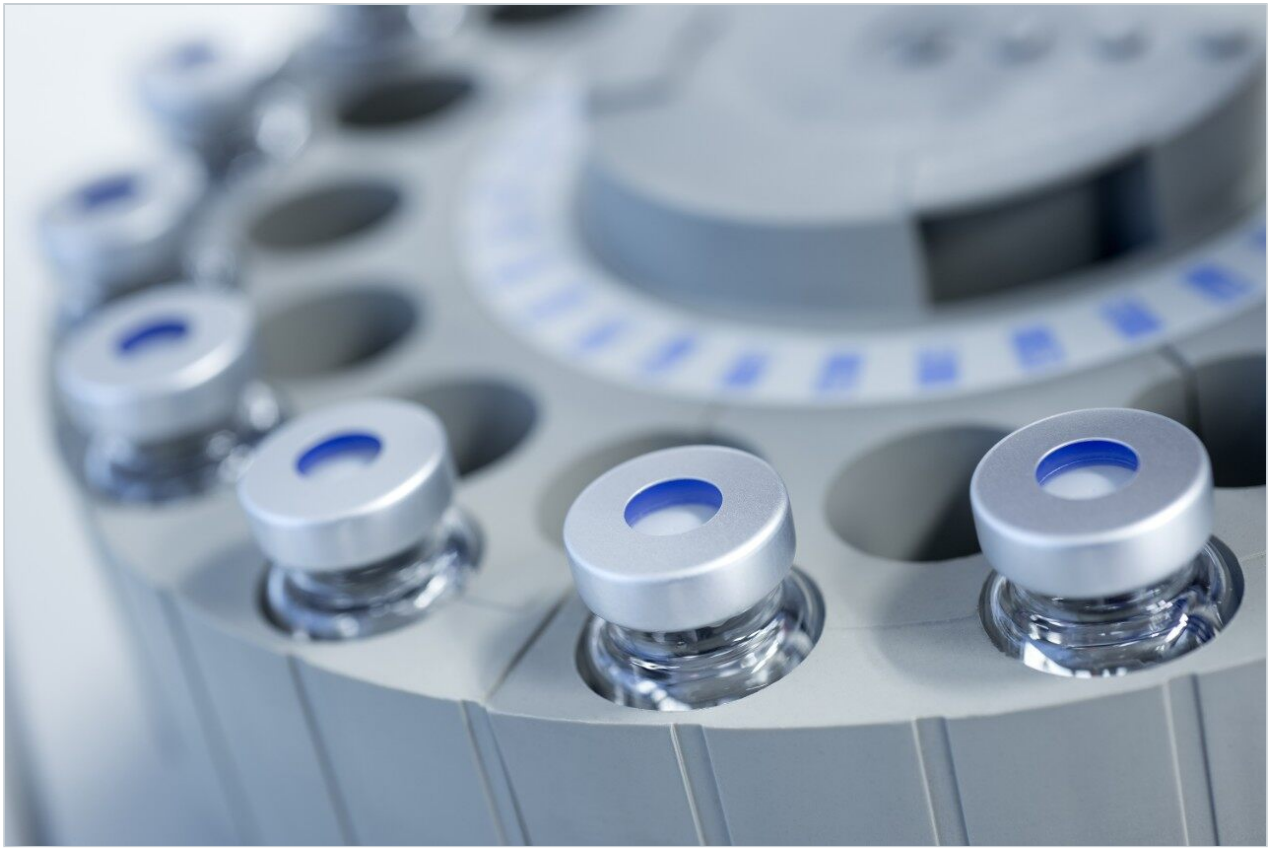

This is an Application Brief and does not contain a detailed Experimental section.

Abstract

Benzyl alcohol is known to give injector carryover in HPLC systems, which may result in out-of-specification values and, eventually, in-batch failure. In this experiment, we used the same HPLC method on the Waters Arc HPLC System and a comparable competitive HPLC system. The percentage carryover observed with the Arc HPLC System is much lower in comparison to the competitive system. The experiment confirms that the Arc HPLC System can minimize the injector carryover issue for benzyl alcohol.

Benefits

- The Arc HPLC System with Flow-Through Needle (FTN) design successfully reduces the carryover of an analyte

Introduction

“Carryover" is a term used to describe a type of sample contamination, which causes sample peaks to reappear in later runs that do not actually contain the sample (e.g., blank runs). There are several factors that can influence injector carryover, including analyte chemical nature, column chemistry, and HPLC system injector design.

The Arc HPLC System is a new High Performance Liquid Chromatography (HPLC) System used for routine testing in the pharmaceutical, food, academic, and various other markets. The Arc HPLC System is for laboratories looking for a rugged, reliable, and modern HPLC system that can run established HPLC methods regardless of the brand of liquid chromatograph on which they were originally developed, while preserving the chromatographic retention time reproducibility of those methods. The system offers ultra-low analyte carryover, superb injection precision, and backpressure tolerance to 9500 psi at 5.0 mL/min.


2998 PDA Detector
Waters
Sample Manager FTN-R
Arc HPLC
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Quaternary Solvent Manager-R
Arc HPLC
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Figure 1. Arc HPLC System.

The experiment conducted here helps to minimize the carryover issue of benzyl alcohol. Benzyl alcohol is used in atropine injection as a preservative. The content of benzyl alcohol is typically (20x) higher than atropine sulfate. The single injection analysis poses the challenge of very high concentration of benzyl alcohol being injected on column.

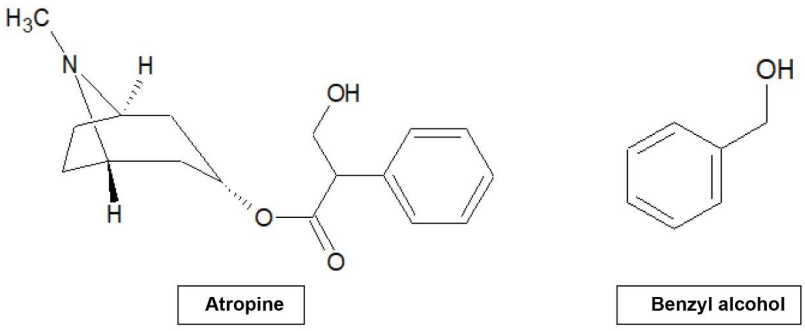


Figure 2. Structure of atropine and benzyl alcohol.

Experimental

Experimental Design

System:	Arc HPLC System with PDA Detector
Column :	Inertsil ODS-3 3 µm
Column temp.:	35 °C
Flow rate:	1.3 mL/min
Mobile phase A:	Buffer pH 4.0

Mobile phase B:	100% acetonitrile
Detection:	254, 210 nm
Sample concentration:	1800 ppm of benzyl alcohol
Injection volume:	50 µL
Purge solvent:	Water:Acetonitrile (9:1)
Needle wash solvent:	Water:Acetonitrile (1:1)
Run time:	25 min
Sample temp.:	25 °C

The experiment was designed to investigate the injector carryover of benzyl alcohol in the post-sample blank injection. The same analytical method conditions where used on the Arc HPLC System and a comparable competitive HPLC system. The sample sequence contains a pre-sample blank, sample (80 µg/mL of atropine sulphate and 1800 µg/mL of benzyl alcohol), and post-sample blank.

Results and Discussion

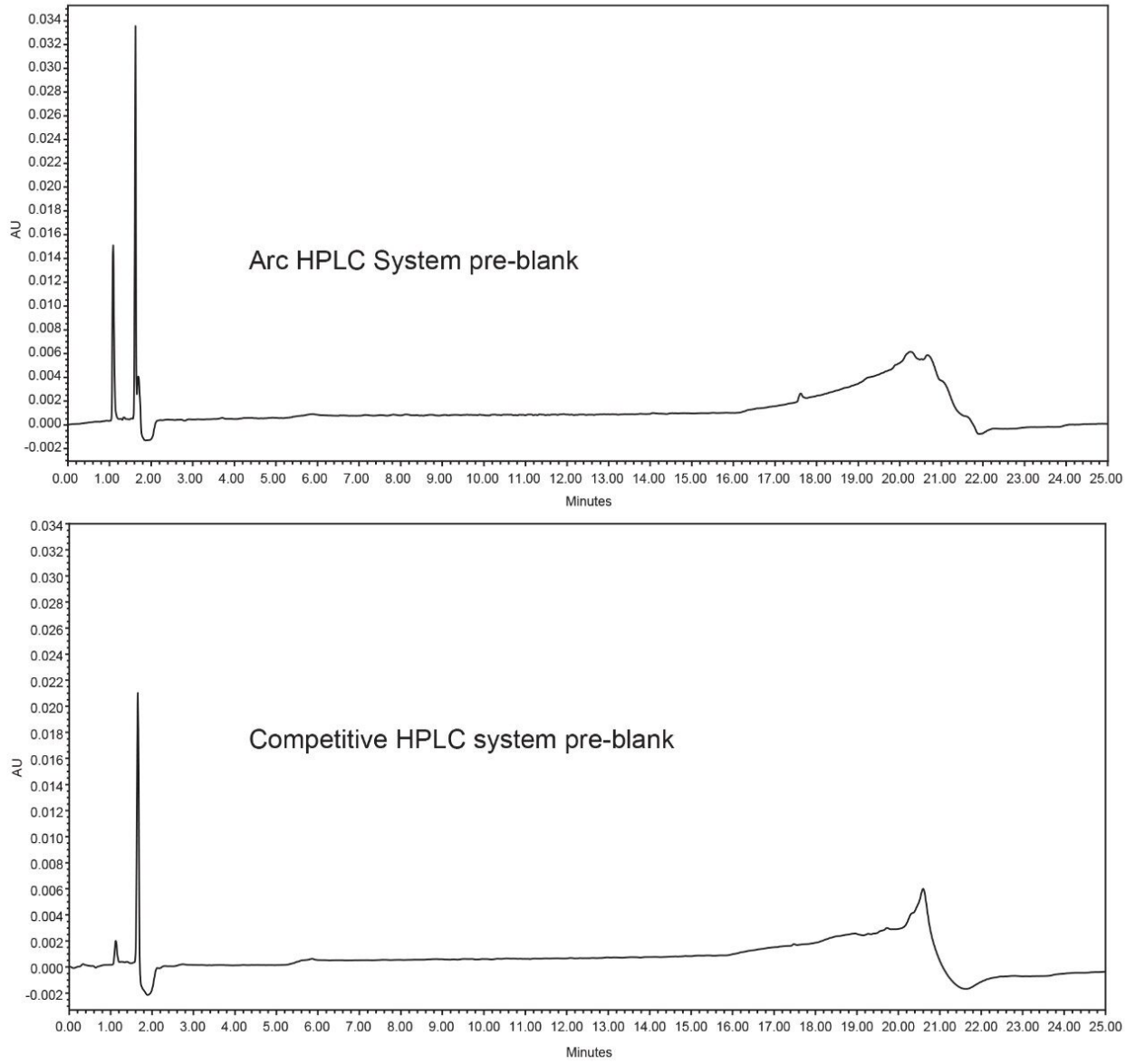
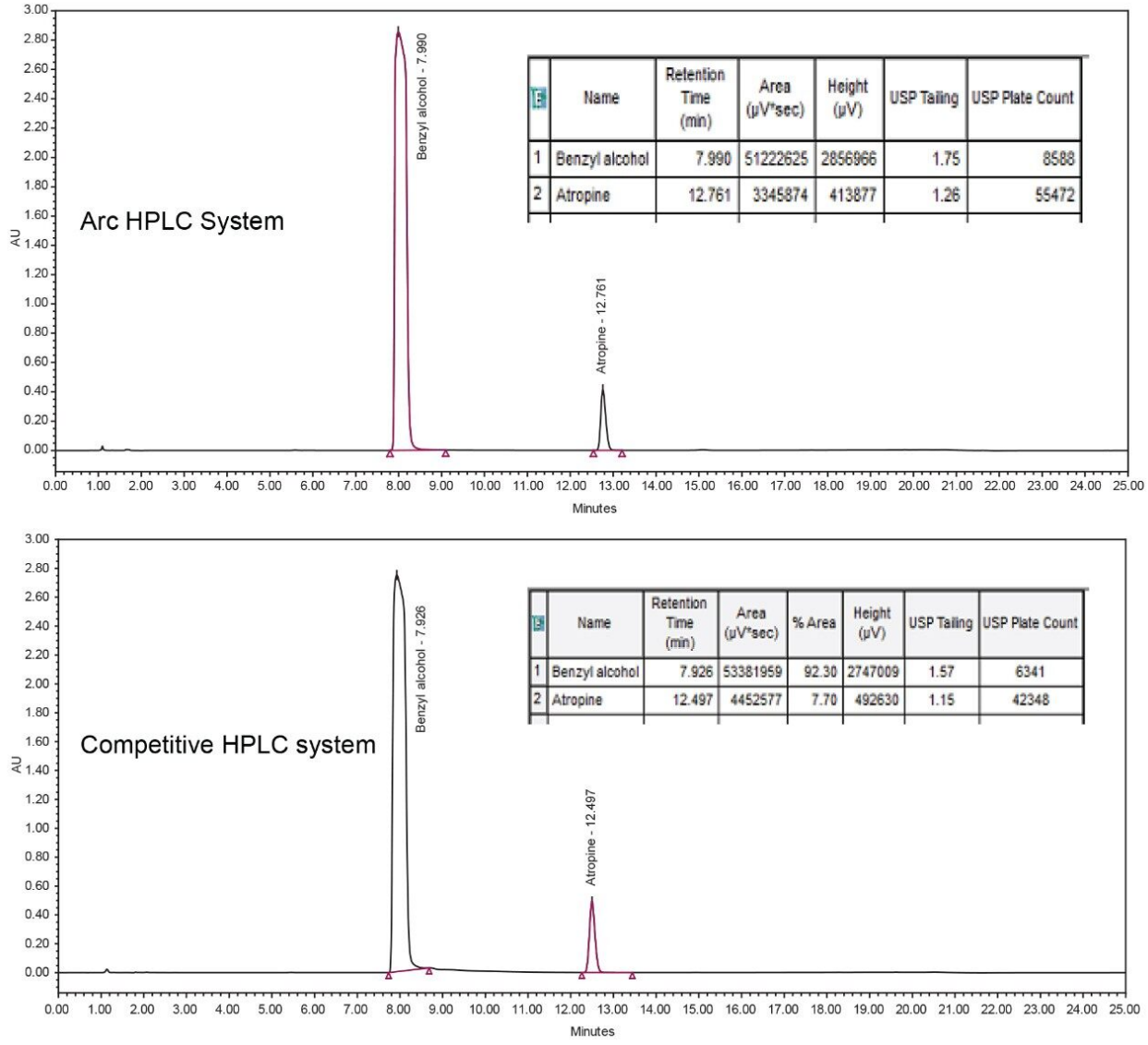


Figure 3. Comparison of pre-blank chromatograms for the Arc HPLC System and a competitive HPLC system.



	Name	Retention Time (min)	Area (µV*sec)	Height (µV)	USP Tailing	USP Plate Count
1	Benzyl alcohol	7.990	51222625	2856966	1.75	8588
2	Atropine	12.761	3345874	413877	1.26	55472

	Name	Retention Time (min)	Area (µV*sec)	% Area	Height (µV)	USP Tailing	USP Plate Count
1	Benzyl alcohol	7.926	53381959	92.30	2747009	1.57	6341
2	Atropine	12.497	4452577	7.70	492630	1.15	42348

Figure 4. Chromatograms for the Arc HPLC System and a competitive HPLC system of sample solution of 1800 ppm of benzyl alcohol (at this concentration the benzyl alcohol peak is saturated).

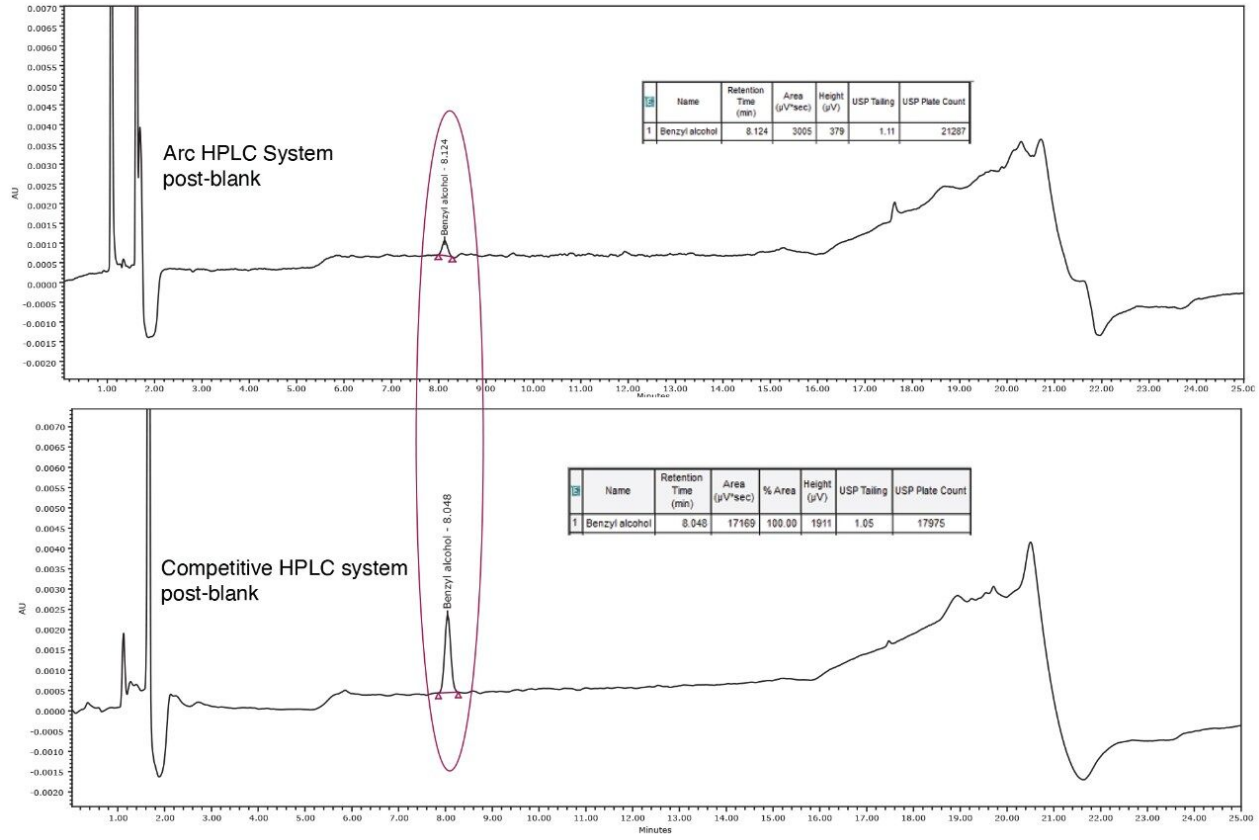


Figure 5. Comparison of post-sample blank chromatograms for the Arc HPLC System and a competitive HPLC system.

Parameter	Arc HPLC	HPLC
Pre-Blank elution pattern	No peak	No peak
Sample Solution (Benzyl alcohol 1800PPM)		
a. RT	7.99	7.92
b. Area	51222825	53381959
c. USP Tailing factor	1.7	1.6
d. USP Plate count	8588	6341
e. Precision (%RSD)	0.1	0.2
Post-blank (Benzyl alcohol peak)		
a. RT	8.12	8.04
b. Area	3005	17169
c. % Carryover	**0.006%**	**0.032%**

Table 1. Comparison of results between the Arc HPLC System and a competitive HPLC system.

The advanced Flow-Through Needle design of the Arc HPLC System helps to minimize the injector carryover, as the interior of the sample injection needle is continuously washed during the run. Further user-configurable wash settings provide the capability to address even 'sticky' compounds to ensure the successful management of injector carryover.

Conclusion

- The Arc HPLC System successfully achieved ultra-low injector carryover for benzyl alcohol analysis in atropine injection
- Injector carryover percentage is reduced 5.3x in the Arc HPLC System when compared with a competitive HPLC system
- The experiment confirms that the Arc HPLC System helps minimize the injector carryover issue for benzyl alcohol

References

1. Dlugasch, A., *et al*. Alliance Carryover Performance Part 1: Carryover Improvement Achieved Through Instrument Design Changes for the Alliance HPLC System. Waters Application Note, 2018, 720006386EN. <https://www.waters.com/webassets/cms/library/docs/720006386en.pdf>

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