

Technical note #019

Energy Drink Analysis

INTRODUCTION

This technical note presents a gradient method for the analysis of eight common ingredients found in energy drinks. The method was developed on an ACE 3 C18-Amide column using a VWR Hitachi Chromaster HPLC system. All eight components were readily separated on the ACE C18-Amide using a reversed-phase gradient (figure 1A). The method was then applied to the analysis of two commercially available energy drinks (figure 1B and 1C) and was proven to be suitable for detection of all eight analytes without interference from other sample peaks. Caffeine was found to be present in the largest quantity in both energy drinks. The standard amount of caffeine found in energy drinks is 80 – 150 mg per serving, with anything containing over 150 mg/L needing to be stated as having a “high caffeine content”, and being unsuitable for consumption by children and pregnant women. The two drinks analysed in this study contain approximately 300 mg/L and 120 mg/L of caffeine respectively. The average daily caffeine consumption for adults is recommended not to exceed 400 mg on a regular basis.

Both energy drinks analysed in this application also contained two of the most common artificial sweeteners: aspartame and acesulfame K. These sweeteners are approximately 200-times sweeter than natural sugars and are added to soft drinks to induce a sweet taste, without the associated calories of natural sugars such as sucrose. Sweeteners also do not increase blood sugar levels after consumption and so are suitable for diabetics. Both aspartame and acesulfame K have been deemed safe for human consumption with no proven adverse effects discovered to date.

The first energy drink analysed contained two B vitamins (B5 and B6) whereas the second soft drink contained only vitamin C (ascorbic acid). All vitamins are present in very small amounts. Citric acid, benzoate and sorbate were also detected and are added to energy drinks as preservatives to increase the product shelf-life.

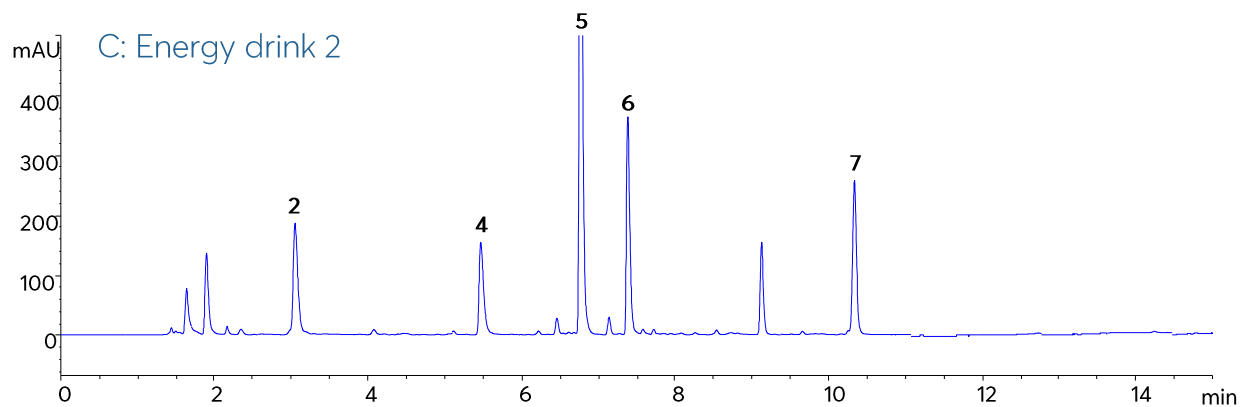
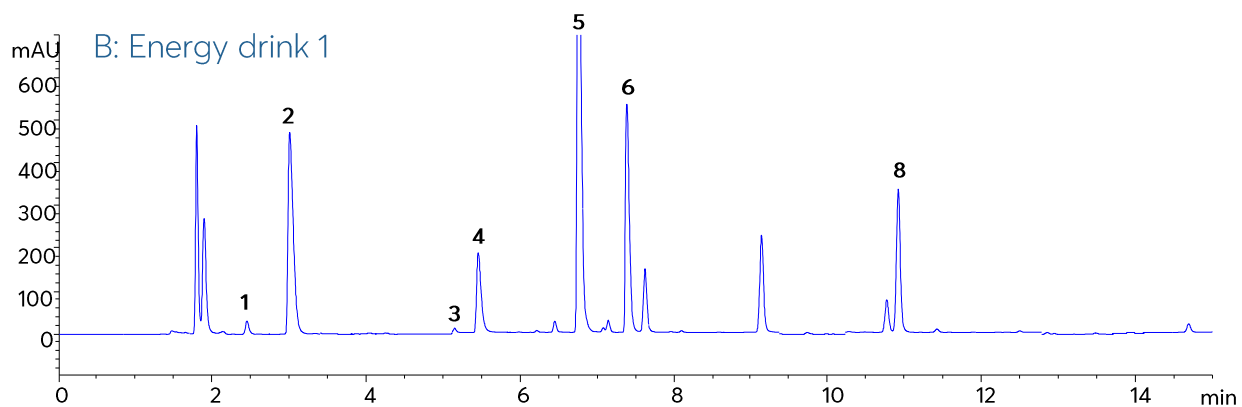
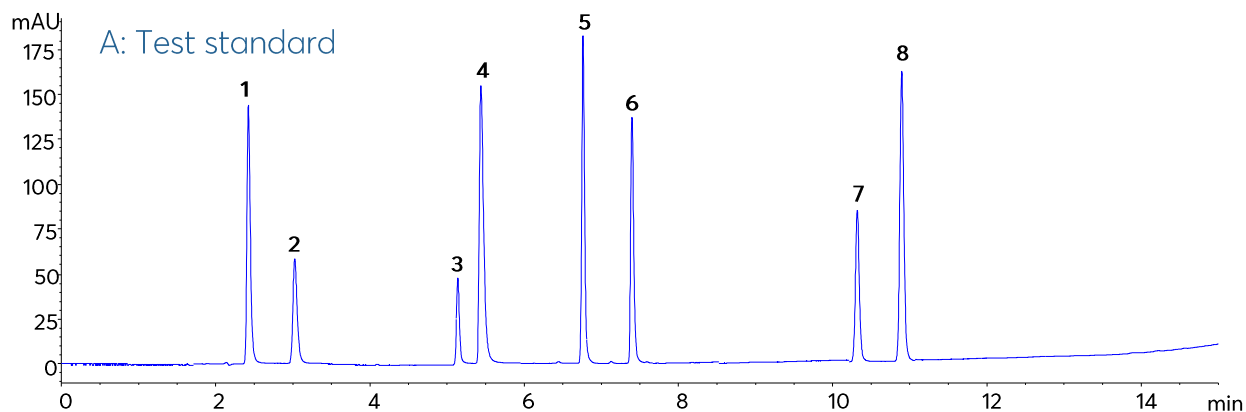
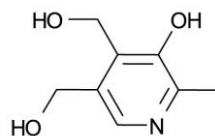


Figure 1: Analysis of two leading energy drink brands (Avantor® ACE® Application Note #6860).

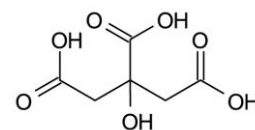
Sample: 1. Pyridoxine (B6), 2. Citric acid, 3. Pantothenic acid (B5), 4. Acesulfame K, 5. Caffeine, 6. Aspartame, 7. Sorbate, 8. Benzoate.

Table 1: Energy drink analysis method details

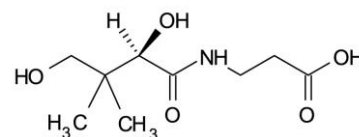
Column	ACE Excel 3 C18-Amide
Dimensions	150 x 4.6 mm
Mobile phases	A: 0.1% phosphoric acid in H ₂ O B: 0.1% phosphoric acid in MeCN
Gradient	5 – 65% B in 12 mins
Flow Rate	1.0 mL/min
Injection	5 µL
Temperature	30 °C
Detection	UV, 214 nm



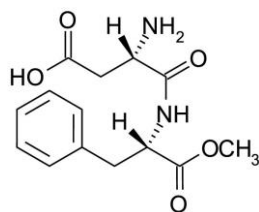
1. Pyridoxine (Vitamin B6)



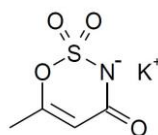
2. Citric acid



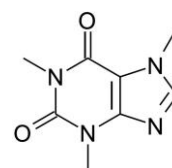
3. Pantothenic acid (Vitamin B5)



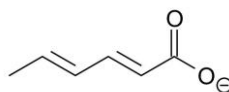
6. Aspartame



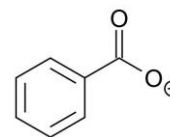
4. Acesulfame K



5. Caffeine



7. Sorbate



8. Benzoate

ORDERING TABLE

Product	Details	Size	Part number
ACE Excel 3 C18-Amide	HPLC/UHPLC column	150 x 4.6 mm	EXL-1112-1546U
Acetonitrile	VWR CHROMANORM [®] gradient grade	2.5 L	83639.320
Water	VWR CHROMANORM [®] gradient grade	2.5 L	83650.320
Phosphoric acid	VWR AnalR NORMAPUR analytical reagent	500 mL	20624.262
VWR Chromaster HPLC system	Pre-configured complete system with UV detector		903-0337
UHPLC guard cartridge	For 4.6 mm i.d. C18-Amide columns	3 pk	ACE-1P12-GD4U
UHPLC guard holder	Required for use of UHPLC guard cartridges	1	H0011