12-Hour Dissolution of an Extra Strength Excedrin® Brand Analgesic in 200mL of Media with the Axcend Focus LC®

Abstract

The Axcend Focus LC High-Performance Liquid Chromatography system (HPLC) delivers repeatable analyses of Active Pharmaceutical Ingredient (API) dissolution. In this test, an Extra Strength Excedrin analgesic tablet was dissolved, without stirring, in a beaker containing 200 mL of media [97% water; 3% acetonitrile (ACN); and <0.1% trifluoracetic acid (TFA)]. With samples acquired approximately every 12 minutes, the three APIs (acetaminophen, aspirin, and caffeine) were well separated at 4.5 min/run with an average retention time of 2.75 min, +/- 0.05 min RSD (relative standard deviation). Additionally, only 513 µL (0.51 mL) of organic and aqueous solvents were consumed during the 12-hour experiment, resulting in dramatically lower costs for solvents and waste disposal.

Introduction

Monitoring API dissolution is an important element of pharmaceutical research and development, as well as manufacturing quality assurance and control (QA/QC). Such test results impact multiple areas, including drug discovery, formulation, dosage, delivery, release, bioavailability, manufacturing, etc.

An Axcend Focus LC was used in this experiment: a compact, lightweight and hand-portable HPLC ideally suited to API dissolution experiments in laboratories and/or manufacturing facilities. This is because its small footprint saves precious laboratory space, while its minimal weight, <17.25 lbs (8.2 kg), allows the Axcend Focus LC to be hand-carried between stations when new tests are required. Additionally, as a nano-flow capillary HPLC, the Axcend Focus LC consumes approximately 1/500th of the solvents of traditional HPLCs, dramatically reducing the Total Cost of Ownership (TCO) per instrument.

Methods and Materials

Dissolution Process

An Extra Strength Excedrin tablet was dissolved, without stirring, in a beaker containing 200 mL of media (97% water; 3% ACN; and <0.1% TFA), while an external M50 Valco pump circulated the media through the injection loop and back into the beaker at 20 µL/min.

A laptop computer running Axcend software wirelessly drove an Axcend Focus LC as it managed a 12-hour queue of 55 sequential runs, with a new sample captured roughly every 12 minutes.

Run Conditions

Detection Wavelength	UV at 255 nm
Column Length	10 cm
Internal Diameter	150 µm
Packing	1.7 µm C18
Injection Volume	40 nL
Flow Rate	2 µL/min

Results

Excedrin's three APIs — acetaminophen (250 mg), aspirin (250 mg), and caffeine (65 mg) — were well separated in 4.5 min/run, with the results shown in Figure 1. Additionally, the Excedrin dissolution profile is shown in Fig. 2 by plotting the caffeine peak area over the course of the experiment.

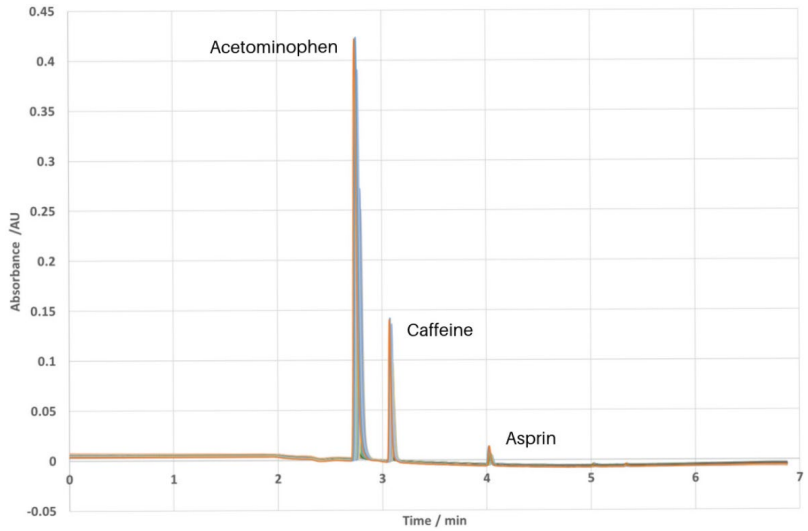

Figure 1. Overlapping chromatograms of 55 runs acquired over 12 hours. Flow rate: 2 µL/min; Gradient: 5% - 95% B, 0-5 min.; 0.5 min equilibration time; Mobile Phase A (97:3 Water:AcN); Mobile Phase B (3:97 Water:AcN); Column: 10 cm x 150 µm i.d.; 1.7 µm C18 column; Injection volume: 40 nL; Detection: UV at 255 nm. Elution peak order: acetaminophen, caffeine, aspirin.

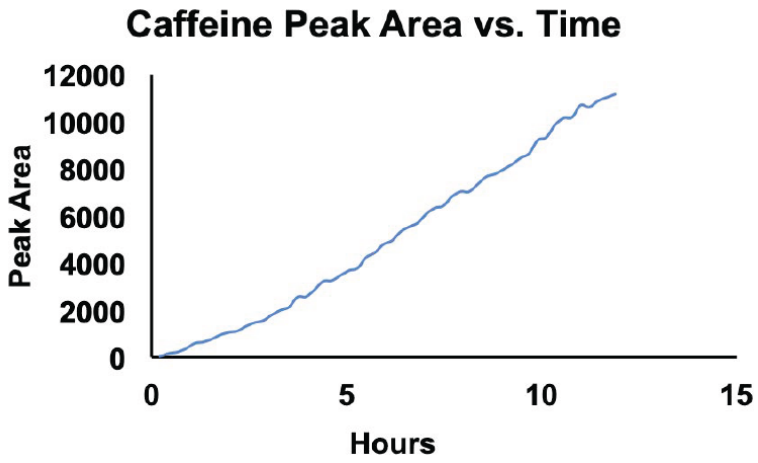

Figure 2. The caffeine peak area versus time from Fig. 1, with all conditions the same as in Fig. 1.

Summary

The Axcend Focus LC performed as expected for Extra Strength Excedrin tablet dissolution in 200 mL of media, with 55 overlapping chromatograms captured during the 12-hour experiment. In addition, by consuming a mere 0.51 mL of solvents during the test, the Axcend Focus LC offers a significant reduction in the Total Cost of Ownership (TCO) for organizations conducting API dissolution testing using HPLCs.