Thin Layer Chromatography Characterization of the Active Ingredients in Excedrin and Anacin

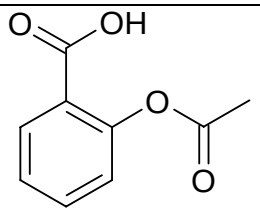
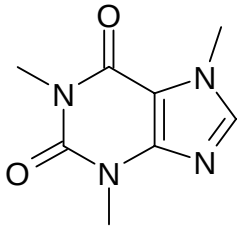
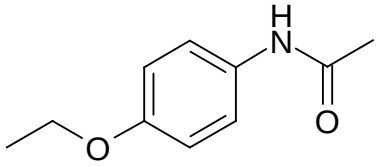
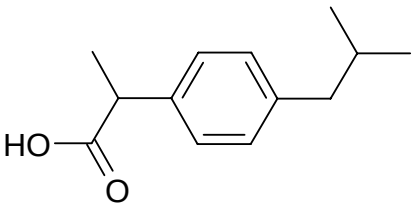
Peter Lipsy

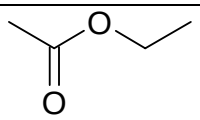
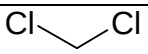
Department of Chemistry and Chemical Biology, Stevens Institute of Technology, Castle Point on Hudson, Hoboken, NJ 07030, USA

Abstract
Using thin layer chromatography, the active ingredients of Excedrin and Anacin were characterized by comparison with chromatograms of pure aspirin, caffeine, acetaminophen, and ibuprofen.

Introduction
Many of the commercial analgesics available today contain combinations of the same four active compounds: caffeine, aspirin, acetaminophen, and ibuprofen. Therefore, on the assumption that there was a solvent system which could sufficiently separate the Rf values of these four analgesics on a silicon-coated plate, thin layer chromatography was used to identify which of these exist in the commercial tablets of Excedrin and Anacin by a comparison of Rf values.

Table of Physical Properties

Substance	*Structure*	*Molecular Weight*
Aspirin		180.16
Caffeine		194.19
Acetaminophen		151.16
Ibuprofen		206.28

Ethyl Acetate		88.11
Dichloromethane		84.93

Experimental

Thin layer chromatograms of pure aspirin, caffeine, acetaminophen, and ibuprofen were produced in ethyl acetate. Only silicon-coated, plastic chromatographic plates were used throughout the experiment.

Ground Excedrin tablets were dissolved in dichloromethane. Ethyl acetate was used to conduct thin layer chromatography on the dissolved components of the ground-Excedrin solution. In the same manner, a thin layer chromatogram was taken of ground Anacin-tablet material.

Results

The chromatograms of pure aspirin, caffeine, acetaminophen, ibuprofen, Excedrin, and Anacin were as displayed in Figure 1, and their Rf values as recorded in Table 1. Excedrin's lowest and middle Rf values clearly correspond to those of caffeine and acetaminophen, respectively. Anacin's Rf values clearly correspond to those of caffeine and aspirin.

Substances:	*Aspirin*	*Caffeine*	*Acetaminophen*	*Ibuprofen*	*Excedrin*	*Anacin*
Rf Values:	0.45	0.08	0.24	0.60	0.09	0.10
					0.26	0.46
					0.39	

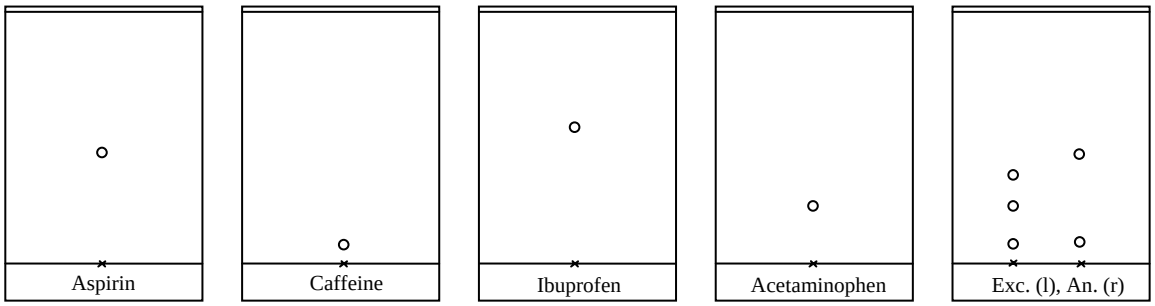


Figure 1 – Chromatograms

Discussion

Thin layer chromatography is a useful means of quickly characterizing the main active ingredients of certain commercial analgesics containing aspirin, caffeine, acetaminophen, and ibuprofen when they do not have many other organic compounds in significant proportions. In this case, it was determined by thin layer chromatography (with ethyl acetate as the mobile phase) that Excedrin contains caffeine and acetaminophen, but that Anacin contains caffeine and aspirin.