

Lab 1 "TLC" Conclusion

On my plate, Ibuprofen traveled the farthest, reaching 5.5 cm. Acetaminophen traveled 3.0 cm and aspirin traveled 4.0 cm. Due to differences in polarity, no two compounds traveled the same distance. It is important to record the R_f value of each compound because it is a ratio of how far the compound traveled to how far the mobile phase traveled so it is possible to compare to other plates.

The most polar compound out of those tested is caffeine because of its multiple amide and amine groups and an alkene group (see attached drawing). Caffeine is capable of forming dipole-dipole and London dispersion interactions with the silica. In contrast, the least polar is Ibuprofen because its carboxylic acid is its only polar group (see attached drawing). It is capable of London dispersion interactions with the silica. The results on the first plate support my hypothesis that caffeine is most polar and ibuprofen is least. Caffeine may have been impure because when held under the UV light, two spots appeared further up from the main spot in the same column.

UV light is needed to see how far the compounds traveled because when the mobile phase dries, it is not possible to discern where the spots ended. The UV light causes the spots to appear. Iodine was also used to help distinguish the spots. On my plate, after treating with iodine, acetaminophen and salicylamide turned yellow. This was helpful to align the compounds with the reference solution because some of the spots in that column turned yellow as well and those distances matched the distances of acetaminophen and salicylamide.

I saw two separate compounds in Anacin, two in Excedrin, and possibly two in Tylenol (the second spot appeared between two columns and it was very small). Comparing the R_f values from the individual compounds and in the over-the-counter drugs, it appears that Anacin contains caffeine and aspirin, Excedrin contains caffeine and acetaminophen, and Tylenol contains acetaminophen and possibly ibuprofen.

I used mystery "B" as my unknown solution and it appears to be Tylenol. Mystery "B" and Tylenol have the same R_f value and they both turned yellow after the iodine treatment. The second spot in the Tylenol column was also shared in the mystery column suggesting that they share that compound as well.

My plates turned out almost as expected except for two small miscellaneous dots in the caffeine column and one spot between the Tylenol and mystery columns in the second plate. I believe that the spot shared by Tylenol and the mystery column indicates a second compound that is shared between the two solutions that got too close so they formed a single spot. The extra spot in caffeine I believe is due to dripping something on my plate while spotting the initial line. In the reference for the second plate there was also one big spot where two smaller spots were expected. This may be due to the solution not having enough time for the two compounds to separate.

Plate 1		
Compound	Rf*	Distance (cm)
Acetaminophen	0.40	3.0
Aspirin	0.53	4.0
Caffeine	0.08	0.6
Ibuprofen	0.73	5.5
Salicylamide	0.64	4.8

Plate 2		
Drug	Rf*	Distance (cm)
Anacin	0.13, 0.55	0.9, 3.7
Excedrin	0.13, 0.45	0.9, 3.0
Tylenol	0.45, 0.81	3.0, 5.2
Mystery B	0.45, 0.81	3.0, 5.2

*Rf value calculated by dividing distance traveled by spot by distance traveled by mobile phase.
The distance traveled by mobile phase for plate 1 was 7.5 cm and for plate 2 was 6.7 cm.