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IDENTIFICATION OF TWO MOST USED ANALGESIC MEDICATIONS IN NO MEXICO, THROUGH REASONS OF IDENTIFICATION AND FINE LAYER CHROMATOGRAPHY

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Abstract: Within the Science Olympics Program, organized by the Mexican Academy of Sciences and the UNAM Chemistry Faculty, it was carried out at the XI National Chemistry Olympiad. Within two tests carried out by some of the middle school students, an experiment was carried out that did not identify by means of tests of three raw compounds, unknown by them and that they were acetylsalicylic acid, or paracetamol and caffeine. Once these composts have been identified, they can be deduced through an analysis by Fine Litter Chromatography, which are two problematic sources that are shown, being one of the Aspirin (acetylsalicylic acid) or Panadol (paracetamol). Another example could be Cafiaspirin (acetylsalicylic acid + caffeine) or Saridon (paracetamol + caffeine). The results obtained were very satisfactory.
Keywords: Analgesics, Group Tests, Thin Layer Chromatography, Chemical Olympiad

BACKGROUND

Within the Science Olympics Program, organized by the Mexican Academy of Sciences and the Faculty of Chemistry of the UNAM, 25 National Chemistry Olympiads have been held so far. These academic events have made it possible to select the 15 best high school students from all over Mexico, to integrate the Mexican team that represented and/or will represent Mexico in the International Chemistry Olympiad in which Mexico participates, the International Chemistry Olympiad. (IChO) and the Ibero-American Chemistry Olympiad. In three of them: a) The XI in the City of exams that the students took, an experiment was carried out through which they had to identify through drop tests three standard compounds, unknown to them and which were acetylsalicylic acid, paracetamol and caffeine. Once they identified these compounds, they had to deduce, through a Thin Layer Chromatography analysis, which

were the two problem samples that were given to them, one of them being Aspirin (acetylsalicylic acid) or Panadol (Tylenol or paracetamol). The other sample could be Cafiaspirin (acetylsalicylic acid + caffeine) or Saridon (paracetamol + caffeine) (León-Cedeño, 2002).

Currently, among the most used pain relievers in Mexico and found in any pharmacy in Mexico, their formulation contains some of the following compounds:

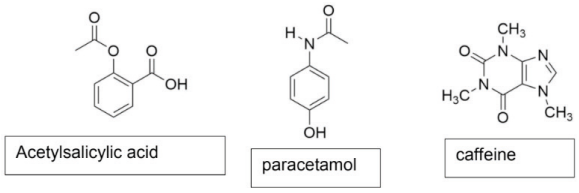

Figure 1. Structure of the three active compounds that are part of the analgesic formulations.

The commercial brands that can currently be found in Mexico are shown in table 1.

In all presentations, starch or methylcellulose is used as an excipient, in sufficient quantity to form the tablet (cbp).

GOALS

(1) That the student identify, through drop tests, the following functional groups: a carboxylic acid, a phenol and, through solubility tests in an acidic medium, an amino group.

(2) Know and apply the Thin Layer Chromatography technique to perform a qualitative analysis in order to identify 2 problem samples.

That the student verify that, in the commonly used analgesics, and that he has most likely used, the active ingredients already mentioned are found.

EXPERIMENTAL PART (PAVIA, 1988; MAYO, 2000)

In this experiment, the student had to identify, through characteristic reactions of a functional group (drop tests), solubility tests and an analysis by thin layer chromatography, the 5 solids that were on his work table, in the plastic containers that had the letters A, B, C, D and E.

Compounds A, B and C were pure and could be any of those already indicated in Figure 1.

Solid D was a tablet, which could be Aspirin or Panadol.

And finally solid E was a tablet that could be Saridon or Cafiaspirin.

FIRST PART. IDENTIFICATION OF COMPOUNDS A, B AND C:

The student followed each of the following steps, so that he had the necessary evidence to identify compounds A, B and C (Shriner, 1995).

To achieve the above, the student placed a small amount of each of the compounds, for example, compound A, in three test tubes (tubes 1, 2 and 3) and was asked to write down his observations and complete the table 2.

1. To tube No. 1 he added 15 drops of 5% HCl solution and stirred.

2. To tube No. 2, he added 15 drops of 5% NaHCO3 solution and stirred.

3. To tube No. 3, he added 15 drops of water and added 5 drops of a 3% ferric chloride solution. (NOTE: a phenol gives an intense blue coloration).

TRADENAME	PRODUCED BY:	COMPOSITION PER TABLET:	
ASPIRIN	Bayer de México, S.A. de C.V.	ACETYLSALICYLIC ACID	500 mg
CAFIASPIRINEA	Bayer de México, S.A. de C.V.	ACETYLSALICYLIC ACID CAFFEINE	500 mg 30 mg
PANADOL	Smith Kline Beecham, México, S.A. de C.V.	PARACETAMOL	500 mg
TYLENOL	Janssen Cilag, S.A. de C. V	PARACETAMOL	500 mg
XL-DOL	Selder, S.A. de C.V.	PARACETAMOL	500 mg
SARIDON	Productos Roche, S.A. de C.V.	PARACETAMOL CAFFEINE	500 mg 30 mg

Table 1. Trade names of the main analgesics used in Mexico and their composition.

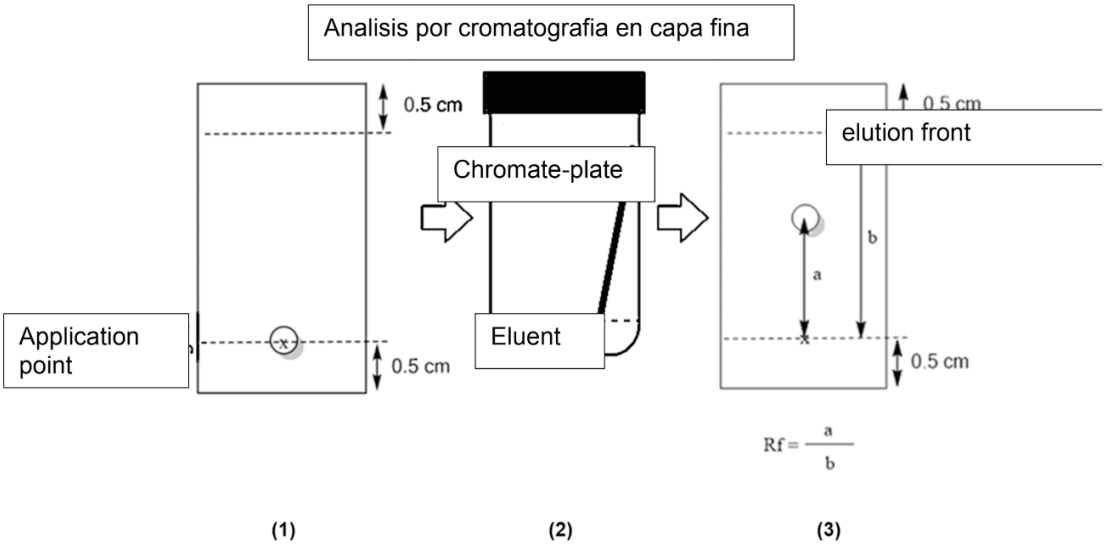

Figure 3. Steps to follow: 1) Apply the sample to the chromatoplate. 2) Elution of the solvent mixture. 3) Determine the Rf of each of the reference compounds of the problems

Identification tests	**COMPOUND (+) dissolved or gave colorful reaction**			**NOTES**
	A	B	C	
a) HCl 5%				
b) $NaHCO_3$ 5%				
c) Test with $FeCl_3$ (ferric chloride)				

Table 2. Tests that the student had to take

Identification tests	**COMPOUND (+) dissolved or gave colorful reaction**			**NOTES**
	A	**B**	**C**	
a) HCl 5%			+	**Dissolved**
b) $NaHCO_3$ 5%	+			**Release of a gas (CO_2)**
c) Test with $FeCl_3$ (ferric chloride)		+		**Intense blue coloring**

Table 3. Results of the tests carried out by the student

3.B SECOND PART.
IDENTIFICATION OF TABLETS D AND E:

THEORETICAL INTRODUCTION
THIN LAYER CHROMATOGRAPHY

We must not forget that of the students who participate in the National Chemistry Olympiads, they are high school students, and that the topic of FINE LAYER CHROMATOGRAPHY could be studied during their training in their State of origin or at worst. cases had not seen it until the day of the practical exam. For this reason, before going to the laboratory, they were shown a video in which they were given the fundamentals of this experimental technique and each of the steps to follow using this analysis technique was illustrated. Later they went to work in the laboratory.

To identify tablets D and E, the active ingredient must be extracted from the problem tablet. For this, the entire ground content of each of the two tablets is placed separately in the 50 ml Erlenmeyer flasks. 10 ml of acetone are added to each of them and the mixture is stirred for 5 minutes. The mixture is filtered by gravity using a glass funnel with a short stem, receiving the filtrate from each tablet in their respective test tubes (solutions D and E).

On the top and bottom of the plate, two lines are drawn with a pencil 0.5 cm from the edges. The lower line is divided into 5 parts equidistant from each other, they are marked, and on the first three marks the solutions of the three standards are applied (each student was provided with their solutions in acetone) of acetylsalicylic acid, paracetamol and caffeine. In the next two points the student applied the acetone solutions of tablets D and E respectively.

Once the student had applied all the solutions to the stationary phase (both the 3 standards and the two tablets), the acetone was allowed to evaporate and the plate was introduced into the elution chamber (8 cm wide bottle with lid). high) which contained a mixture of hexane-acetone (40:60). He let the solvent mixture elute to the top of the plate (which is marked with a pencil), carefully removed the chromatoplate and let the solvent mixture evaporate. The plate was allowed to develop with iodine fumes. The student determined the Rf values, which he reported and also had to deduce based on the data from the drop tests and the analysis by thin plate chromatography, the composition of the two tablets D and F.

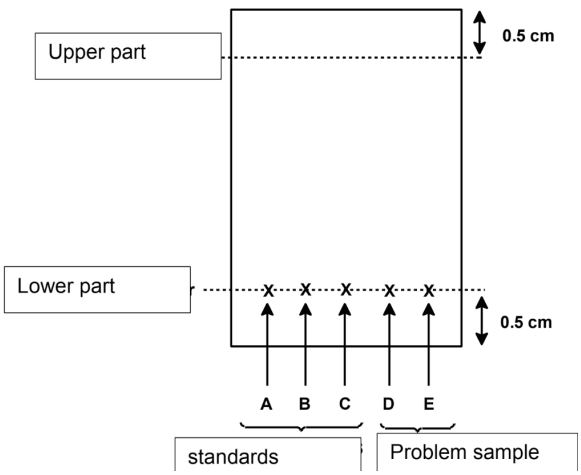

Figure 2. Drawing of the chromatoplate once the sample application lines and the upper mark marking the elution limit of the eluent were marked.

RESULTS OBTAINED

Of the 60 students who performed this experiment, 50 correctly guessed what their compounds A, B and C were. And of the same 60 students, 40 correctly guessed what their compounds D and E were.

Regarding the gout tests, the summary of the tests is shown in table 3.

The Rf values of the 3 compounds are shown in Figure 4.

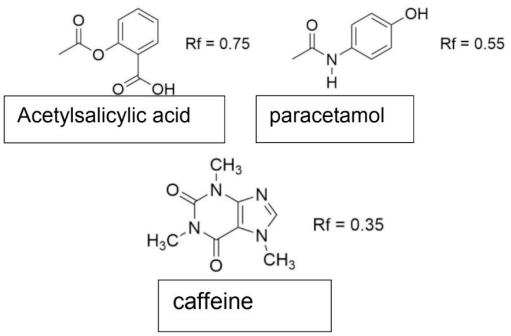

Figure 4. Structure of the three active compounds and their respective values de Rf determinados experimentalmente (ver parte experimental).

CONCLUSIONS

This is an experiment that has turned out to be interesting for the students. Two analytical techniques are used, such as drop tests and analysis by thin layer chromatography. It becomes clear to the students that commercial analgesics contain the active ingredients that were already mentioned.

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