

# Analysis of Counterfeit Medicines

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## Introduction

The counterfeiting of medicines is a global problem, which has been on the ascendancy in recent years, and the incidence is usually significant in regions with weak drug regulatory and legal infrastructures.

In this work, we have made a comparison between forty three (43) medicines from a variety of therapeutic classes, collected in the street or at the pharmacies in Kabul (the capital of Afghanistan) with their equivalents available at the pharmacies in France, in order to detect any counterfeiting operation. The strategy was to apply different analysis techniques for producing "chemical fingerprints" of each drug suspected to be counterfeited (Afghanistan's medicines), and then to make a comparison with the "chemical fingerprints" of the reference analog (Figure 1).

## Experimental Conditions

Four techniques have been applied for the analysis of different medicines:

1- HPLC was carried out using a DIONEX chromatographic apparatus equipped with an automatic injector and RF 2000 fluorescence detector. The analytical column was a reversed-phase column C18 (300mm×3.9 mm i.d.).

2- The REMEDI HS: an automated high pressure liquid chromatography system with on-line sample clean-up, multi-column separation and a full scan Diode Array Detection.

3- The GC system consisted of an Agilent 6850 chromatographic apparatus equipped with an automatic injector and a mass spectrometer detector (Agilent 5975). The analytical column was non-polar columns DB-5 (20 m x .18 mm i.d., 0.18  $\mu$ m film).

4- UV-VIS spectrophotometer of mark VARIAN controlled by the software Cary 100 Bio

In this work it was considered that when the doses of medicines are outside the fork of  $\pm 10\%$  of the content specified by the manufacturer, they were counterfeit medicines.

## Results and discussions

Quantitative analysis showed that four medicines among the 21 medicines analyzed by GC/MS and/or HPLC and/or REMEDI HS were sub-dosed of their active ingredient, three other medicines were over-dosed and only one medicine contained impurities. However, the qualitative analysis of all medicines (43 medicines) showed that there was no medicine with or without active ingredient other than that on label.

## Conclusion

Interesting information was obtained from this study. Nearly 43 % of the medicines analyzed in this study were counterfeited medicines, proving the reality of counterfeit medicines in Afghanistan.

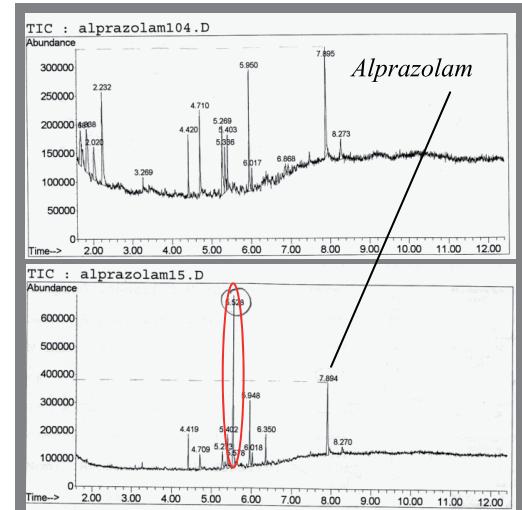


Figure 1: Chromatograms of Alprazolam (reference and suspected medicines).



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