

Identifying Counterfeit Amoxicillin in National Capital District, Port Moresby, Papua New Guinea



By David Maima
maimadavid9@gmail.com
University of Goroka



INTRODUCTION

- ⇒ The World Health Organization (WHO) has reported that counterfeit medicines potentially make-up more than 50% of the global drug market with a significant proportion of these fake products being encountered in developing countries. And also in developing countries, it estimated that 1 in every 10 medical products is substandard or falsified.
- ⇒ The influx of counterfeit drugs that are in developing countries is due to weak national drug regulatory authority and no standard government laboratories to monitor drug quality (Nair, 2011).This TLC seeks to provide solutions to address these counterfeit drugs.
- ⇒ About 4 different samples of Amoxicillin Capsules were collected from 4 different suppliers in Port Moresby, Papua New Guinea. Samples from a Chinese retail store, street vendors, and a certified pharmacy outlet and from Port Moresby General Hospital.
- ⇒ Each sample was subjected to visual inspection, disintegration testing, and TLC analysis according to Standard Reference Material. Samples were further investigated according to the methods of the US Pharmacopeia using high-performance liquid chromatography (HPLC) here at the University of Papua New Guinea.

THEORETICAL BACKGROUND

- ⇒ Thin layer chromatography (TLC) is a technique that is used for separating non-volatile compounds, identifying compounds, determining their purity and following the progress of a reaction. It is basically composed of two phases: the stationary phase (e.g. silica Gel) and Mobile Phase (e.g. Hexane, Methanol).The underlying principle involves the polarity of compounds of interest that is to be determined/ examined.
- ⇒ Less polar compounds/molecules will move closer to the solvent front through the capillary action and more polar compounds/molecules will move less or somewhat will stay close to the starting point on a TLC plate.
- ⇒ The Mobile phase helps to move less polar compounds away from the starting point via capillary actions. In Figure 1. Compound X is more polar than compound Y and Unknown.
- ⇒ The Stationary phase traps all the polar compounds close to the starting point.
- ⇒ Silica gel is often used as the stationary phase as it is bonded to 4 oxygen atoms in which each oxygen atom becomes partially negatively charged. The negative charge on each oxygen atom makes it vulnerable to any incoming polar molecules/compounds.

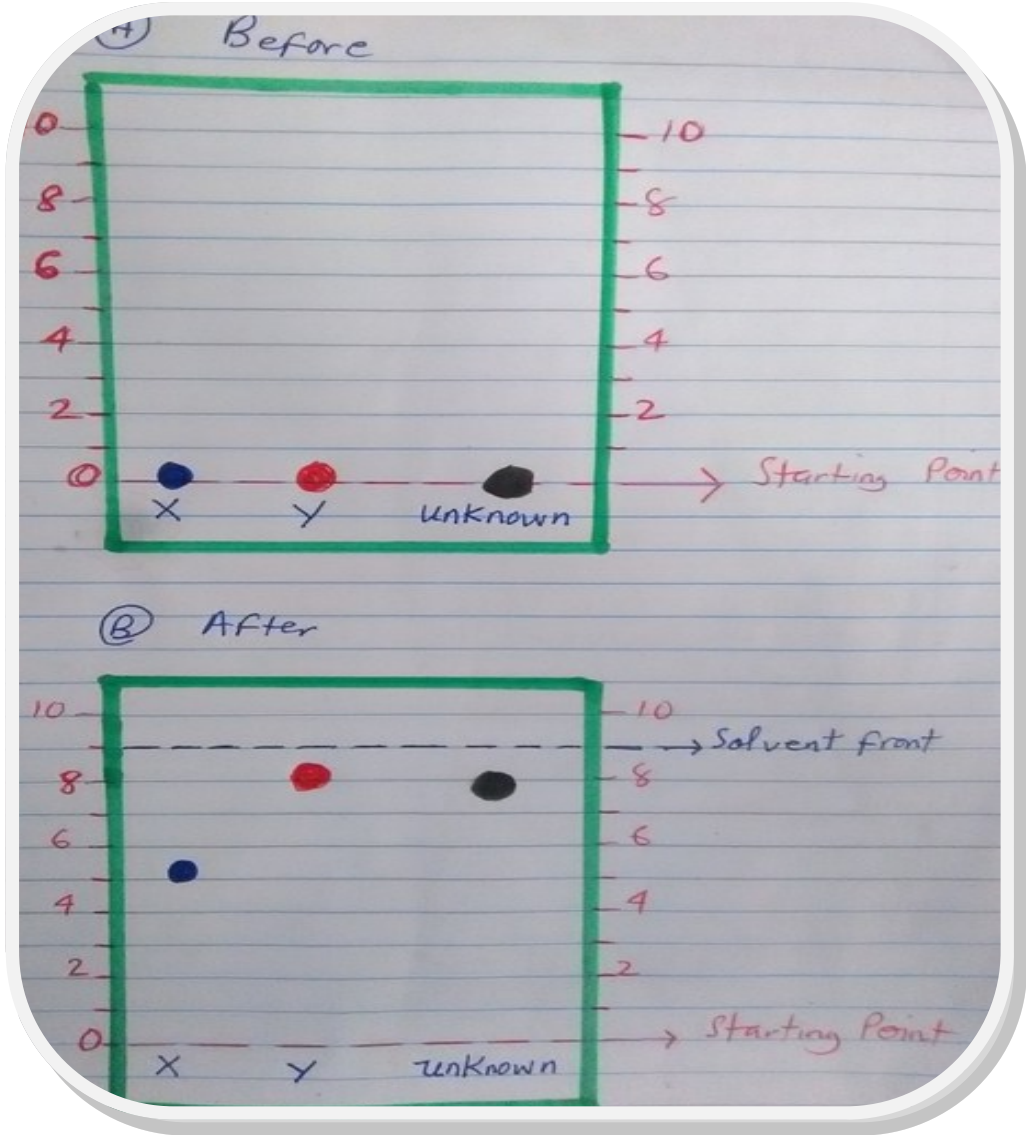


Figure 1. Polar and Non-polar

METHODOLOGY

- 1 . Visual Inspection
- ⇒ Compared the brand names, sizes, colour and weight of each capsules from the 4 different suppliers as according to the International Pharmaceutical Federation’s checklist for Visual inspection of counterfeit products
- 

Figure 2. Sample AB
- 

Figure 3. Sample CD
- 

Figure 4. Sample E
- Sample AB = Samples from Asian Stores and street vendors , Sample CD= Samples from a local Pharmacy Outlet and Port Moresby General Hospital and Sample E = Standard Amoxicillin Capsules

2. Disintegration Testing
- Each capsule was dissolved in 125ml water to measure the solubility rates.
3. TLC Analysis
- ⇒ Mobile Phases (20ml ethanol= 1.25%) and acetic acid (2%) in the ratio of 20:80)
 - ⇒ Stationary phase (Silica gel 60 F₂₅₄ plate (Merck, Darmstadt, Germany)

RESULTS

- ⇒ TLC plate spotted under UV lamp (wavelength 230nm) with 4 different samples against standard reference sample.
- ⇒ Retention Fractions (R_F) Values (Sample E= 0.65, Sample C=0.64 sample D = 0.62 Sample A = 0.59 and sample B = 0.52)

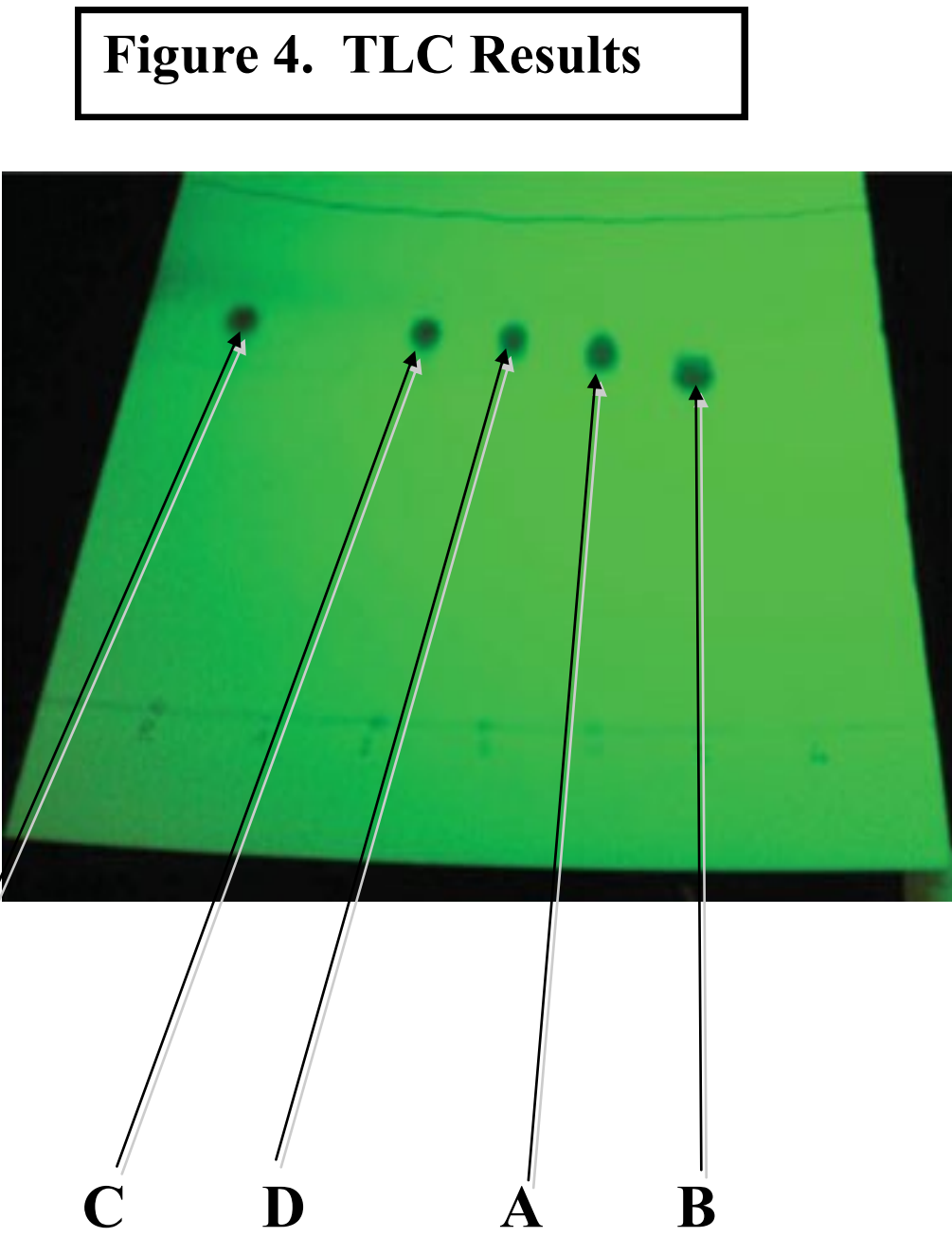


Figure 4. TLC Results

DISCUSSION

- ⇒ The TLC Tests show that Sample A and B which were collected from Street vendor and Asian Store did not conform to the standard Amoxicillin drugs.
- ⇒ It means these samples are containing less or no main active ingredient, amoxicillin trihydrate.
- ⇒ Further HPLC Test shows that those sample (A & B) have different Retention Time to the Standard Amoxicillin Sample E

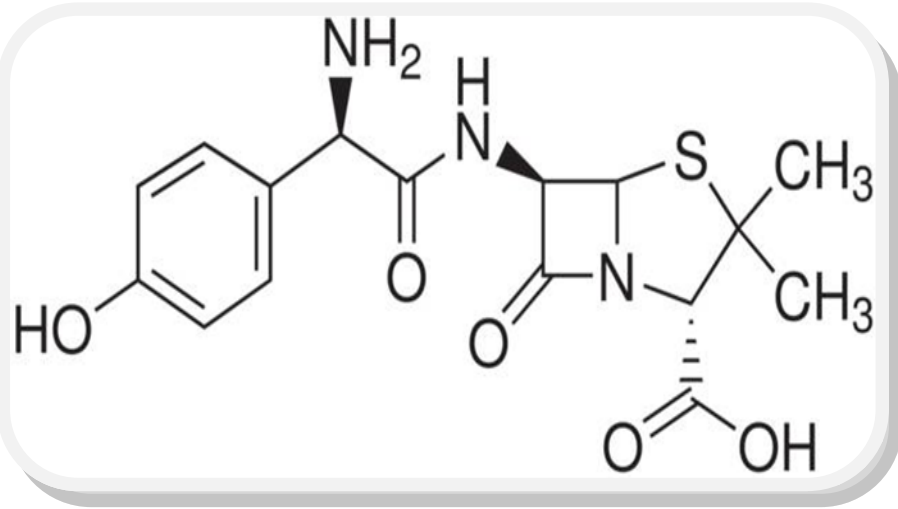


Figure 5. Amoxicillin Trihydrate Structure

CONCLUSION

- ⇒ Apart from other methods, TLC Method is very cost-effective and is highly recommended to use in resource poor setting. The procedures are very easy and it is carried out in less time with reputable results.
- ⇒ In the future this TLC technique may be applied to test other counterfeit or substandard medical drugs.

FUTURE WORK

ACKNOWLEDGEMENTS

1. Professor Topul Rali, University of Papua New Guinea
2. Mr. Wasa Sibiya– University of Goroka

