INVESTIGATION ON PACKAGING MATERIAL OF COUNTERFEIT PANADOL® VARIANTS AND CREOBIC® CREAM BY NON-DESTRUCTIVE TESTS

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A dissertation submitted in partial fulfilment of the
requirements for the award of the degree of
Master of Science (Forensic Science)

Faculty of Science
Universiti Teknologi Malaysia

2014

Especially to my beloved Mother with endless gratitude and admiration

ACKNOWLEDGEMENT

The writer wishes to acknowledge the supervisors; Assoc. Prof. Dr. Azli Bin Sulaiman and Assoc. Prof. Dr. Wan Aizan Binti Wan Abdul Rahman for their guidance and patience alongside the journey in establishing this dissertation.

To Assoc. Prof. Dr. Umi Kalthom Binti Ahmad and Dr. Naji Arafat Bin Mahat for their endless encouragement. Ministry of Health (MOH) and Pharmaceutical Enforcement Division, MOH for the trust and financial support.

Infinite appreciation to Malaysia Fire and Rescue Department of Johor, UTM lecturers, staffs and friends whom have contributed to this achievement.

ABSTRACT

The World Health Organization (WHO) has defined counterfeit drugs as those which are “deliberately mislabelled with respect to identity and/or source”. Packaging materials are ubiquitous and manufacturers are able to obtain them from multiples of supplier. That is the reason for the unfeasible confiscation. There are a few methods used to detect counterfeit products through its packaging: visual inspection (visible light) and other optical methods such as infrared and ultraviolet analysis as well as pattern recognition. The objective of this study is to differentiate the features on the packaging material found from the original and the counterfeit of the same fast-moving pharmaceutical products. There are four different product packaging investigated obtained through over-the-counter purchase, from the complainant or seized by the authority. Firstly, examination is carried out on the direct paperboard packaging by comparison; physical examination on the basic properties (viz. dimension, thickness and prints), microscopic, optical character recognition (OCR) and near infrared analysis. Then, further investigation on the information printed and hologram serial number was done. Determination of the originality of the products upon procurement was done through authenticating the hologram. Microscopic examination on the printed paperboard exhibited consistent printing effect for all of the counterfeit and the genuine ones. Results on OCR for certain parts of the prints show constant difference between the original and counterfeit. However, the IR results indicated that such differences may prove inconsistent and hence unreliable to be used for comparison. In conclusion, the counterfeit pharmaceutical packaging may be distinguished from the genuine ones through physical examination of its basic properties, microscopic observation and OCR.

ABSTRAK

Pertubuhan Kesihatan Sedunia (WHO) telah mentakrifkan ubat palsu sebagai "kesilapan pelabelan yang disengajakan berkenaan dengan identiti dan/atau sumber". Bahan pembungkusan boleh didapati secara meluas daripada sumber pembekal yang banyak. Oleh sebab itu, rampasan terhadap bahan mentah pembungkusan untuk ubatan palsu sukar dilakukan. Terdapat beberapa kaedah yang biasa digunakan untuk mengesan produk palsu melalui pembungkusan: pemeriksaan visual dan kaedah optik lain seperti analisis inframerah dan ultralembayung serta pengecaman corak. Objektif kajian ini adalah untuk membezakan ciri-ciri bahan pembungkusan yang terdapat pada produk tulen dan palsu daripada produk farmaseutikal tertentu. Terdapat empat bahan pembungkusan produk yang berbeza diperolehi melalui pembelian di kaunter, daripada pengadu atau disita oleh pihak berkuasa. Pemeriksaan dijalankan terhadap bungkusan kotak luar dengan membuat perbandingan; pemeriksaan fizikal ke atas sifat-sifat asas (dimensi, ketebalan dan cetakan), pemeriksaan mikroskopik, pengecaman aksara optik (OCR) dan analisis inframerah. Kemudian, siasatan lanjut mengenai maklumat yang tercetak dan nombor siri hologram dilakukan. Penentuan awal ketulenan produk dilakukan semasa perolehan melalui pengesahan hologram. Pemeriksaan sifat-sifat asas serta mikroskopik ke atas kualiti percetakan boleh membezakan antara produk palsu dan tulen. Hasil analisa OCR untuk bahagian-bahagian tertentu pada percetakan di luar kotak pembungkusan menunjukkan perbezaan antara produk tulen dan palsu. Walau bagaimanapun, analisis inframerah menunjukkan spektrum yang tidak dapat membezakan antara produk palsu dan produk tulen. Kesimpulannya, bahan pembungkusan produk farmaseutikal palsu dan tulen boleh dibezakan menggunakan sifat-sifat asas, pemeriksaan mikroskopik dan OCR.

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LIST OF ABBREVIATIONS

API	-	Active pharmaceutical ingredient
CC	-	Creobic® Cream
cm	-	Centimeter
DCA	-	Drug Control Authority
DUNAS	-	*Dasar Ubat Nasional*
FTIR-ATR	-	Fourier Transform Infrared – Attenuated Total Reflectance
MOH	-	Ministry of Health
mm	-	Millimeter
MTDCC	-	Ministry of Domestic Trade, Co-operatives and Consumerism
nm	-	Nanometer
NPCB	-	National Control Pharmaceutical Bureau
OCR	-	Optical character recognition
OTC	-	Over-the-counter
PA	-	Panadol® Actifast
PCA	-	Principal Component Analysis
PE	-	Panadol® Extend
PED	-	Pharmaceutical Enforcement Division
ppi	-	Pixel per inch
PR	-	Panadol®
RFID	-	Radio frequency identification
SD		Standard Deviation
TDM	-	Toxicity Drug Monitoring
USFDA		United State Food and Drug Administration
WHO		World Health Organization

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Throughout the chapter, discussion will be from the investigation on the information on the paperboard packaging such as the manufacturing date and hologram serial number search using the Mediharta Sdn. Bhd. official web site, observations using microscope, Fourier transform infrared – attenuated total reflectance (FTIR-ATR) and optical character recognition (OCR). The findings of the sampling pattern and procurement of the samples will also be discussed.

1.2 Research Background

In this study, focussed is on the paperboard packaging. There are several analysis to be used on this material. Since the information pertaining to the medicine is printed on the paperboard, there is also of importance to analyse this as a way to recognize its authenticity. In Malaysia, a medicinal product will only be recognized as registered when there are two (2) features; product registration number and Meditag^{TM} hologram. Thus, the hologram will also be investigated through its unique serial number.

1.3 Problem Statement

Counterfeit medicine has flooded Malaysia market and has been an issue among healthcare professionals. Public seem to have easy access to counterfeit medicine rather than the authentic due to the vast availability and cheaper price. Usage of counterfeit medicine will endanger lives due to the unknown ingredient in the products.

Although the better way to ensure a fake drug is by direct analysis of the active pharmaceutical ingredient (API), but this is not feasible due to short course therapies and what only remains is the packaging material. Nevertheless, most patients/customers will discard the packaging materials as thought to be unimportant although it contain most of the information pertaining to the medication.

Furthermore, modus operandi of modern criminals' separately ship packaging materials of the fake and the raw materials for the pharmaceutical dosages makes it even harder for the perpetrators to be caught.

Counterfeiting is also a form of intellectual property infringement. Even though this is not of forensic significance but this may be the main reason if a jointly effort to be applied in further studies.

The importance to precede such study is to prepare the authorities, stake holders and public in differentiating fake medicinal products. For the authorities to know that there are such analyses to be done on the packaging and possibly determining its source; for the stakeholders to cooperate and challenge the current situation on counterfeiting and for the public to be more careful in purchasing their health care products to ensure its safety, efficacy and quality.

1.4 Research Objectives

The objectives of this study are:

i. To determine the features on the packaging material found in the original and the counterfeit on the same fast-moving pharmaceutical products by visual examination.

ii. To create a simple, reproducible, reliable and applicable method viz. infrared analysis, microscopy observation and pattern recognition for early detection of counterfeit in the department.

1.5 Scope of the Research

The samples for this study was procured in the state of Johor and only accounts for the centre of each districts and regions. Samples consist of three (3) Panadol® variant; namely Panadol®, Panadol® Actifast and Panadol® Extend as well as one (1) topical antifungal, Creobic® Cream.

Analysis of the packaging material is via visual examination of the printed side of the paperboard, microscope observation of the print quality, attenuated total reflectance infrared analysis on the paperboard box and the coated surface as well as optical character recognition of the printed side of the paperboard.

1.6 Significance of Research

The need to conduct this research is to point out the manifestation of counterfeit pharmaceuticals in the market from a scientific point of view. Currently, there is no study pertaining to the investigation of these counterfeit from the packaging material use in Malaysia. Since there are countless of packaging materials suppliers and manufacturers, a better framework must be implemented in the packaging material procurement process to reduce the counterfeit products.

There is no provision under the laws enforced by Pharmacy Enforcement Division to try cases pertaining to counterfeits. At present, the fake medicinal products were prosecuted under different Acts and for offences not mentioning counterfeiting; and the practice as stated below:

1. Section 13 Possession for sale of poison and sale of poison, Poisons Act 1952 which only can try cases where the content has been confirmed containing poison as listed in the First Schedule, Poisons List.
2. Section 15 Adulteration, Sales of Drugs Act 1952 which needs to analyse the ingredients and to be compared with the declared content and does not provide any means to charge the counterfeiter.
3. Regulation 29 Directions, Control of Drugs and Cosmetics Regulation 1984 which states that the Director of Pharmaceutical Services may issue written guidelines pertaining to labelling, storage including requirement of the containers etc. The labelling includes the use of hologram at point of sale. Unfortunately, according to Mediharta Sdn. Bhd., the maker for Meditag™ hologram there has not been a case relating to the counterfeit holograms.

Recently, Pharmacy Enforcement Johor received information pertaining to the supply of packaging material and enquires whether there are any way(s) to determine the culprit of this counterfeiting activity. Since the core function of the department is to investigate offences made under the act and forensic science may contribute to finding the probable source, no doubt this study should be conducted.

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