DNA RECOVERY METHOD COMPARISON from BLACK ELECTRICAL TAPES

Weawgarn Duangshatome[1], Pattamawadee Yanatatsaneejit[2],Budsaba Rerkamnuaychoke[3*]

[1]*Forensic Science Graduate Programme, Faculty of science, Mahidol university*

[2]*Department of Botany, Faculty of Science,Chulalongkorn University*

[3]*Department of Pathology, Faculty of Medicine Ramathibodi Hospitol,Mahidol University*

**Corresponding author*

Oral Presentation

Abstract

Electrical tape or insulation tape is an evidence from bomb scene and isusually sent for DNA investigation. DNA can be recovered by cutting the tape into small pieces then extracting DNA from the tape directly. The other method to recover DNA from the tape is swabbing method. Swab moisten with a solvent is used and DNA is extracted from the swab. In this study these 2 recovery methods are compared. Furthermore, 2 solvent ; xylene and ethanol were compared to know which one is better to be used to moisten swab and dissolve the glue and the DNA before extraction. Result show that swabbing method gave better result than cutting and ethanol was better than xylene.

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Introduction

Electrical tape is a kind of tape which is used to insulate electrical wires. This tape is made in a variety of plastics, but vinyl is the most common. Although electrical tape comes in a variety of colors, black is generally used for insulation purpose whilst other colors are used to indicate the phase of the wire and the voltage level. Because it is easily torn by hands, electrical tapes are used for many purposes such as temporarily attaching an object to one another.

An improvised explosive device (IED) is comprised of items which are not produced to be used together but when they are assembled, they can be explored. Basic components of the IED are the main charge explosive and the fuzing system. Tape is frequently used in the construction of an IED. Many kinds of tape such as electrical, transparent and duct tape are used.[(1)] In Thailand black electrical tape is found used by bomb builders. Electrical tape is easily torn by hands, bomb builders can use the tape for multipurpose such as used to insulate electrical wires in electrical fuzing system and used to secure all components of an IED together. It is expected that some skin cells of a bomb builder are deposited on tapes and can be used as a source of DNA. Sloughed skin cells can be transferred by skin contact and DNA profiles can be obtained from handled items.[(2, 3)] Torre and Gino reported that epidermal cells were observed on double-sided adhesive tapes which were affixed on SEM stub used to collect samples from human skin. DNA was recovered from these tapes by cutting the tapes into small pieces followed by chelex extraction, subsequently HLADQα were successfully amplified and typed.[(4)] Fingerprints on adhesive tapes were reported that they could be extracted and typed for DNA profiles. Cutting the tapes into small pieces then extracting DNA from the tapes directly was one method used to recover DNA from fingerprints on adhesive tapes. [(5, 6)] The other method used to recover DNA from fingerprints on adhesive

tapes was swabbing adhesive side of the tapes by cotton swabs moisten with 96% ethanol then extracting DNA from the swabs.[7] May and Thomson reported that DNA on adhesive tapes can be recovered by swabbing. Xylene was reported the best solvent used to moist swabs and xylene treated chelex extraction was the best extraction method.[8]

It is the fact that not only cutting the tape into small pieces is difficult but also the sticky property of adhesive tapes causes trouble while handling them. Moreover, if a long length of tape had to be extracted, the larger tube was required that resulted in more labor intensiveness and time consuming. Swabbing the tape by a cotton swab is an alternative method to recover DNA from tapes. The purpose of swabbing is to concentrate DNA from large area of tapes on a swab head. One or two swabs from a numerous amount of tape can be extracted in 1.5 ml. tube and extracted along with other samples in a batch from the start, no extra procedure is needed. It is more convenience when comparing with cutting method. The objective of this study is to compare the quantity of DNA recovered from electrical tapes between 2 recovery methods: cutting and swabbing.

Materials and methods

Sample preparation

Saliva of a volunteer was used as the source of DNA in this research. It was collected freshly before use each day. Each 4 cm. electrical tape was spotted by 10 µl saliva and air dry.

DNA recovery and extraction

2 DNA recovery methods and 2 solvent were compared. Each test was done in triplicate. 1.) Swab an electrical tape spotted with saliva by a cotton swab moisten with 96% ethanol and place the swab head in 1.5 ml then add 300 µl 96% ethanol. 2.) Swab an electrical tape spotted with saliva by a cotton swab moisten with xylene and place the swab head in 1.5 ml then add 300 µl xylene. 3.) Cut an electrical tape spotted with saliva into small pieces and place in 1.5 ml tube then add 300 µl 96% ethanol. 4.) Cut an electrical tape spotted with saliva into small pieces and place in 1.5 ml tube then add 300 µl xylene. All tubes were left open in a hood until dried. After that all samples were extracted by chelex extraction. Susequently the extracts were concentrated by Microcon YM-100.

DNA quantification

DNA in the extracts will be quantified by using QuantifilerHuman DNA quantification kit and ABI 7500 Fast real-time PCR system from Applied Biosystems.

Result and discussion

According to May and Thomson[8], xylene was the best solvent used to moist swab. After concentrating the glue and DNA on to swab head, it was necessary to dissolve the glue and release DNA into solution. Xylene treated chelex extraction was reported to be the best method to dissolve the glue and the DNA. On the other hand, cutting the tapes into small pieces then extracting DNA from the tapes directly was one method used to recover DNA from fingerprints on adhesive tapes[5, 6] In this study 2 recovery methods: cutting and swabbing were compared to know which one is the best method to recovery DNA from black electrical tapes. Base on xylene treated chelex extraction, xylene was used to dissolve glue and DNA from cut electrical tapes and swab head. Furthermore, Franke et al.used 96% ethanol to moist swab which was used to swab fingerprints on adhesive tapes for DNA examination.[7] In this study besides 2 recovery methods, 2 solvents : xylene and ethanol were compared to fine the best solvent to use to dissolve the glue and the DNA from black electrical tapes.

Table 1 Summary of results.

Tube No		DNA concentration (ng/µl)	Mean (ng/µl)
1	swab moisten	0.8601	
2	with EtOH	1.1049	0.9982
3		1.0297	
4	swab moisten	0.4614	
5	swab xylene	0.5808	0.5648
6		0.6522	
7	cut into small pieces	0.1401	
8	soak in EtOH	0.0402	0.0902
9		Undetected	
10	cut into small pieces	0.0279	
11	soak in xylene	0.1189	0.0868
12		0.1135	
13	neat saliva 10 µl	8.5133	8.5133

All DNA concentrations are shown in table 1. Mean DNA concentration of swabbing method, moisten swab with 96% ethanol is 0.9982 ng/µl. Mean DNA concentration of cutting method, soaking the tape in 96% ethanol is 0.0902 ng/µl. Mean DNA concentration of swabbing method, moisten swab with xylene is 0.5648 ng/µl. Mean DNA concentration of cutting method, soaking the tape in xylene is 0.0868 ng/µl. Comparing between 2 recovery