

## Central Lancashire Online Knowledge (CLoK)

Title	The Effect Of Sandy Surfaces on Touch DNA
Type	Article
URL	<a href="https://clock.uclan.ac.uk/32041/">https://clock.uclan.ac.uk/32041/</a>
DOI	##doi##
Date	2019
Citation	Salem Alketbi, K. and Goodwin, William H orcid iconORCID: 0000-0002-3632-3552 (2019) The Effect Of Sandy Surfaces on Touch DNA. Journal of Forensic Legal & Investigative Sciences, 5 (034). ISSN 2473-733X
Creators	Salem Alketbi, K. and Goodwin, William H

It is advisable to refer to the publisher's version if you intend to cite from the work. ##doi##

For information about Research at UCLan please go to <http://www.uclan.ac.uk/research/>

All outputs in CLoK are protected by Intellectual Property Rights law, including Copyright law. Copyright, IPR and Moral Rights for the works on this site are retained by the individual authors and/or other copyright owners. Terms and conditions for use of this material are defined in the <http://clock.uclan.ac.uk/policies/>



## Research Article

# The Effect of Sandy Surfaces on Touch DNA

Salem Alketbi K<sup>1\*</sup> and Goodwin W<sup>2</sup>

<sup>1</sup>General Department of Forensic Science and Criminology, Dubai Police, UAE

<sup>2</sup>Department of Forensic Genitics, University of Central Lancashire, Preston, UK

### Abstract

Touch DNA profiling is an important tool to solve the mystery of many cases, especially when other biological evidences cannot be found in crime scene. However, there are many variables that influence Touch DNA profiling such as recovery techniques and extraction. In addition, effect of environmental factors on items found outdoor such as sand can impact on the process. Therefore the aim of this experiment was to test how sandy surfaces can affect the recovery of Touch DNA Profiling by validation two recovery methods and two extraction kits that are widely used in the DNA forensic field.

**Keywords:** DNA recovery; Forensic DNA; PrepFiler Express BTA™; QIAamp® DNA Investigator; Quantifiler™ Human DNA Quantification Kit; Touch DNA

### Introduction

Touch DNA profiling is an important tool to solve the mystery of many cases, especially when other biological evidences cannot be found in crime scene. However, there are many variables that influence Touch DNA profiling such as recovery techniques and extraction [1-3]. In addition, heat and humidity on items found outdoor can reduce or loss of trace DNA [4,5]. Another issue with environmental factors that can influence Touch DNA recovery on items found outdoor is dust or sand, especially in hot climates such as Dubai where sands move all the time because of the winds.

Therefore the aim of this experiment was to test how sandy surfaces can affect the recovery of Touch DNA Profiling by validation two recovery methods and two extraction kits that are widely used in the DNA forensic field.

**\*Corresponding author:** Salem Alketbi K, General Department of Forensic Science and Criminology, Dubai Police, UAE, Tel: 00447774141205; E-mail: alkitbe.11@hotmail.com

**Citation:** Alketbi SK, Goodwin W (2019) The effect of sandy surfaces on Touch DNA. *Forensic Leg Investig Sci* 5: 034.

**Received:** October 17, 2019; **Accepted:** October 24, 2019; **Published:** October 31, 2019

**Copyright:** © 2019 Alketbi SK and Goodwin W. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

### Materials and Methods

#### Experimental set up and deposition

A selection of four surfaces (stainless steel; smooth non-porous, glass; smooth non-porous, textured wood; rough porous and textured plastic; rough non-porous) were chosen to replicate common items encountered in crime scenes and to have a variety of surfaces. All non-porous surfaces were sterilised by 2% virkon and ultraviolet radiation (UV) for 15 min, and only textured wood was irradiated with UV for 25 min.

For DNA deposition, a participant was asked to wash his hands with antibacterial soap and refrain from undertaking any activity for 10 minutes. Then, charge the fingers of both hands with eccrine sweat by touching behind their ears or forehead to load them with enough DNA. The participant was then asked to touch the surfaces using their index, middle, and ring fingers of both hands separately for deposition by applying medium pressure on 5 x 7 cm area of the surface for 1 minute. The same procedure was repeated on all the surfaces for equal deposition on each surface.

After deposition of DNA, sand from Dubai (common sand found outdoors) was left on the surfaces, which were then placed in High temperature with moderate humidity (40°C/50%) for three hours to simulate Dubai weather (n=48 – three replicates for each variable).

#### DNA recovery and extraction

Two methods were used to recover the touch DNA, Copan cotton swab (150C) (CS) and Copan nylon flocked swab (4N6 FLO-QSwabs®) (NS). Before collection, 100µL of sterile distilled water was applied to moisten CS using a plastic spray bottle technique (developed in Dubai police forensic DNA lab; each single spray contains approximately 50µL). For NS, 30µL of sterile distilled water was applied to moisten the swab using a pipette as recommended by the manufacturer.

Full swabs head were extracted by PrepFiler Express BTA™ kit (Thermo Fisher Scientific) (EX1) using an AutoMate Express Forensic DNA Extraction System according to the manufacturers' recommendations and manually using the QIAamp® DNA Investigator Kit (Qiagen) (EX2) as per the manufacturers' protocol. However, with EX2 nylon swabs were extracted using NAOBasket™ as recommended by Copan to increase the DNA yield.

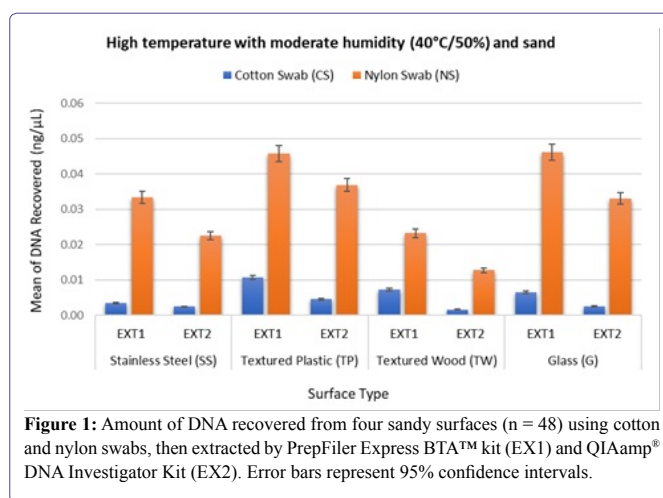
#### DNA quantification, amplification and analysis

Extracted samples were quantified using the Quantifiler® Human DNA Quantification Kit, Quant Studio 5 Real-Time PCR (qPCR) and HID Real-Time PCR analysis software v1.3 according to the manufacturer's instructions (Thermo Fisher Scientific). Amplification was performed using the Global Filer™ PCR Amplification Kit (Thermo Fisher Scientific) according to the manufacturer's recommendation, following 30 cycles protocol.

Then the data were analysed using GeneMapper® ID-X Software Version 1.2 (Thermo Fisher Scientific). Statistical analysis on the tested variables was performed with RStudio using factorial analysis of variance (ANOVA). Blanks were taken from surfaces after sterilization, and negative controls for the collection and extraction methods, all of which were negative for DNA when quantified.

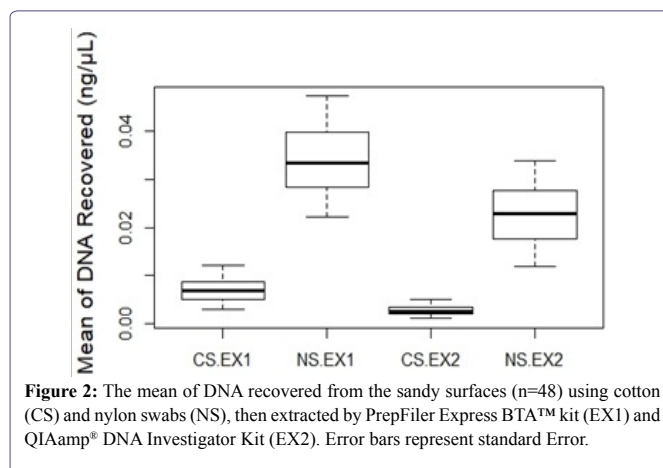
## Results and Discussion

The amount of DNA collected from the sandy surfaces was significantly affected by collection method ( $F_{1,32} = 7557.47, p < 0.05$ ), extraction type ( $F_{1,32} = 817.26, p < 0.05$ ) and the interaction between collection and extraction ( $F_{1,32} = 172.22, p < 0.05$ ) (Figure 1).



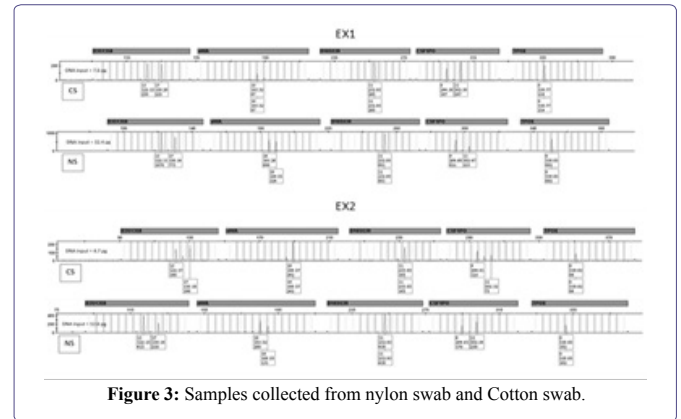
**Figure 1:** Amount of DNA recovered from four sandy surfaces (n = 48) using cotton and nylon swabs, then extracted by PrepFiler Express BTA™ kit (EX1) and QIAamp® DNA Investigator Kit (EX2). Error bars represent 95% confidence intervals.

Samples performed better when extracted by PrepFiler Express BTA™ kit (EX1) than the QIAamp® DNA Investigator Kit (EX2), when the collected swabs contained sand. Nevertheless, the Nylon Swab was the best performer of collection touch DNA from the sandy surfaces, when compared to cotton swabs (Figure 2). When using both swabs to collect DNA from the sandy surfaces, the cotton swab collected much more sand than the nylon swab. That can be caused by the amount of distilled water used with the swabs (100μL with cotton swab and 30μL with nylon swab), or the fact that the cotton swab retains much more sand.



**Figure 2:** The mean of DNA recovered from the sandy surfaces (n=48) using cotton (CS) and nylon swabs (NS), then extracted by PrepFiler Express BTA™ kit (EX1) and QIAamp® DNA Investigator Kit (EX2). Error bars represent standard Error.

Samples collected from stainless steel were amplified to validate the quality of samples collected. Samples collected by nylon swab produced full profiles, and samples collected by cotton swab produced almost full profiles with few allele dropouts (Figure 3).



**Figure 3:** Samples collected from nylon swab and Cotton swab.

## Conclusion

Sand on the surfaces found outdoors can influence the amount of the DNA recovered from touched items. A nylon swab is an advisable to use as a collection method from items found outdoors in sandy environments such as Dubai, in combination with the PrepFiler Express BTA™ extraction kit.

## Conflict of Interest

None.

## Acknowledgements

This study was approved by General Department of Forensic Science and Criminology in Dubai Police and Ethical approval was granted by School of Forensic and Applied Sciences, and the University of Central Lancashire's Research Ethics Committee (ref. no. STEMH 912). Many thanks to COPAN DIAGNOSTICS INC. for supporting this experiment with free swabs, and to Thermo Fisher Scientific™ for the discounts on their products.

## References

- Alketbi SK (2018) The Affecting Factors of Touch DNA. J Forensic Res 9: 424.
- Verdon TJ, Mitchell RJ, Oorschot RA (2014) Swabs as DNA collection devices for sampling different biological materials from different substrates. J Forensic Sci 59: 1080-1089.
- Ip SC, Lin SW, Lai KM (2015) An evaluation of the performance of five extraction methods: chelex® 100, QIAamp® DNA blood mini kit, QIAamp® DNA investigator kit, QIASymphony® DNA Investigator® kit and DNA IQ™. Sci Justice 55: 200-208.
- Raymond JJ, Walsh SJ, Van Oorschot RA, Gunn PR, Evans L, et al. (2008) Assessing trace DNA evidence from a residential burglary: abundance, transfer and persistence. Forensic Science International: Genetics Supplement Series 1: 442-443.
- Poinar HN (2003) The top 10 list: criteria of authenticity for DNA from ancient and forensic samples. In International congress series 1239: 575-579.



Journal of Anesthesia & Clinical Care  
Journal of Addiction & Addictive Disorders  
Advances in Microbiology Research  
Advances in Industrial Biotechnology  
Journal of Agronomy & Agricultural Science  
Journal of AIDS Clinical Research & STDs  
Journal of Alcoholism, Drug Abuse & Substance Dependence  
Journal of Allergy Disorders & Therapy  
Journal of Alternative, Complementary & Integrative Medicine  
Journal of Alzheimer's & Neurodegenerative Diseases  
Journal of Angiology & Vascular Surgery  
Journal of Animal Research & Veterinary Science  
Archives of Zoological Studies  
Archives of Urology  
Journal of Atmospheric & Earth-Sciences  
Journal of Aquaculture & Fisheries  
Journal of Biotech Research & Biochemistry  
Journal of Brain & Neuroscience Research  
Journal of Cancer Biology & Treatment  
Journal of Cardiology: Study & Research  
Journal of Cell Biology & Cell Metabolism  
Journal of Clinical Dermatology & Therapy  
Journal of Clinical Immunology & Immunotherapy  
Journal of Clinical Studies & Medical Case Reports  
Journal of Community Medicine & Public Health Care  
Current Trends: Medical & Biological Engineering  
Journal of Cytology & Tissue Biology  
Journal of Dentistry: Oral Health & Cosmesis  
Journal of Diabetes & Metabolic Disorders  
Journal of Dairy Research & Technology  
Journal of Emergency Medicine Trauma & Surgical Care  
Journal of Environmental Science: Current Research  
Journal of Food Science & Nutrition  
Journal of Forensic, Legal & Investigative Sciences  
Journal of Gastroenterology & Hepatology Research  
Journal of Gerontology & Geriatric Medicine  
Journal of Genetics & Genomic Sciences  
Journal of Hematology, Blood Transfusion & Disorders  
Journal of Human Endocrinology  
Journal of Hospice & Palliative Medical Care  
Journal of Internal Medicine & Primary Healthcare  
Journal of Infectious & Non Infectious Diseases  
Journal of Light & Laser: Current Trends  
Journal of Modern Chemical Sciences  
Journal of Medicine: Study & Research  
Journal of Nanotechnology: Nanomedicine & Nanobiotechnology  
Journal of Neonatology & Clinical Pediatrics  
Journal of Nephrology & Renal Therapy  
Journal of Non Invasive Vascular Investigation  
Journal of Nuclear Medicine, Radiology & Radiation Therapy  
Journal of Obesity & Weight Loss  
Journal of Orthopedic Research & Physiotherapy  
Journal of Otolaryngology, Head & Neck Surgery  
Journal of Protein Research & Bioinformatics  
Journal of Pathology Clinical & Medical Research  
Journal of Pharmacology, Pharmaceutics & Pharmacovigilance  
Journal of Physical Medicine, Rehabilitation & Disabilities  
Journal of Plant Science: Current Research  
Journal of Psychiatry, Depression & Anxiety  
Journal of Pulmonary Medicine & Respiratory Research  
Journal of Practical & Professional Nursing  
Journal of Reproductive Medicine, Gynaecology & Obstetrics  
Journal of Stem Cells Research, Development & Therapy  
Journal of Surgery: Current Trends & Innovations  
Journal of Toxicology: Current Research  
Journal of Translational Science and Research  
Trends in Anatomy & Physiology  
Journal of Vaccines Research & Vaccination  
Journal of Virology & Antivirals  
Archives of Surgery and Surgical Education  
Sports Medicine and Injury Care Journal  
International Journal of Case Reports and Therapeutic Studies  
Journal of Ecology Research and Conservation Biology

Submit Your Manuscript: <http://www.heraldopenaccess.us/Online-Submission.php>