

# Dna by touch: dna investigator kit

[Science](#), [Genetics](#)



Tobias et al. (2017) looked into the effects pressure has on the DNA deposited. They used polycarbonate boards that were soaked in 25% bleach for 20 minutes and rinsed with deionised water. The board was then UV-irradiated for 5 minutes on each side to remove any DNA. The removal of DNA was confirmed by negative controls. To calculate the total area of contact per hand both volunteers placed inked fingerprint on a graph paper and the area was calculated using ImageJ 1. 50i (Tobias et al. 2017).

The polycarbonate board was put on a balance where the volunteer can push down on the board with all the fingertips from one hand for 1 min at varied weight values. These values depended on the area of the hand to give pressures of 4 kPa, 21 kPa and 37 kPa that is low pressure, medium pressure and high pressure. The volunteers were instructed to wear surgical masks to prevent DNA deposition by breathing and speaking (Tobias et al. 2017). The volunteers did this procedure for both right and left hands in a random order with a 10-minute gap in between each touch for three non-consecutive days. The fingerprints on the board were immediately swabbed using a wet swab and followed by a dry swab. All five fingerprints were swabbed as one sample (Tobias et al. 2017).

QIAamp® DNA Investigator Kit was used to extract DNA from each pair of swabs into 35 µl elution buffer. These were quantified using Quantifiler® Human DNA Quantification Kit and then profiled using AmpFISTR® NGM SElect™ (10 µl template in 25 µl reactions, 30 cycles) (Tobias et al. 2017). Profiling data were interpreted using GeneMapper® IDX v1. 3 software (peak height threshold 100RFU. The matched number of alleles from the swabs were represented as percentage of match to the volunteer's reference

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sample that was taken from a buccal swab. Box-and-whisker plots of the quantities of DNA (a) and profile percentages (b) obtained at each pressure by each volunteer. Asterisks indicate outliers, and, for ease of presentation, an outlier of 3.5 ng deposited by volunteer 1 at 21 kPa is omitted from (a). (Tobias et al. 2017).

The difference in the amount of DNA deposited and recovered between the two volunteers was checked using the Mann Whitney U test. Mann Whitney U test is a nonparametric test to test the null hypothesis that is equally likely that a random value selected from one set of results will be less than or greater than a randomly selected value from another set of results. At a low pressure, no significant difference between the amount of DNA by the volunteers was seen ( $U = 7.0$ ,  $p = 0.075$ ). At a higher pressure one of the volunteers deposited a much higher amount of DNA compared to the other for both 21 kPa ( $U = 3.5$ ,  $p = 0.033$ ) and 37 kPa ( $U = 0.0$ ,  $p = 0.004$ ). From this it can be seen that the amount of DNA deposited differs from individual to individual and pressure also plays a role on the amount of DNA transferred too (Tobias et al. 2017).

The results were then compared for each individual with their own results from both hands for all the three days to see if the results form a pattern and if they can be used as replicates of each other. These results were analysed to check for any differences in the amount of DNA based on a hand or any of the days. This analysis and comparison was done for essentially each contact using the Mann Whitney U or the Kruskal Wallis Chi-squared tests (Tobias et al. 2017). The result for the analysis showed no significant difference

between the amount of DNA deposited between the dominant and the non-dominant hand or between the results from the three days (Tobias et al. 2017).

This contradicts the results and conclusion derived from the Phipps and Petricevic (2007) study. The p results for all the tests were between 0.323 and 0.964 for each volunteer. The results however support and the results are in line with a study done by Goray et al (2016) where volunteers placed their hands on a glass plate. This variation could be due the difference in the collection and analysis method (Tobias et al. 2017), the materials used for the deposition on for the DNA or even the fact that with this study and the study by Goray et al (2016) the volunteers hands were either faced down straight or the pressure was just on the fingerprint to allow the DNA transfer whereas in the study by Phipps and Petricevic (2007) the volunteers had to hold the tubes which meant their palm was primarily used for the DNA transfer and this could be a factor in the difference of the amount of DNA deposited. Another factor is the status of volunteer's hands in terms of the cleanliness is unknown for this study and the study by Goray et al (2016). This could play a part as it is unknown if their hands were recently washed or not and could've affected the amount of DNA deposited, although there is no way knowing. When data from both hands and three days for all low, medium and high pressure was combined for both the volunteers a correlation was detected between the pressure and the amount of DNA deposited (Spearman's  $\rho = 0.5$ ,  $p < 0.05$ ) (Tobias et al. 2017). It showed that the amount of DNA deposited increased as the pressure increased from 4 kPa to 21 kPa. The profile percentage and the pressure showed a

correlation however it was a weak correlation and was not statistically significant (Spearman's  $\rho = 0.3$ ,  $p > 0.05$ ) (Tobias et al. 2017).

Secondary DNA transfer was also seen during higher pressure contact above 4 kPa. It can be determined from these results that DNA transfer increased as pressure increased from skin to a surface and not just DNA transfer between objects (Tobias et al. 2017). It can also be seen that as the pressure increases the amount of DNA transferred increased too even though the amount varies from individual to individual an overall pattern of increase in the amount of DNA transfer increased within an individual. It is suggested that the pressure as a variable is independent from an individual's shedding status although the pressure applied can affect the shedding status of an individual.

In conclusion it can be seen from the results obtained from this study that increase in contact pressure between skin and a surface has a significant effect in the amount of DNA transferred from the skin onto the surface. It can also be seen that although the amount of DNA transfer increases with the increase in pressure the amount of DNA transfer varies between individuals even when the same amount of pressure is applied (Tobias et al. 2017). DNA analysis in the forensic industry is expensive and time consuming a study like this can help priorities and provide a better understanding in what should be taken into evidence and which pieces of evidence should be used for DNA recovery and testing with a decreased risk of getting no results.