# Evaluation of DNA profiles obtained from deceased individuals at Salt River Mortuary (South Africa)

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## Key Words

Forensic DNA profiling

Post-mortem human identification

Salt River Mortuary (SRM)

## Background

- SRM services the City of Cape Town [1]
- >3000 cases of unnatural death are admitted annually [2]
- Identification of decedents is performed using various methods (Figure 1)
- Each year, ~300 cases remain unidentified[2]

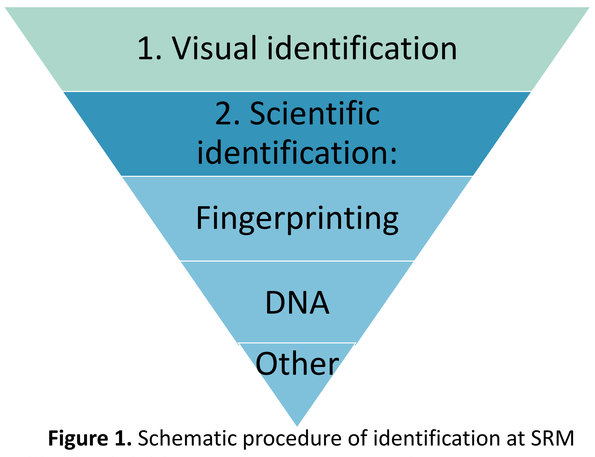


**Figure 1.** Schematic procedure of identification at SRM
Identification is initially performed through visual means, followed by scientific means which include DNA analysis and others like anthropology

- DNA profiling in the deceased can be challenging due to post-mortem factors [3]:
  - Decomposition
  - Skeletonisation
  - Time between death and sample collection
  - Post-mortem changes

**AIM: Assess the quality of forensic DNA profiles obtained via cotton swabs from individuals who have been deceased and stored for various lengths of time**

## Methods

Institutional ethics approval obtained

| Sample collection | | Sample processing | Data analysis |
|---|---|---|---|
| Phase 1 | Phase 2 | | |
| n=38 blood and buccal swab sample deceased infants Storage time: 1-11 days | n=37 Buccal swabs unidentified deceased adults Storage time: 1-887 days | *DNA extraction* *Quantification:* Real-time PCR Quantifiler™ Trio (Thermo Fisher Scientific) *DNA profiling:* Promega PowerPlex® Y23 or ESI 16 systems | STATA Excel GraphPad Prism |

## Results and Discussion

Definition of profile type:

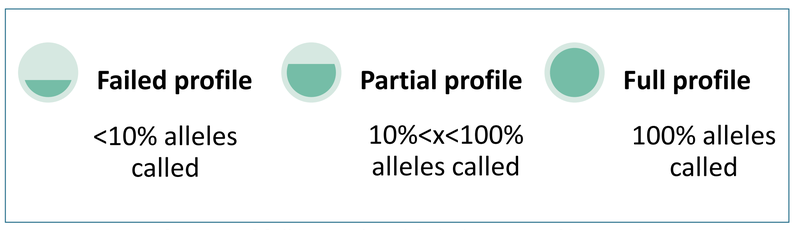


**Figure 2:** Definition of full, partial and failed DNA profiles implemented in this research study.
<10% of alleles being called is equivalent to less than three markers reaching the analytical threshold

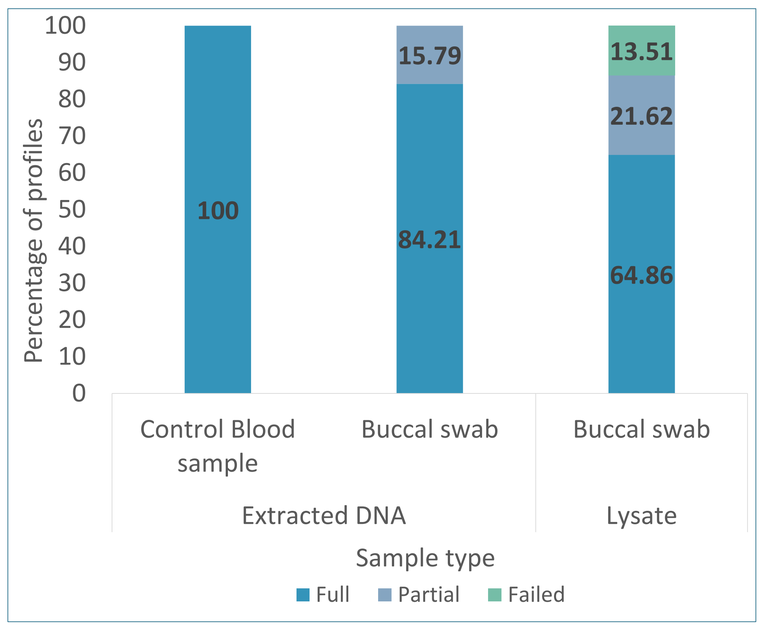


**Figure 3:** Percentage of full, partial or failed DNA profiles obtained per sample type.
Percentages shown indicate success rates following the performance of PCR optimisation (altered input DNA, cycle number etc.)

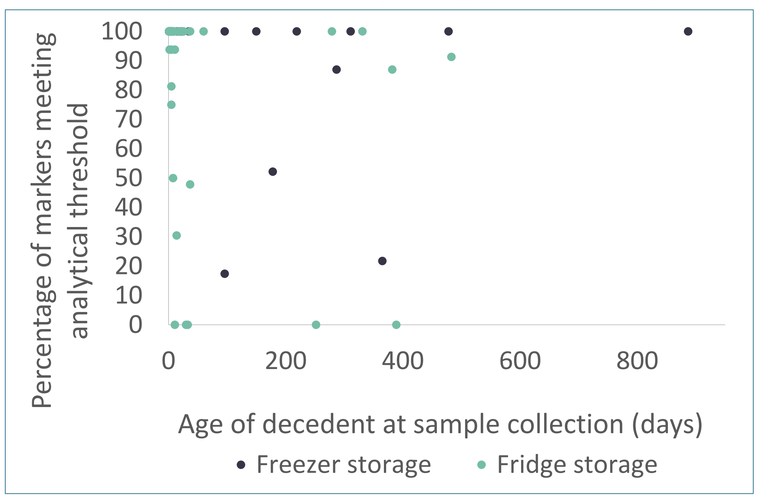


**Figure 4:** Percentage of markers meeting the internally validated analytical threshold as a function of time between death declaration and sample collection, and storage conditions.
Data point colour indicates storage in a freezer (-20˚C) or a refrigerator (4˚C)

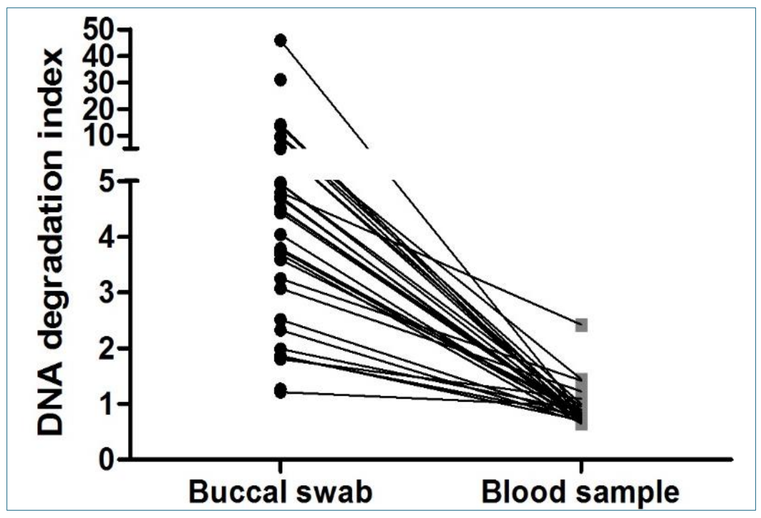


**Figure 5**. Degradation indices determined for samples where DNA was extracted from buccal swabs or blood samples .
Degradation index was determined using the Quantifiler™ Trio qPCR assay (Thermo Fisher Scientific)

- Overall **75%** of **buccal samples** obtained full DNA profiles following optimisation (Fig 2&3)
- **Control blood samples** yielded **100%** full DNA profiles without any optimisation (Fig 3)

- Age of body at time of sampling ranged from **1 to 887 days** (Fig 3)
- **No effect** on the success of DNA profiling was observed when bodies were s**tored** at either 4 °C or -20 °C (Fig 4)

- **Time** between death declaration and sample collection showed **no significant association** with success of DNA profiling (p=0.16) (Fig 4)
- This is in **accordance** with others [4,5] **,** who suggested that the **interaction** between **time and environmental conditions** is what leads to DNA degradation

- Obtaining a partial or failed profile was **significantly associated with degradation of buccal swabs** (p<0.001, DI=6.35±8.45), (Fig 5) but **not blood** samples (DI=0.804 ± 0.34)

## Conclusion

- Full DNA profiles can be obtained years after death, provided that the body has been stored appropriately
- The level of DNA degradation affects the quality of DNA profiles obtained (Fig 5)
- These results are in agreement that the interplay between time and environmental conditions is of particular importance when assessing DNA degradation

**Regardless of body condition or age, DNA samples should be obtained for identification purposes**

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