Forensic Science International: Genetics Supplement Series 8 (2022) 145–146

Contents lists available at ScienceDirect

Forensic Science International: Genetics Supplement Series

journal homepage: www.elsevier.com/locate/fsigss

# Is there human DNA on cats

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ARTICLE INFO

*Keywords:*
Cats
Human DNA
Forensic science

ABSTRACT

The transfer, persistence, prevalence, and recovery of DNA (DNA-TPPR) can be highly relevant in forensic investigations to evaluate the presence and/or actions of a person of interest (POI). Whilst the DNA-TPPR-related research has increased significantly over the last decade, there is a lack of data on companion animals and their relationship to human DNA transfer. Given the commonality of cats and dogs in households around the world, companion animals as receptors and vectors for DNA transfer can be highly relevant in cases involving animals as victims of a criminal offense, or cases requiring activity level evaluations. Samples were collected from an external area on the right side of 20 cats to determine the prevalence and sources of human DNA on this area. Preliminary data shows that human DNA is present on household cats, its source is mainly from household inhabitants. Further studies are required to elucidate the means and level of transfer of human DNA to and from cats and other household animals. This knowledge can be relevant to sample targeting in specific case circumstances and/or when considering possible means of the presence of a person's DNA at the crime scene location.

## 1. Introduction

The research area of DNA-TPPR continues to gain interest [1–3]. However, while household animals, including cats, are commonly present at crime scenes there has been little to no research into how this may affect crime scenes or if there could be probative value in sampling household animals for human DNA. Therefore, this preliminary study aimed to determine the presence and origin of human DNA on cats.

## 2. Methods

Twenty cats from 15 different households were used in the study. The persons from within the household were designated Human 1-Human 4 (H1-H4) and had a different level of interaction or ownership with the cat. The DNA samples were collected from the cat's right side (an area of 5–20 $cm^2$ dependent on the size of the cat) at the participant's house.

Reference samples were collected from every person in the household except for two household (cats 9, 10 and 11) where all but one person was sampled. A questionnaire pertaining to the cats' daily behaviours and environment including information on how often a cat is contacted and by whom was also completed for each household. Samples were collected using the double swabbing method and processed as per Reither et al. [4] using (Forensic Swab L, Sarstedt, Germany). and analysed with STRmix$^{TM}$ v 2.9 and a Mann-Whitney U test (P value ($\leq$0.05) was undertaken using SPSS v 28.0.0.

## 3. Results and discussion

There were detectable levels of DNA found in 80% of the samples with an average of 0.22 ng and a range of 0 ng to 1.32 ng (Table 1). Interpretable profiles were generated in 70% of the samples, including one instance where the DNA quantity equalled 0 ng that generated a partial 2-person mixture. Cat 11 was the cat that had the most amount of DNA recovered whilst cats 9 and 10 came from a similarly structured household with parents and kids all living in the house yet cat 10 had no quantifiable DNA. In all cats there was no significant difference between the amount of DNA present on the cat and the time since the cat was last contacted or hair length and the amount of DNA present on the cat.

All profiles were either single source or 2-person mixtures except for one in cat 15 which was a 3-person mixture (Table 1). One person from the cat's household was detected in the 12/18 interpretable profiles, included in the 12 instances were two cats where two owners contributed to the profile (Table 1). In general, the last person to contact the cat

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https://doi.org/10.1016/j.fsigss.2022.10.014
Received 19 September 2022; Accepted 6 October 2022
Available online 7 October 2022

**Table 1**
Questionnaire data and related DNA results from samples taken from the cat's right side.

| Cat | Breed | Hair Length | Time since last contact (min) | Last person to contact the cat | Quantity of DNA (ng) | Number of contributors | Who contributed to the profile (Highest to lowest contributor) | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Domestic Cat | S | 10–60 | H1 | 0.12 | 1 LP | H1 | – | – |
| 2 | Domestic Cat | S | 10–60 | H1 | 0.12 | 1 LP | H1 | – | – |
| 3 | Ragdoll | M | 10–60 | H1 | 0.06 | 1 LP | U | – | – |
| 4 | Domestic Long Hair | L | 10–60 | H1 | 0.18 | 1 HP | U | – | – |
| 5 | Domestic Cat | S | ≤ 10 | H1 | 0.78 | 2 HP | H1 | U | – |
| 6 | Tabby | M | 10–60 | H1 | 0.06 | 1 LP | H1 | – | – |
| 7 | Ragdoll | L | 10–60 | H1, H2 | 0.06 | 1 HP | H2 | – | – |
| 8 | Tabby | S | ≤ 10 | H1 | 0.06 | 2 HP | U | U | – |
| 9 | Domestic Cat | S | 10–60 | H1 | 0.84 | 2 HP | H2 | H1 | – |
| 10 | Domestic Cat | L | ≤ 10 | H2 | 0 | 2 LP | U | U | – |
| 11 | Moggy | S | ≤ 10 | H1, H2 | 1.32 | 1 HP | U | – | – |
| 12 | Domestic Cat | S | ≤ 10 | H1, H2 | 0 | NP | – | – | – |
| 13 | Moggy | M | ≤ 10 | H1 | 0.12 | 1 HP | H1 | – | – |
| 14 | Moggy | L | ≤ 10 | H1 | 0 | NP | – | – | – |
| 15 | Sphynx | NA | 10–60 | H1, H2 | 0.36 | 3 HP | H1 | H2 | U |
| 16 | Ragdoll Cross | S | 10–60 | H1, H2 | 0 | 1 LP | H1 | – | – |
| 17 | Russian Blue | S | ≤ 10 | H1 | 0.18 | 1 LP | H2 | – | – |
| 18 | Domestic Medium Hair | M | ≤ 10 | H1 | 0.06 | 1 LP | U | – | – |
| 19 | Domestic Short Hair | S | 10–60 | H1, H2 | 0.06 | 1 LP | H1 | – | – |
| 20 | Domestic Short Hair | S | ≤ 10 | H1 | 0.12 | 1 HP | H1 | – | – |

*L- Long, M- Medium, S- Short, U- Unknown LP- Low partial ≤ 12 alleles, HP- ≥ 12 alleles.*

was detected as the major or single source contributor. Profiles from unknown individuals were observed in eight profiles. On a further six occasions unknowns were the only contributors to the profile, i.e., no household members detected. In 4 of these profiles there was a single unknown contributor and on two occasions the profile was a 2-person mixed profile. For two of the cats (10 and 11) where unknown contributors only were detected, the questionnaire indicated that the animals had spent a significant amount of time in the unprofiled child's bed, possibly explaining the results. In the other 4 profiles where an unknown was present, the households had no visitors for a minimum of two days prior to experiment commencement. Only one cat had a 3-person mixture detected (cat 15) and this animal came from a two-cat household (with cat 16) however this household only had two people living in it. The questionnaire indicated that both cats were treated in the same manner including whom the cats interacted with, the amount of contact, and the type of contact, with the only difference being that cat 15 was a hairless sphynx and cat 16 a short-haired ragdoll cross (Table 1). This indicated that direct contact with the cat may not be the only, or greatest, influencer of how much DNA is present and further research must be done to determine what other influences may also be relevant, such as the shedder status of the owners, where the cat spends their time and the cat's ability to acquire human DNA from, and/or transfer to, surfaces throughout the house that they regularly use such as couches and beds.

## 4. Conclusion

Human DNA is present on cats, and its origins tends to be from individuals from within the household. DNA from unknown non-household members was also frequently present on the cats. The mode of transfer of this DNA to the cat, and its persistence on them, is unknown. Further research is required on the transfer of human DNA to and from cats, and the persistence of human DNA on cats and what may influence the varying levels of DNA found on cats such as behavioral habits, and shedder status of the owners.

## Acknowledgments

We would like to thank all individual and their cats who participated in this study, as well as the staff of the Biometric Services Division of the Victoria Police Forensic Services Department for their assistance in the analyses of the DNA samples collected in this study.

*Conflict of interest*

None.

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