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Review Article

Touch DNA in a Complicated Alleged Child Abuse Case

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Abstract

Touch DNA can be of use in establishing what may have occurred through reconstruction of events based on biological evidence transfer. However, interpretation of results and patterns must be approached with some caution as in the alleged child abuse case detailed here. This case was brought forward as a touch DNA and body fluid case where the male in question was a father reported to have forced a young child to perform oral sex on him. Her pajamas were collected and evaluated for presence of body fluids and associated DNA. The sleeves of the pajamas tested positive for amylase, a potential indicator of saliva and DNA of both victim and father combined. Initially, it was thought that this would be clear evidence to bring forth to trial; however, as the remaining stains were tested on the pajamas, reconstruction of events became substantially altered. Up to six family members DNA profiles were recovered off the child's garments and also a semen stain from a half-brother.

Keywords: DNA; Familial DNA; Touch DNA; Sexual assault; Body fluids; Pattern interpretation

Abbreviations

DNA: Deoxyribonucleic Acid; FST: Forensic Statistical Tool; LR: Likelihood Ratio

Introduction

The enzyme alpha amylase is a non-specific indicator of saliva and was used to screen sixteen stains identified on a young child's pajama shirt. Of the sixteen stains, six were positive for amylase, two stains were inconclusive, and eight stains were negative. Subsequent DNA testing of the stains revealed various DNA mixtures with at least six family members detected by standard forensic DNA methods. On the pajama pants, fifteen stains were tested for the presence of amylase and seven were positive; one stain was also positive for semen. Alpha amylase is an enzyme produced by salivary glands and using forensic Phadebas tests, false positives have been detected from urine, sweat and fecal matter [1].

Since the amylase diffusion test indicates but is not a conclusive identification for saliva, some interpretation of the DNA profiles associated with the stains was important for forming conclusions about the case. Vaginal secretions and bacteria, both commonly found on worn clothing, also will yield a positive result for amylase [1]. When DNA is recovered from a stained area, it may be from the same source as the body fluid and deposited at the same time as the fluid. Alternatively, deposit may occur as an independent event through touching whereby shed epithelial cells are being placed in the same area either before or after the saliva and appear by DNA test methods as an inadvertent mixture.

Given the accusation of forced oral sex with the juvenile victim, the case went forward for prosecution with the focus being on the two amylase positive stains on the wrist area of the right and left pajama sleeves (Table 1, shirt stains 1 and 2) that contained the DNA mixture of father and victim (shirt stain 1) and victim only (shirt stain 2). However, when the case was evaluated holistically and with a broad overview of all the stains combined with the DNA results, (sixteen on

the shirt, and fifteen on the pants) and a surprise semen contributor on the pajama pants, the interpretation of the DNA case became significantly more complex.

The six family members included: (a) the victim, (b) an uncle, (c) an aunt, (d) the biological mother, (e) the half-brother and (f) the biological father. The majority of the DNA mixtures consisted of two individuals but due to large percentages of shared DNA, the results were often not sufficiently distinctive enough to do more than include a relative as a potential contributor in the non-deducible mixture (Table 1). Although probabilistic genotyping software is one method for teasing apart DNA mixture interpretation, when high percentages of shared genetic information exist as with this case, the software often cannot conclusively establish with DNA profiles which relative is the definite contributor [2]. DNA mixtures and stain interpretation for reconstruction of events remains a challenge in forensic science in these circumstances. If one relative possesses a rare allele, then that individual may be distinguishable from the others, however, there is some associated error rate when genetic relatives are involved [3-5]. The Forensic Statistical Tool (FST) software recommends not using their mathematical algorithms for calculation of Likelihood Ratios (LR) when genetic relatives are involved as with shared genetics the error rates would be substantially greater due to coincidental matching; this is evident by accidental matches to non-contributors in validation studies [6]. True Allele software has one published case where genetic relatives could be distinguished and the difference is likely due to use of no analytical threshold and the presence of a detectable allele difference between the related individuals [7]. In this case scenario, you can see without the father's DNA information, it would be impossible to distinguish maternal parentage between the mother and aunt for the victim which does lend some concern for immigration casework since the shared alleles are 50% identical by descent and either individual could have contributed the necessary allele per locus. If these two individuals' DNA were present in a DNA mixture, it would be difficult to discern individuality.

Table 1: Allele Values for Touch DNA samples.

Locus	Victim	Uncle	Aunt	Mother	Father	Half-Brother	Shirt Stain 1	Shirt Stain 2	Pant Semen Stain 15
D3S1358	16	16	16	16	16	15,16	16	16	15,16
D16S539	11,13	12,13	11,12	12,13	11,12	11,13	11,12,13	11,13	11,12,13
Sex	X,X	X,Y	X,X	X,X	X,X	X,Y	X,Y	X,X	X,Y
TH01	6,9	9,3	6,9	6,9,3	7,9	6,8	6,7,9	6,9	6,8,9,9,3
TPOX	9,11	11	8,9	8,11	9,10	8	9,10,11	9,11	8,9,11
CSF1PO	9,12	12	9,10	10,12	12,Z'	12	9,12	9,12	9,12
D7S820	8,9	8,11	8,12	8,11	12,Z'	8,10	8,9,12	8,9	8,9,10,11
VWA	14,17	17	14,18	14,17	17,18	11,17	14,17,18	14,17	11,14,17
FGA	22,24	24	22,24	24	22	21,24	22,24	22,24	21,22,24
D8S1179	12,15	10,12	12,15	12	14,15	12,14	12,14,15	12,15	12,14,15
D21S11	28,29	28,30	29,30	28,30	29	28	28,29	28,29	28,29
D18S51	17,18	17,18	14,17	14,18	17,20	12,18	17,18,20	17,18	12,17,18,23
D5S818	10	12,13	10,13	10,13	10,13	10,12	10,13	10	10,12,13
D13S317	11,12	11,13	9,11	11,13	9,12	11,13	9,11,12	11,12	9,11,12,13
D2S1338	17,20	20,21	17,20	20,23	17,20	20,23	17,20	17,20	17,20,21,23
D19S433	11,16.2	13,16.2	11,16.2	13,16.2	11,14	13,15.2	14,16.2	11,16.2	11,13,15.2,16.2

Z*, refers to a missing allele or allele drop-out during processing of the DNA sample

The outcome for this case was an acquittal based on the inability to firmly associate the amylase enzyme activity from the shirt stains to the small child wiping her mouth on the sleeve after eating or to bacteria or to forced oral sex. Other contributing factors to the decision included the highly confounding touch DNA results from thirty-one stains indicating that multiple family members, including the father, had detectable DNA on her pajamas which could have been deposited under any number of circumstances. The most compelling biological evidence was a semen stain from the young half-brother on the hip of the victim's pajama bottoms which strongly suggested a different scenario than the oral sex allegation. This was initially a challenging case to resolve due to a family custody battle with additional immigration issues but the DNA and body fluid analysis was helpful in refuting the allegations of oral child sex abuse brought against the father given the semen evidence.

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