Use of a Database Feature in the TrueAllele®Casework System to Cross Compare DNA Cases

Dr. Nasir Butt, Ph.D.* and Jeffrey Oblock, B.S.,



The History

- Spike in auto thefts in multiple westside suburbs of Cleveland, Ohio in the summer and fall of 2015
- Believed to be committed by the same gang of juveniles
- Most vehicles stolen over night from driveways
 or from the street
- Vehicles were unlocked or windows smashed
- Steering columns "peeled" or keys left inside vehicle



The Numbers

- 37 separate incidents/cases submitted for testing
- 6 different jurisdictions
- 161 total evidence samples
 - Swabs from various areas of recovered autos
 - Personal property left behind
- 38 suspect reference samples collected during gang "round up" (72 total references)

THESE ARE BUCKET SWARDS COLLEGADD FROM SUSPECTS RELATED TO THE METROPHYRIC RUTORY (15-503) AND PCLATED WEST SIDE CRIME RING (10406 WHEST.



The Challenge

- · Efficiently cross-compare 38 suspect references to each of the 37 cases/100+ evidence samples
 - Manual interpretation done using in-house protocols with RMP/CPI
 - Many man hours of desk work
 - Ignoring profiles/data



Manual Interpretation

- Threshold 200RFU cutoff
- Profiles reported as single source and major/minor or indistinguishable mixtures up to 3 contributors >3 is inconclusive due to too many contributors
- Statistical calculations
 - RMP for single source and major profiles
 - CPI for indistinguishable mixtures
- General rules
 - >50% data (alleles) needed for inclusions
 <50% data inconclusive due to insufficient information



Manual Interpretation

- ~2 months from initial testing to release of 37 reports
- ~1 additional month for release of 26 supplemental reports for additional suspect submissions
- 11 of the 38 suspects were associated to at least one case (RMP/CPI)
- 4 of the 11 positively associated suspects were connected to more than one case30 evidence samples contained no or insufficient
- amount of DNA
- 30 profiles were reported as inconclusive due to too many contributors or insufficient information (some minor components also)



TrueAllele® Interpretation/Database

- Cuyahoga County Prosecutor's Office made aware of
- Cuyanoga County Prosecutor's Office made aware of TA Databasing capabilities
 Probabilistic Genotyping using TrueAllele® Technology's Databasing Feature was done by Cybergenetics.
 Ihid data files sent to Cybergenetics for TA analysis
 All profiles run through TA including those manually deemed inconclusive
 I ow data (24 contributors)
- Low data/3+ contributors
 Database Match Rules: *EVI-EVI, EVI-REF, REF-REF*



TrueAllele® Interpretation/Database

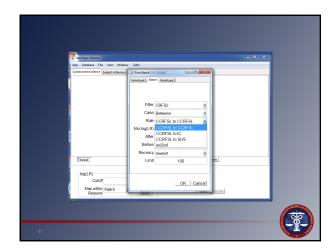


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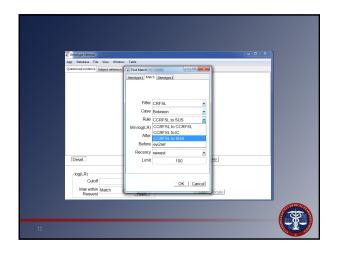


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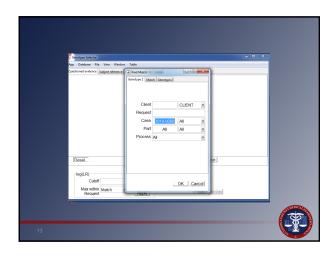


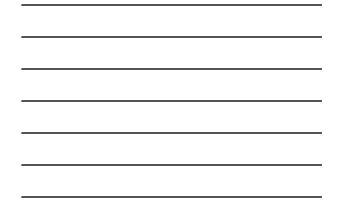


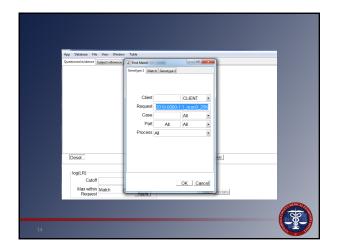




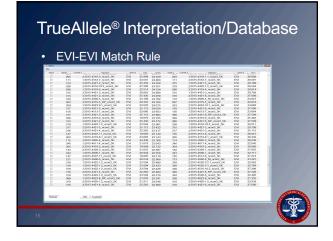












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13	241	3/2015-4520-5.1_ecos3_5K 3/2015-4513-4_ecos3_5K	EM	14,709	15,211	90	12015-4071-8_ref 12015-4507.3 off	REF	31209	
10	153	12015-4623-4 rcon0_5K	EM	14:302	15.059	61	12015-4507-3_ref	REF	33.031	
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12	181	12015-4513-5_RI_ncon3_5K	EM	19.070	13.028	62	12015-4507-4_ref	REF	33.030	
12	338	3 2016-4620-2.1.1_ncon3_5K	EM	09.855	13.437	64	12015-4515-5_ref	REF	34.593	
85	359	3 2015-4623-9-1_scon3_5K	EM	54,000	13.376	85	12015-4071-10_ref	REF	33.879	
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10	151	22015-4513-2 rcord 5K	EM	21//25	13.248	63	12015-4507-5 ref	DFC	35 194	
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10	307	12015-4419-7_ncon3_5K	EM	11.415	12.932	64	12015-4515-5_ref	REF	34.593	
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13	147	12015-4507-11_ncon3_5K	EM	08.406	12.109	62	12015-4507-4_ref	REF	33.030	
23	122	22015-3906-7_ncon0_5K	EM	09.942	12.127	50	12015-3906-1_ref	REF	28.352	
	367	12015-4623-7_ncon3_5K	EM	12.839	11.979	102	12010-4623-1_ref	HEP.	29.458	
	129	12015-3909-3_ncon2_5K	EM	50.475	11.924	62	1 2015 3909.4_ref	REF	32.193	

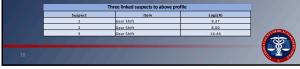
TrueAllele® Interpretation/Database

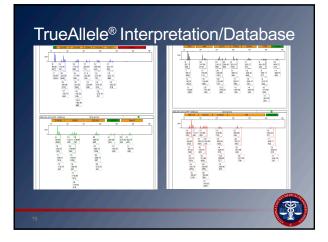
- EVI-REF Match Rule
- Link suspects to multiple cases
- Avoid direct comparison between reference and evidence profiles

ase	Item	Log(LR)
1	Steering Wheel	12.45
2	Steering Wheel	6.44
3	Steering Wheel	2.28
4	Flashlight	4.02
	Steering Wheel	16.04
	Steering Wheel	5.21
5	Cigar	6.36
Steering V	Steering Wheel	9.54
6	Ignition Key	2 33
Gea	Gear Shift	5,99
7	Gear Shift	4.22
	Driver Door Handle	3.00
	Pass Door Handle	4.55
8	Cigar	13.52
	Cigarette Butt	14.84
	Ziploc Package	10.32

TrueAllele® Interpretation/Database

- EVI-REF Match Rule
- Profiles not considered previously provide match information
- Manually interpreted profile was inconclusive due to >3 contributors
- Three linked suspects identified in the TA database







The Summary

Manual

- ~2 month from testing to report
 ~1 month from data
 release, additional month to
 upload/request to preliminary release supplemental reports
- 11 of 38 suspects associated to at least one case
- 4 of the 11 suspects connected to multiple cases
 8 of the 16 suspects connected to multiple cases
- 30 profiles reported as inconclusive
- 12 samples reported as exclusions

TrueAllele

- 16 of 38 suspects associated to at least one case
- All 30 profiles with at least one positive association
 Positive match scores for the 12 manual exclusions



Acknowledgements

Work would not have been possible without the help and support of the members of the Cybergenetics team:

Bill P. Allen, MS Jennifer M. Hornyak, MS Dr. Mark W. Perlin, PhD, MD, PhD Matthew Legler



Thank You!

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