

DNA Mixture Interpretation:
Principles and Practice in Component Deconvolution and Statistical Analysis

Numbers and Types of Casework Mixtures

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Mixtures.....

- How often are mixtures obtained
- What types of mixtures are we seeing
 - Where should we focus our attention for training
 - What info can we give to the forensic community regarding mixtures
- What types of samples most often yield mixtures

Torres et al. 4 year Spanish study

- Four year study (1/1997 to 12/2000)
- 2412 samples typed
 - 955 samples from sexual assaults
 - 1408 samples from other offenses
 - 49 samples from human remains identifications
- 163/2412 samples (6.7% showed mixed profile)

Torres et al Spanish Case Summary Data

N = 163		Biological Fluid			
		Blood	Semen	Saliva	
Sample type	Victims	N = 60	23%	73%	---
	Clothing/ bedding	N = 76	70%	30%	---
	Weapons	N = 15	100%	---	---
	Crime scene	N = 12	75%	---	25%

Spreadsheet Information Requested

<http://www.cstl.nist.gov/biotech/strbase/mixture.htm>

Labs requested to also provide info on kit, PCR volume used, etc.

- Case#
 - Item#
 - Type of sample (biological material if ID'd)
 - Type of substrate
 - Quantity amp'd
 - **Minimum # of contributors (1, 2, 3, 4, or >4)**
 - Predominant type (major profile) determined?
 - Stats reported
 - Comments
- This information retained by lab and not returned...*

We would love to have your lab mixture numbers...

Email information to ann.gross@state.mn.us

Labs submitting data

- Palm Beach Sheriff's Office Crime Lab, Florida
- Centre for Forensic Science, Toronto
- Connecticut State Police
- Washington State Police
- New Jersey State Police
- Georgia Bureau of Investigation
- Royal Canadian Mounted Police, Ottawa
- USACIL, Georgia
- Michigan State Police
- Kern County Crime Lab, California
- CAL DOJ
- Minnesota Bureau of Criminal Apprehension

CFS Toronto Case Summary Data

		# contributors				
		1	2	3	4	>4
N = 276						
Case type	Sexual Assault	N = 152 42%	52%	7%	1%	--
	Major Crime	N = 68 59%	34%	7%	--	--
	High Volume	N = 56 69%	16%	16%	--	--

Single source

Mixtures

PBSO Case Summary Data

		# contributors				
		1	2	3	4	>4
N = 979						
Case type	Sexual Assault	51%	41%	7%	--	1%
	Major Crime	58%	31%	9%	2%	--
	High Volume	51%	34%	14%	1%	--

Single source

Mixtures

CT State Police Case Summary Data

		# contributors					
		1	2	3	4	>4	
N = 71							
Case type	Sexual Assault	N = 57	75%	21%	4%	--	--
	Major Crime	N = 13	69%	31%	--	--	--
	Other	N = 1	100%	31%	--	--	--

Single source

Mixtures

WA State Patrol Case Summary Data

		# contributors					
		1	2	3	4	>4	
N = 392							
Case type	Sexual Assault	N = 156	53%	41%	6%	--	--
	Major Crime	N = 190	56%	22%	16%	6%	--
	High Volume	N = 46	35%	37%	28%	--	--

Single source

Mixtures

NJ State Police Case Summary Data

		# contributors				
		1	2	3	4	>4
N = 100						
Case type	Sexual Assault	N = 15	47%	53%	--	--
	Major Crime	N = 23	96%	4%	--	--
	High Volume	N = 62	66%	27%	--	--

Single source

Mixtures

GBI Case Summary Data

		# contributors				
		1	2	3	4	>4
N = 20						
Case type	Sexual Assault	N = 10	90%	10%	--	--
	Major Crime	N = 10	0%	100%	--	--
	Other	N = 0		--	--	--

Single source

Mixtures

RCMP Case Summary Data

N = 1554		# contributors				
		1	2	3	4	> 4
Case type	Sexual Assault N = 651	53%	37%	10%	--	--
	Major Crime N = 895	71%	22%	6%	1%	--
	High Volume* N = 8	100%	--	--	--	--

Single source Mixtures

USACIL Case Summary Data

N = 118		# contributors				
		1	2	3	4	>4
Case type	Sexual Assault N = 85	41%	48%	8%	2%	--
	Major Crime N = 33	70%	15%	15%	--	--
	High Volume N = 0	--	--	--	--	--

Single source Mixtures

MSP Case Summary Data

Case type		N = 220	# contributors				
			1	2	3	4	>4
Sexual Assault	86	10%	73%	15%	1%	--	
Major Crime	48	25%	52%	23%	--	--	
High Volume	86	38%	37%	24%	--	--	

Single source Mixtures

Kern County Case Summary Data

Case type		N = 26	# contributors				
			1	2	3	4	>4
Sexual Assault	11	55%	36%	9%	--	--	
Major Crime	15	60%	20%	20%	--	--	
High Volume	0	--	--	--	--	--	

Single source Mixtures

CAL DOJ Case Summary Data

N = 274		# contributors					
		1	2	3	4	>4	
Case type	Sexual Assault	188	59%	33%	7%	1%	--
	Major Crime	66	53%	32%	9%	6%	--
	High Volume	20	75%	25%	--	--	--

Single source Mixtures

MN BCA Case Summary Data

N = 331		# contributors					
		1	2	3	4	>4	
Case type	Sexual Assault	N = 149	58%	39%	3%	--	--
	Major Crime	N = 95	61%	30%	8%	1%	--
	High Volume	N = 87	23%	49%	24%	3%	--

Single source Mixtures

All Laboratory Data Combined

		# contributors					
		1	2	3	4	>4	
N = 3106							
Case type	Sexual Assault	N = 1408	51%	40%	8%	--	--
	Major Crime	N = 1388	66%	24%	8%	2%	--
	High Volume	N = 310	43%	37%	19%	1%	--

Single source Mixtures

Overall Summary – 3106 samples

- 57% of samples from all types of cases are single source
- 43% of samples from all types of cases are mixtures
 - 33% of mixtures of at least two contributors
 - 9% of mixtures of at least three contributors
 - 1% of mixtures of at least four contributors

MN BCA Data

contributors

			1	2	3	4	>4
Sample type	Blood	N = 77	79%	18%	3%	--	--
	Saliva	N = 16	75%	19%	--	3%	--
	Semen	N = 120	54%	43%	3%	--	--

Single source
Mixtures

MN BCA Data

contributors

			1	2	3	4	>4
Sample type	Hair	N = 2	100%	--	--	--	--
	NECs	N = 38	39%	37%	21%	3%	--

Single source
Mixtures

MN BCA Data

		# contributors					
		1	2	3	4	>4	
Sample type	Wearer	N = 19	16%	47%	32%	5%	--
	Gun Swabs	N = 55	5%	65%	27%	2%	--

Single source Mixtures

Conclusion/Further analysis

- Focus training on 2-person mixtures
- Look at all the data based on sample type and quantity of DNA amplified
- Publish the results of the survey

Thanks to the labs who took the time to fill
out the spreadsheet!!

- Palm Beach Sheriff's Office Crime Lab, Florida
- Centre for Forensic Science, Toronto
- Connecticut State Police
- Washington State Police
- New Jersey State Police
- Georgia Bureau of Investigation
- Royal Canadian Mounted Police, Ottawa
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