

Bodily Fluids on Laundered Evidence - A Comprehensive Summary of Forensic Biology and DNA Results

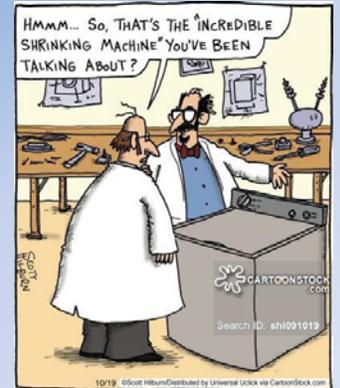


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Purpose and Background

- Evidence received for FBIO/DNA examinations often compromised, which includes laundering
- Laundered item forensic publications
 - ❖ few in number
 - ❖ limited to semen
- Primary study on hand washed clothing conducted by the DPD
 - ❖ Amount of DNA obtained at quantification surprising

-therefore-
- Secondary comprehensive laundry study devised to investigate the range of FBIO and DNA results laundered evidence can produce



Materials and Methods

Bodily Fluids blood, saliva, semen (known laboratory donors; 20ul each/stain area)

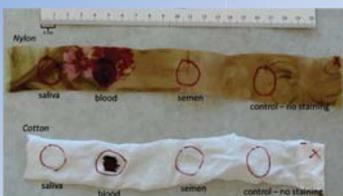
Fabric types cotton, nylon

Number of households participating

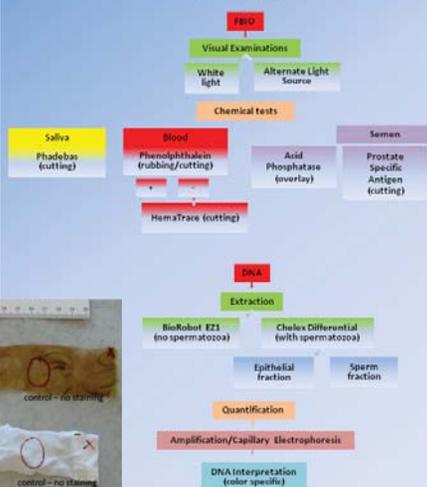
- 11 (cotton)
- 8 (nylon - 3 fabric strips destroyed during laundering)

➤ Each household reported number of members whose clothing was co-laundered with fabric strips

➤ References collected when possible



The Process



Household

Participating household	# of household co-laundering members	Number of references provided	Laundering highlights: Cycle Load size Time wash/dry Temp wash/dry
1	4	4	Cotton X-large 54 mins/not indicated Warm/not indicated
2	4	1	Perm. Press Large 42 mins/45 mins Warm/Warm
3	1	1	Gentle X-large 25 mins/45 mins Cold/Cold
4	0	1	Colors Large 12 mins/100 mins Warm/Cold
5	3	1	Normal Large 10 mins/45 mins Warm/Cold

results not considered in final conclusion - missing references for DNA comparisons

And

Laundering Details

Household	# of household co-laundering members	Number of references provided	Laundering highlights: Cycle Load size Time wash/dry Temp wash/dry
6	3	3	Whites Large 30 mins/60 mins Warm/Warm
7	1	4	Delicate Medium 36mins/75mins Cold/Cold
8	2	1	Normal Large 45 mins/54 mins Warm/Cold
9	2	2	Cotton Large 49 mins/not indicated Warm/Cold
10	1	1	Quick Small 10 mins/not indicated Cold/Cold
11	4	4	Normal Large 40 mins/60 mins Warm/Cold
Control			not laundered

ALS

Cotton ALS Results Summary (n=11)			
	Saliva	Semen	Laundered Controls
+	0	4	3
-	11	7	8

Nylon ALS Results Summary (n=8)			
	Saliva	Semen	Laundered Controls
+	0	0	0
-	8	8	8

Forensic Biology Alternate Light Source (ALS) Examinations and Chemical Test Results

Chemical Tests

Cotton FBIO Chemical Tests Summary (n=11)						
	Phad	Phe	HemaTrace (n=2)	AP	PSA	Sperm
+	0	9	0	0	4	11
-	11	2	2	11	7	0

Nylon FBIO Chemical Tests Summary (n=8)						
	Phad	Phe	HemaTrace	AP	PSA	Sperm
+	0	0	0	0	1	7
-	8	8	8	8	7	1

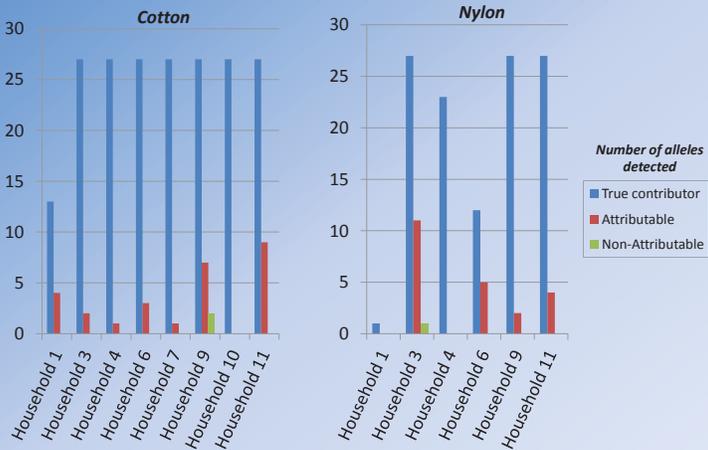
DNA Quantification Results

Quantification results (ng/ul)			
Cotton (n=11)	Mean ± 1 SD	Nylon (n=8)	Mean ± 1 SD
Saliva	0.040 ± 0.037	Saliva	0.003 ± 0.031
Blood	0.544 ± 0.718	Blood	0.045 ± 0.069
Semen EF	0.098 ± 0.177	Semen EF	0.052 ± 0.136
Semen SF	9.326 ± 20.981	Semen SF	0.128 ± 0.155
Laundered Control	0.00012 ± 0.00016	Laundered Control	0.00004 ± 0.00007

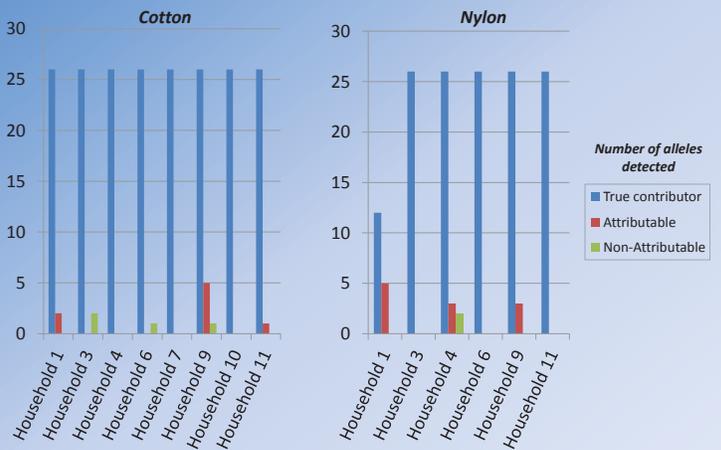


<http://www.sopachem.com/lifesciences/portfolio/kapa-gdnq-quantification-and-qc-kit/>

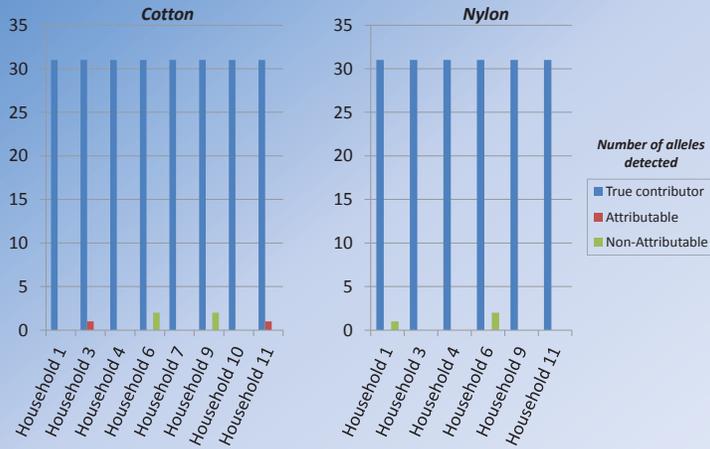
DNA Interpretation Results Saliva



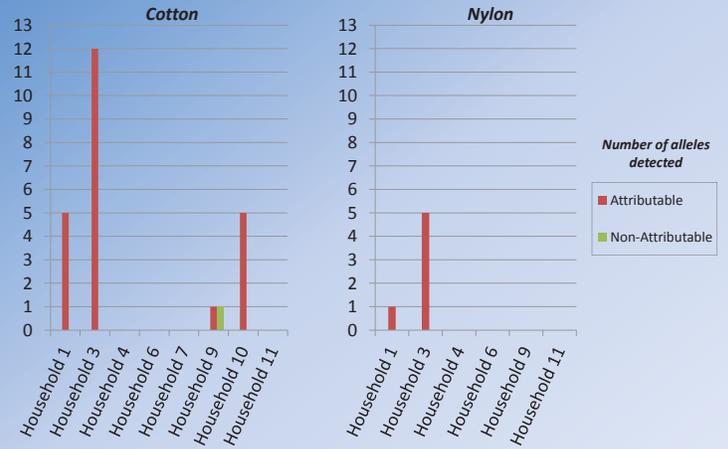
DNA Interpretation Results Blood



DNA Interpretation Results Semen



DNA Interpretation Results Unstained Laundered Controls



Conclusions

- Bloodstaining may be visible post-laundering
63.6% on cotton; 12.5% on nylon
- Laundering compromises ALS
10.5% ALS+ of all stains, + all semen on cotton
- Laundering compromises bodily fluid components targeted in presumptive tests
16.3% of chemical tests + (9 Phe, 5 PSA)
- Spermatozoa will likely be present post-laundering
100.00% on cotton; 87.5% on nylon
- Intact spermatozoa may be present post-laundering
72.7% on cotton; 0.0% on nylon
- Complete true contributor DNA profiles can be obtained post-laundering
89.5% total stains analyzed
(either single source or as contributor to the mixture)
- Complete loss of the true contributor can occur by laundering
1.3%, one saliva stain on cotton
- Attributable and non-attributable DNA transfer occurs
- DNA profiles from laundered items can exhibit degradation and/or inhibition
- One allele can be obtained from a non-laundered cutting



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