

# Casework Experience with the GlobalFiler STR Kits

## Saint Louis County Police Crime Laboratory

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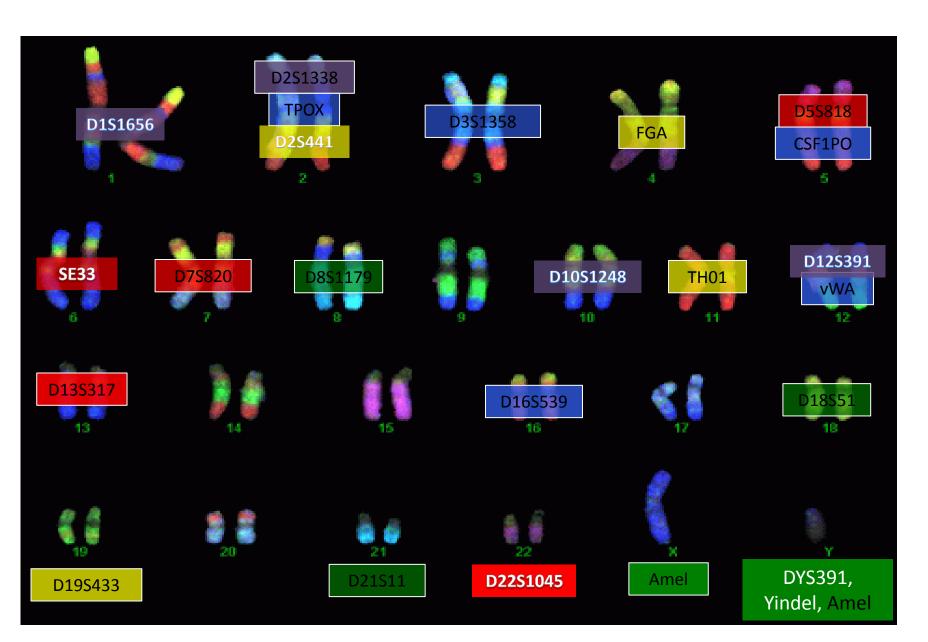


#### Saint Louis County Police Crime Laboratory

- > Serve a population of ~1 million
- > 12 employees in the Bio/DNA unit Currently (2015) we have 2.5 biologists, 1 technician (training in Biology), 5 full-time DNA analysts (one just signed off for DNA), 3 supervisory/DNA analysts (section supervisor, TL, and CODIS Administrator)
- > Biologists perform the sampling step for DNA = huge time savings for DNA
- > We use EZ1s for extraction (Erase on EZ1s for differentials, Tecan in validation), 7500s, 9700s, and 3500s for CE- We average ~ 1000 cases per year in DNA

#### ➤ GlobalFiler online in June of 2014

Location of GlobalFiler Loci in the Genome:



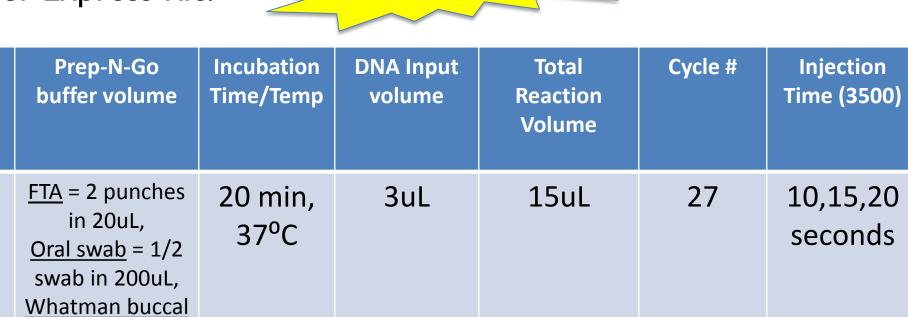
## **Protocol Overview and Optimization**

## GlobalFiler Express Kit: 40 min. amp!

Protocol

**Optimized** 

Protocol



1uL and 2uL

volumes

5 second

injection

time added

### GlobalFiler Casework Kit:

swabs = ~3 teeth

in 200uL

DNA Target Amount	DNA Input volume	Total Reaction Volume	Cycle #	Injection Time (3500)	GeneMapper ID-X v1.4 Settings
1.5-2ng	Up to 15uL	25uL	29	10,15,20 seconds	Local Southern Sizing Method, Peak Window Size=11

#### Analytical and Stochastic Thresholds for Casework Analysis:

	Analytical Threshold	Stochastic Threshold - 5*, 10, 15 second injection times	Stochastic Threshold - 20 second injection time
GlobalFiler Express Kit	80 RFU	300 RFU *5 second injection time only used with Express Kit	300 RFU (stochastic threshold validated using 20 second injection time samples)
GlobalFiler Casework Kit	100 RFU	400 RFU	550 RFU

#### Master Mix Additive (MMA) Update

- > Customers reported seeing elevated NED<sup>TM</sup> peak heights as well as a reverse ski slope in the purple channel (SID<sup>TM</sup>)
- > Suspected cause is the old MMA formulation which used a phosphate buffer - phosphate likely forming a precipitate  $(Mg_3(PO_4)_2)$  which reduces the available  $Mg^{2+}$  in the reaction
- ➤ Higher input DNA samples (≥4ng) have a more pronounced effect due to the balance of primers and the excess DNA using up even more of the Mg<sup>2+</sup>
- > Updated kit uses BSA in a Tris buffer and MMA is no longer in a separate tube
- > Only applies to the Casework kit, no changes to the Express kit

#### ➤ Performance check needed!

Sensitivity Series:

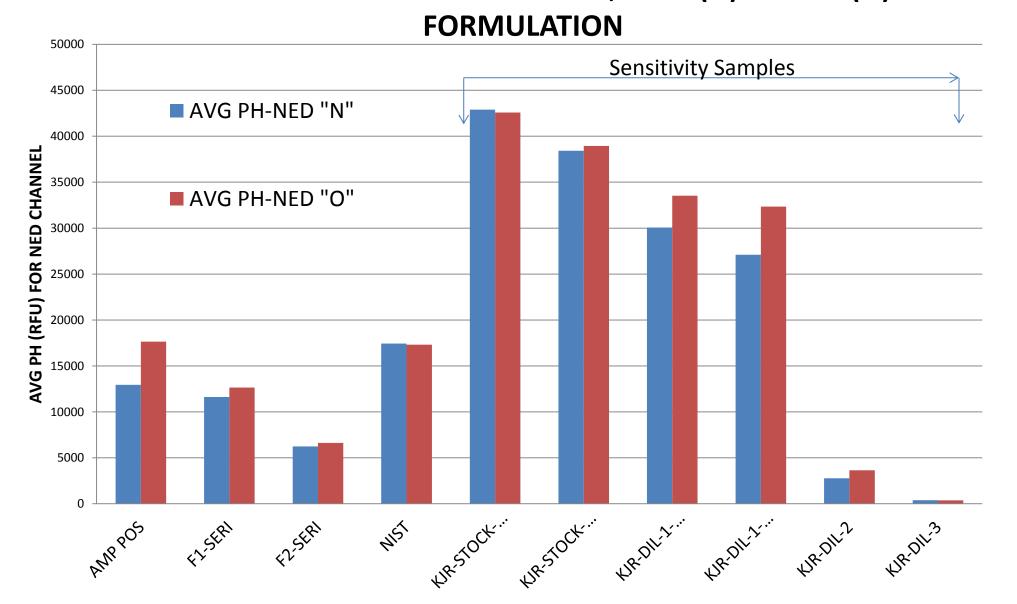
Sample ID	Plexor Quant value (ng/ul)	Plexor factor	Adjusted Quant value (ng/ul)	ul added to reaction	Total DNA (ng) in Amp reaction
KJR-stock (average*)-3ul	5.38	0.651	3.50238	3	10.507
KJR-stock (average*)-2ul	5.38	0.651	3.50238	2	7.0047
KJR-Dil-1-15ul	0.538	0.651	0.350238	15	5.2535
KJR-Dil-1-10ul	0.538	0.651	0.350238	10	3.5023
KJR-Dil-2	0.0538	0.651	0.0350238	10	0.3502
KJR-Dil-3	0.00538	0.651	0.00350238	10	0.0350

#### Known/non-probative:

Sample ID	Source	Body Fluid/Substrate
F1 /F2	SERI R675B lot# 1003001 + Saliva from	Component and its component
F1/F2-	4024 (differential extraction	Semen+saliva on
SERI	performed)	fabric
NIST	Bloodstain card extract	Blood on FTA
KJR	Whole blood with EZ1 TTD extraction	Blood
	CTS-14-575#3 (no differential	Blood+semen on
S-MIX-A	performed)	fabric

#### **Performance Check Results – MMA Update**

NED CHANNEL AVG PEAK HEIGHTS, NEW (N) VS OLD (O)



- > No significant differences were noted between the two kit formulations
- > All controls correct, no contamination indicated
- > The "old" kit had been thawed only 4 days prior to amplification
- > Data indicates the level of precipitate formation may be related to the length of time the kit sits refrigerated after MMA is added

#### Interesting Case #1 – 1990 Homicide

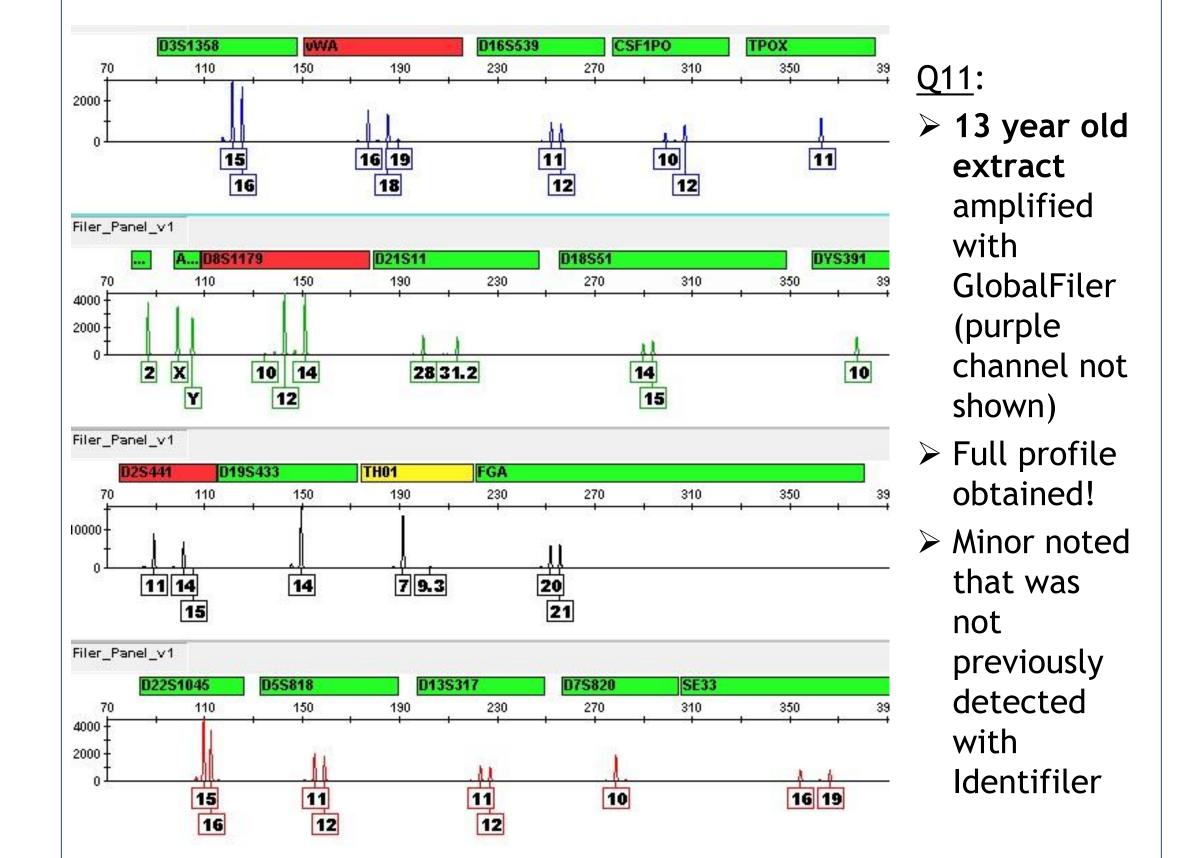
#### Scenario:

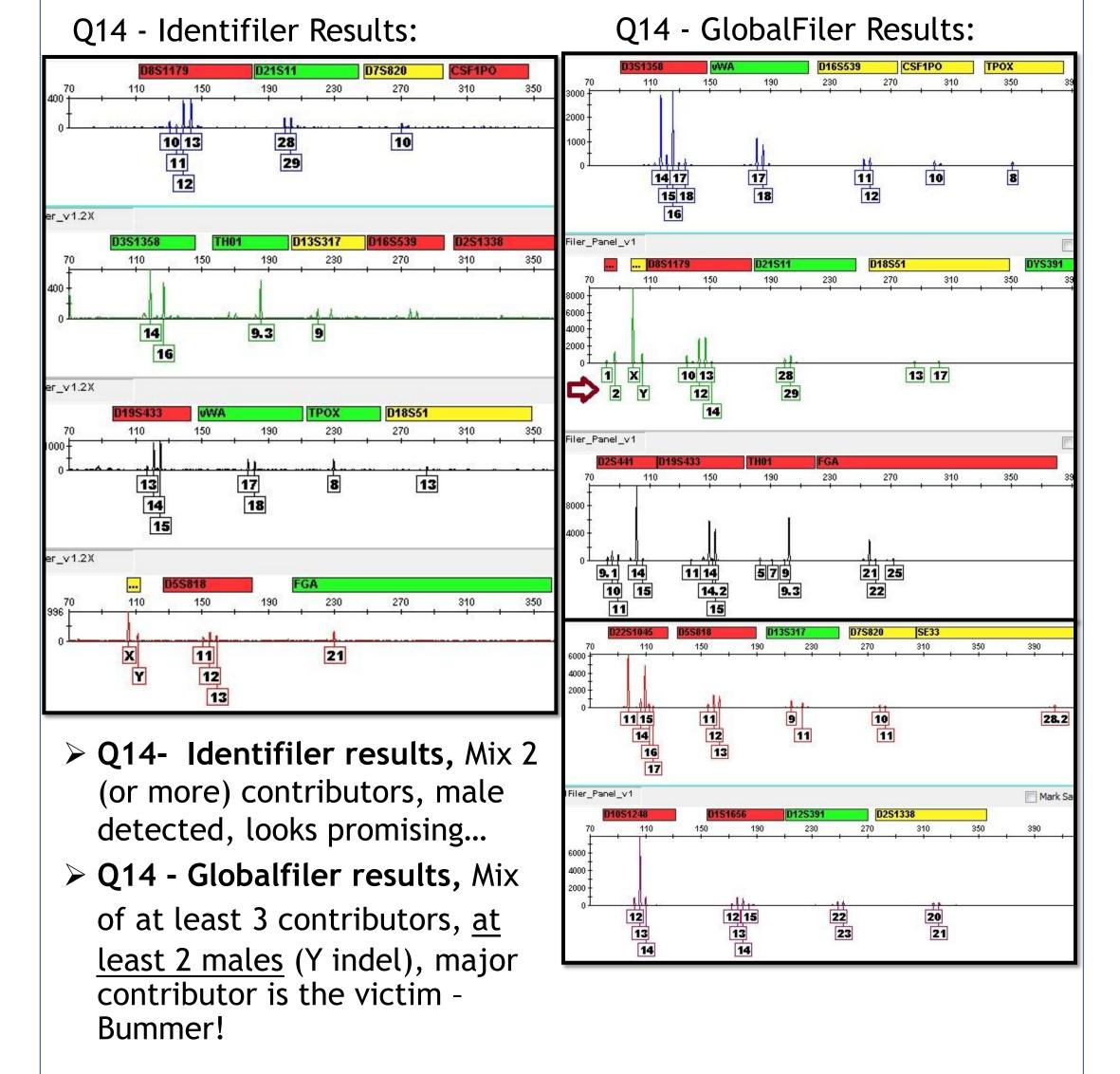
Female maintenance worker was found stabbed and strangled in the men's restroom of a local seminary. Original suspect was the victim's boss - a glove with a bloodstain (Q11) was located in a gym bag at the suspect's residence.

Evidence: (Q14 not previously tested)

Q11 - 2001 extract of RBS from glove located in suspect's residence Q14 - swabs from restroom sink, back of fixture

Globalfiler was just being brought online (waiting for NDIS approval) These samples were the first run with GlobalFiler once it came online





- > Although the new analysis did not "solve" the case, it was incredibly valuable to see a direct comparison of the Identifiler and GlobalFiler kits on a casework sample
- > The GlobalFiler kit is far more sensitive than Identifiler

### **Contact Information**

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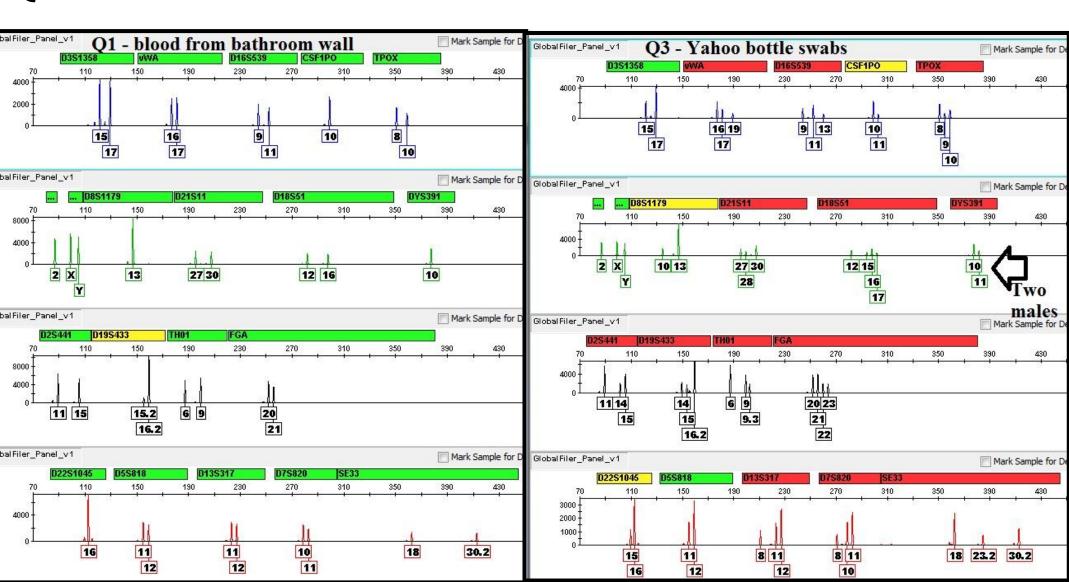
#### Interesting Case #2 – "Yahoo"

#### Scenario:

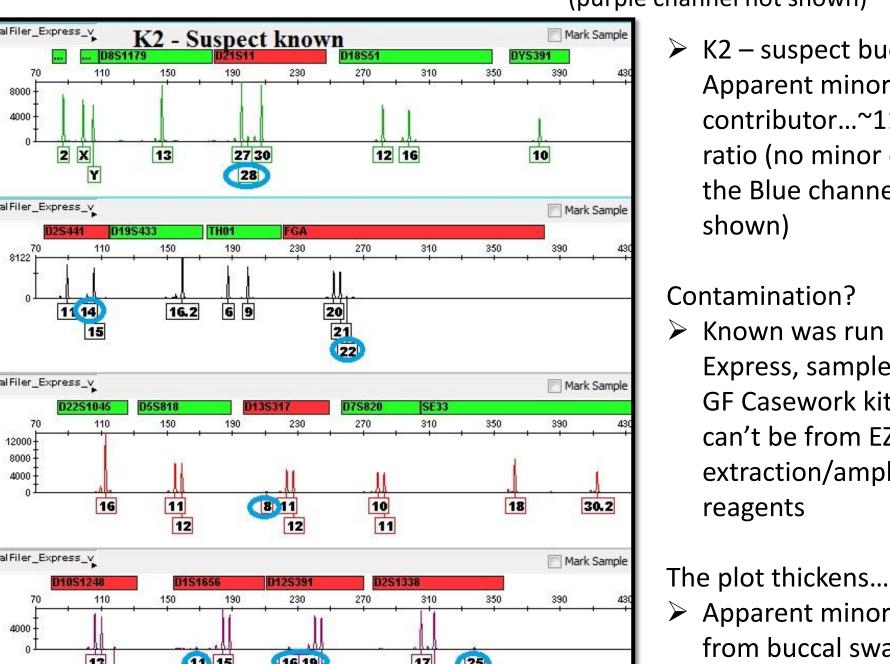
Suspect broke into an unoccupied home (resident had recently passed away - relatives had been packing up belongings). Suspect steals a TV and other items, then steals the victim's car. He is found in the city passed out in the stolen car (high on heroin).

#### Evidence:

- Q1 swabs of blood from bathroom wall
- Q3 swabs from mouth of "Yahoo" bottle



➤ Q1 – Single source male (purple channel not Q3 – Perfect 2 male mixture with ~2:1 ratio, Major is consistent with the male from Q1 (purple channel not shown)



- ➤ K2 suspect buccal swabs Apparent minor contributor...~11:1 mixture ratio (no minor detected in the Blue channel - not shown)
- Contamination? Known was run with GF Express, samples run with GF Casework kit –therefore can't be from EZ1 or extraction/amplification
- Apparent minor contributor
- from buccal swab matches 11 15 (1619) the minor contributor from the "Yahoo" bottle

## Possible Explanations:

- > Officer collected swabs at same time (or used contaminated swabs)? – no. Per officer, he collected the Yahoo bottle swabs but the buccal swab was collected at the city jail the following day...
- > Chimera?

CODIS hit to a multi-allelic offender solves the mystery. The suspect is a bone marrow recipient!

- ➤ Interesting that one saliva sample has a mixture ratio of 11:1 (buccal swab) and the other 2:1 (Yahoo)
- The MO Highway Patrol has 7 multi-allelic offenders (out of 263,755 offenders (0.002%) as of 3/5/15)

#### Summary

- >Overall we are very pleased with the GlobalFiler kits.
- > The significantly reduced processing/amplification times has improved our throughput and allowed for expedited analysis.
- > The 15uL input volume allows for dramatically increased sensitivity.
- > The additional loci provide more definitive information with respect to the number of contributors and the gender of contributors.
- > The additional loci provide an amazing power of discrimination - Random Match Probabilities are routinely in the nonillion-decillion range (10<sup>30</sup>-10<sup>33</sup>)