Rapid DNA Profiling of Samples Collected at the Booking Station

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Rapid DNA

CBI participated in a pilot project with 2 other labs to test the GE rapid instrument in 2015/2016.

An opportunity was given to CBI to test an updated version of the rapid instrument by ANDE™ in 2017.

This presentation will be an overview of the 2017 project in addition to a comparison between the two instruments.
Collection of Samples

A local booking station collected approximately 100 samples over a 2 week period.

The staff was trained for less than 10 minutes on sample collection but had prior experience collecting Rapid DNA Samples.

Each sample was collected after the required adult felony arrestee sample was taken.

Swabs were stored at room temperature and labeled with identifying information.
Instrument Basics

A (Arrestee)-Chip

Swab with a unique RFID Tag including two attached desiccant packs

Each A-Chip allows for up to 5 samples
Chemistry of Chip

- FlexPlex Assay

- Controls
  - None included on the Chip

- Ladders
  - A ladder is run with each Chip
    - Note: If the ladder run with the Chip does not pass a preinstalled ladder is used

- Size Standard
  - Internal lane standard is reviewed by the instrument
Instrument Use

- Approximately 20 minute instrument start-up
- Secure login - 3 security options available
- Enter sample information
- Scan RFID tag for each swab
- Place Chip in instrument
- Approximately 92 minute run time
Run Completed

Approximately
29 in x 24 in x 17 in

12 in x 6.5 in x 4.5 in
View and Export A-Chip Data

- Sample passed – All 20 CODIS core loci
- Sample failed - < 20 CODIS core loci
- Sample flagged yellow – OLA at a CODIS core loci not in allele table
Data RESULTS

<table>
<thead>
<tr>
<th>Possible Reason for failure</th>
<th>ANDE™ Rapid Instrument Results</th>
<th>CBI – Forensic Services Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tri-allele</td>
<td>Sample Fails</td>
<td>After verification sample is uploaded to CODIS</td>
</tr>
<tr>
<td>Low peak height</td>
<td>Sample Fails</td>
<td>Sample is re-run using additional methods</td>
</tr>
<tr>
<td>OLA</td>
<td>Sample passes if in the allele table</td>
<td>After verification sample is uploaded to CODIS</td>
</tr>
<tr>
<td>Peak Height Imbalance</td>
<td>Sample Fails</td>
<td>After verification sample is uploaded to CODIS</td>
</tr>
<tr>
<td>ILS</td>
<td>Sample Fails</td>
<td>Sample will be re-run</td>
</tr>
<tr>
<td>Peak between loci</td>
<td>Sample Fails</td>
<td>After verification sample is uploaded to CODIS</td>
</tr>
</tbody>
</table>

* Table is in reference to CODIS core loci only
Data from CBI-FS

- Tri-alleles comprise less than 1% of our samples in CODIS.
  - Using current technology samples with a tri-allele will not pass on a Rapid Instrument.
- A 1st time pass rate of approximately 93% was determined using data from 2013.
  - Problem samples can be run again using additional methods.
  - All genetic anomalies must be run twice.
Key Data Points

• All samples were concordant

• One Chip failed due to a software error

• One of the samples run had an OLA that was called correctly (NIST-STRBase table)

• Four samples failed
  • 3 low peak heights – possibly due to collection
  • 1 overall low sample with all alleles called

• Data obtained from Rapid Instrument not analyzed in GMID-X (including ladders)
Instrument Pass Rate For Rapid Instruments

2017  92%

Percentage does not include the failed run

2015  80%

Four samples that were flagged yellow had less than 13 loci

COLORADO Bureau of Investigation Department of Public Safety
Advantages

• Easy to use
• Compact and light weight
• Low maintenance
• Easy to transfer data
• Cap design on swab (square design)
• Simple results
• Tracks sample based on RFID tag even if placement is incorrect on Chip
Disadvantages

• Cost
• Chip
  • Excessive Packaging
  • Must be used within 15 to 30 minutes of opening
  • Temperature/handling
• No distinguishable notification that run is complete
• Limited to 5 samples per run
• Loud
• RFID Swabs
  • Long term storage not advised
  • Limited to only a single collection device (swabs only)
## Comparison Table

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>PowerPlex (16 loci)</td>
<td>FlexPlex (27 loci)</td>
<td></td>
</tr>
<tr>
<td>No barcode scanner</td>
<td>Barcode scanner option</td>
<td></td>
</tr>
<tr>
<td>No desiccant in swab cap</td>
<td>Desiccant included in swab cap</td>
<td></td>
</tr>
<tr>
<td>1 Chip option</td>
<td>2 Chip options</td>
<td></td>
</tr>
<tr>
<td>Self tape for seal on used chip</td>
<td>Sticker provided for seal on used chip</td>
<td></td>
</tr>
<tr>
<td>88 minute run time</td>
<td>92 minute run time</td>
<td></td>
</tr>
<tr>
<td>Set warm-up time</td>
<td>Self adjusting warm-up time</td>
<td></td>
</tr>
<tr>
<td>Chips near expiration may fail (hand made)</td>
<td>Adjusted expiration date to increase shelf life (automated production)</td>
<td></td>
</tr>
<tr>
<td>Several step decryption process for viewing data on a computer</td>
<td>One step decryption process for viewing data in FAIRS software</td>
<td></td>
</tr>
<tr>
<td>1 un-scanned RFID tag on swab allowed</td>
<td>No un-scanned RFID tag on swab allowed</td>
<td></td>
</tr>
</tbody>
</table>
Overall Opinion

• Positive improvements
• Only negative is the 1 RFID scan mismatch change
• Did not observe any dropout this time
• No yellow flags
• Kit includes more loci
Legal hurdles for Colorado

16-23-104. Collection and testing

(1) The Colorado bureau of investigation shall provide all specimen vials, mailing tubes, labels, and other materials and instructions necessary for the collection of biological substance samples required pursuant to this article.

(2) The Colorado bureau of investigation shall chemically test the biological substance samples collected pursuant to this article. The Colorado bureau of investigation shall file and maintain the testing results in the state index system after receiving confirmation from the arresting or charging agency that the adult was charged with a felony. If the Colorado bureau of investigation does not receive confirmation of a felony charge within a year after receiving the sample for testing, the Colorado bureau of investigation shall destroy the biological sample and any results from the testing of the sample. The Colorado bureau of investigation shall furnish the results to a law enforcement agency upon request. The Colorado bureau of investigation shall store and preserve all biological substance samples obtained pursuant to this article.
Thank you to the CBI Database staff for their participation as well as to ANDE™ for allowing us to test their instrument and providing consumables!