

# CAST-OFF DNA AND GLOBALFILER EXPRESS

KELSEA GOODWILLIE



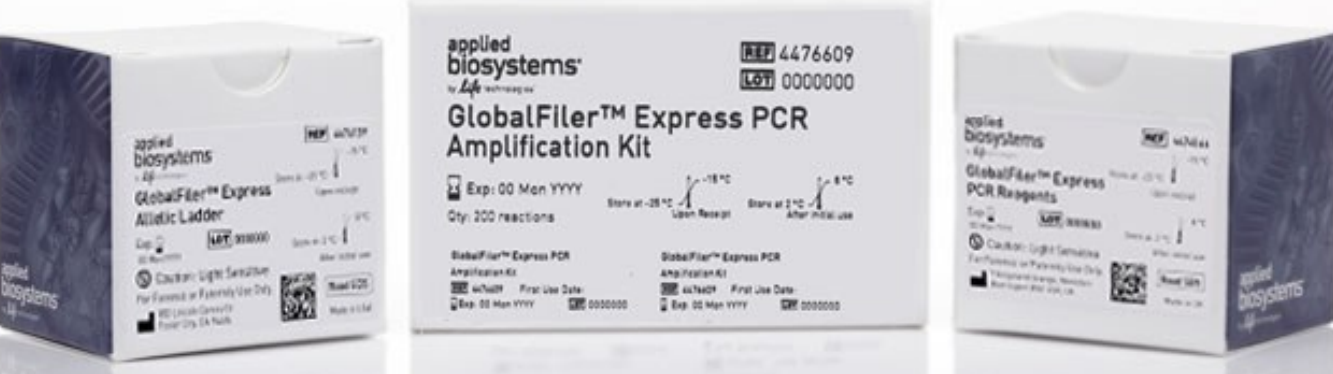
BRITISH COLUMBIA  
INSTITUTE OF  
TECHNOLOGY

FORENSIC SCIENCE  
& TECHNOLOGY

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## Abstract

The focus of this project is to perform the analysis of ‘cast-off’ DNA using the next generation of Short Tandem Repeat (STR) technology: GlobalFiler Express. During this study, different types of cast-off exhibits that are commonly obtained for the collection of DNA will be analyzed and compared using this new kit. The results provided by this analysis will be used to show the effectiveness of using GlobalFiler Express for testing cast-off exhibits, as well as provide recommendations in regards to the usefulness of various types of exhibits for generating useable DNA profiles.



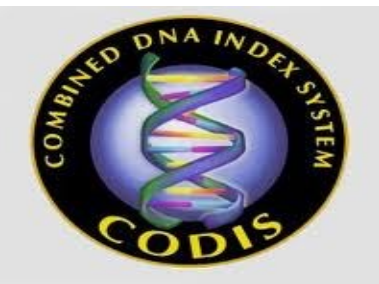
## Introduction

### What is Cast-Off DNA?

- The term ‘cast-off’ DNA refers to DNA that has been obtained from an object that a suspect has discarded.
- Typical cast-off exhibits include cigarette butts, used coffee cups, chewed gum, etc.
- Cast-off exhibits are collected from suspects who refuse to provide a DNA sample, and the investigators do not have a warrant to obtain it.

### What is GlobalFiler Express?

- GlobalFiler Express is a new 24 loci STR kit that uses a six dye technology for DNA analysis.
- This new form of technology is much faster than previous systems used, and in some cases can generate results in less than two hours.
- The 24 loci means that there are more portions of DNA that can be analyzed, providing a greater opportunity to obtain useable results. This is beneficial for partial or degraded samples.
- The 24 loci also contains the different markers used in all national and international databases, making it the first of its kind to meet all of the requirements neces-



## Procedures



### 1. Determining the Cast-Off Exhibits Needed

- Experienced investigators were interviewed with a list of questions relating to the collection of cast-off DNA.
- Based on the information provided by these interviews, the exhibits that were chosen were cigarette butts, coffee cups, drinking straws, chewing gum, and plastic cutlery.

### 2. Collection of Exhibits

- The exhibits were collected over a two week period, and were placed into labeled paper evidence bags using proper collection techniques to prevent contamination.
- The known samples were buccal swabs collected from different people that the exhibits were obtained from.

### 3. DNA Extraction

- The exhibits were either swabbed or cut up, and placed directly into the Prep and Go buffer for DNA extraction.

### 4. Sample Analysis

- The samples were analyzed and tested using the necessary steps used with GlobalFiler Express for PCR amplification and electrophoresis.



## Results and Discussion

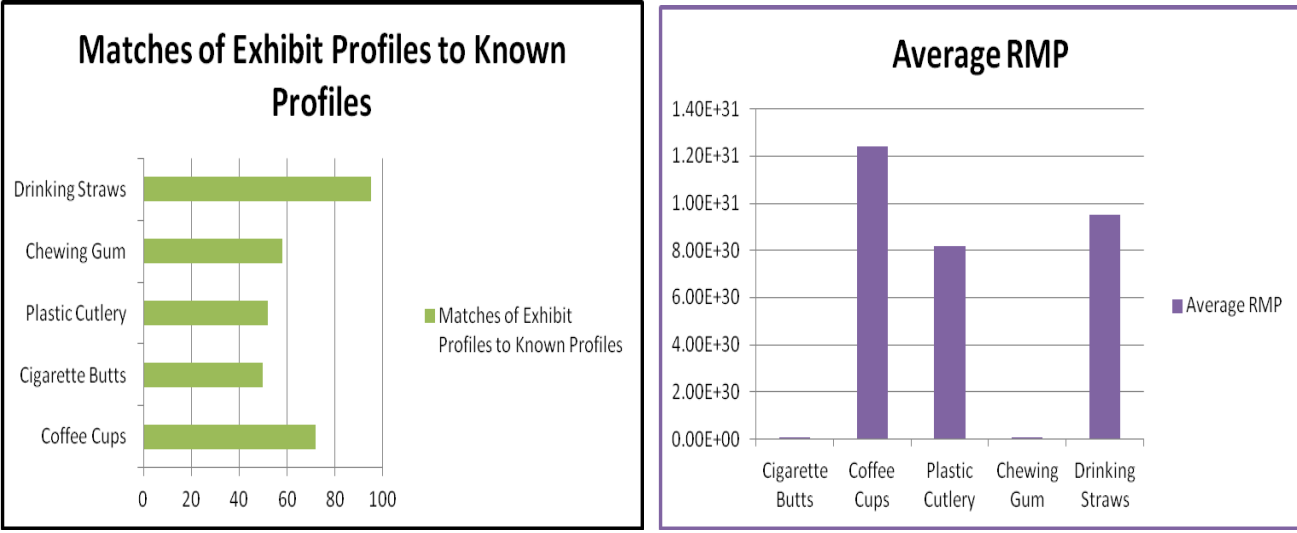
EXHIBITS	RESULTS
DRINKING STRAWS	-All samples provided full profiles.
COFFEE CUPS	-All samples provided either full or partial profiles.
CHEWING GUM	-All samples provided either full or partial profiles.
PLASTIC CUTLERY	-All samples provided either full or partial profiles
CIGARETTE BUTTS	-Only one sample yielded a full profile, and two provided very partial profiles.

For most types of exhibits that were tested, factors such as the time between the use of the exhibit and collection did not seem to impact the results. Exhibits that had a great deal of food remnants left over still provided full or partial profiles, and the various factors effecting the coffee cups, such as presence or absence of a lid, also seemed to have no impact on the results.

Cigarette butt exhibits were an exception to the time factor. Of the six cigarette butt exhibits tested only one provided a full profile, and two provided very partial profiles. The sample that provided a full profile was the only one that was collected immediately after the user smoked it. It is possible that the accuracy of the results for cigarette butt exhibits is dependant on the amount of time between the use and collection.

The known samples all yielded full DNA profiles which were used to compare the unknown samples to their known profiles. Figure 1 shows the percentage of the average match for each exhibit type. This graph shows that drinking straws provided the best percentage of profiles, and cigarette butts provided the worst. Plastic cutlery has only a slightly higher average match to known profiles, but there were usable results obtained for every sample, unlike the cigarette butt exhibits.

The random match probabilities (RMP) for each of the profiles collected was determined. This number is related to the chance that a random unrelated individual would have the same profile. The total RMP from the profiles for each exhibit type was averaged and compared in Figure 2. This graph is consistent with Figure 1 in that drinking straws have the most accurate and unique profiles, and cigarette butts have the least.



## Conclusions

In general, there were very good results obtained from all the exhibits tested. Out of the 35 samples, only two did not provide profiles. The general recommendations that can be made from this experiment is that drinking straws provide very good DNA profiles, and is a highly effective type of cast-off exhibit to obtain. Coffee cups also worked very well, and chewing gum and plastic cutlery provided relatively good results. Cigarette butts are the least recommended type of exhibit to obtain for the use of cast-off DNA.

GlobalFiler Express was able to provide very effective results, in less time and less steps than previous forms of STR technology use. The 24 loci profiles allow for more accurate testing of partial and degraded profiles, and enable the use of international databases. This is very important for Forensic casework. GlobalFiler Express is very useful for the analysis of cast-off DNA.



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