



Criminalistics Section – 2010

A40 Quantitative Analysis of DNA Distribution on Cigarette Butt Filter Paper

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After attending this presentation, attendees will have learned the results of a quantitative study regarding the distribution of DNA on smoked cigarette butt filters. The data can then be used to make informed decisions when selecting from a limited sample in order to avoid complete consumption of available evidence.

This presentation will impact the forensic science community by providing forensic scientists with a better idea of the location and amount of DNA evidence that can be found on cigarette butt filters which have been found indoors or left outdoors for unknown periods of time. This will allow for more accurate sampling of cigarette butt filters and enable the analyst to defend against speculation that evidence was inappropriately consumed.

DNA evidence from cigarette butt filters can be an important part of reconstructing a crime and the sampling of this type of evidence is controlled so as to prevent consuming more than 50% of a sample. The Washington State Patrol (WSP) Crime Lab is one of many laboratory systems in the country that follow a common practice of preserving at least half of an evidence sample to be made available for independent testing by the defense team or retesting in the future. Recently, a question was raised about the effectiveness of this practice in regard to leaving half of a cigarette butt filter when there is no way to ensure DNA is equally distributed on the filter paper.

DNA distribution on smoked cigarette butt filters can be quantitatively mapped by taking measured cuttings of the filter paper, noting their location, and quantifying the amount of DNA on each cutting. The DNA in this experiment was quantified using a Quantifiler® Kit and a 7500 Sequence Detection System. The percentage of total DNA on each cutting can then be compared to the other cuttings to define where the highest percentage of DNA can be found on the filter paper of cigarette butts.

Preliminary testing on twenty four cigarette butt filters has shown that when paper from a cigarette butt filter was sliced parallel to the seam of the cigarette in a consistent pattern, DNA was spread uniformly. However, it was also found that when paper from a cigarette butt filter was sliced perpendicular to the seam of the cigarette, DNA was not spread equally. In short, trends of DNA distribution have been observed.

Data from an experiment in quantification of DNA distribution on the filter paper of 50 randomly collected smoked cigarette butt filters which have been cut into 200 samples. Twenty-five of those cigarette butt filters were collected outdoors while the other twenty-five were collected indoors in an attempt to mimic crime scene situations as closely as

possible. The 50 cigarette butt filters consisted of multiple brands from multiple unknown smokers. The results of this experiment will allow DNA analysts to more confidently and accurately sample this type of evidence while preserving the necessary DNA for future testing. **Cigarette Butt Filter, DNA Distribution, Sampling**