B109 "Taking a Bite Out of Crime": STR Typing of Biological Evidence Left on Food Remnants

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The goal of this presentation is to demonstrate the amenability of bitten foodstuffs to DNA profiling using current STR methodology and identifies some of the limitations and problems that may be encountered when dealing with food evidence. This research will provide an evaluation of the STR profiles obtained from different types of food possibly encountered at crime scenes and a guide for crime scene investigators and police officers on what kind of evidence should not be overlooked at a crime scene.

This presentation will impact the forensic community and/or humanity by showing that DNA typing from bitten foodstuffs is an efficient and reliable alternative source for biological evidentiary samples, and identifies some of the limitations and problems that may be encountered. These results can be used to educate crime scene investigators and police officers on what kind of valuable evidence should not be overlooked at a crime scene.

The advancement of DNA technology has increased the capability of DNA profiling to a level in which its greatest boundary is innovation. It is well known that the common biological fluids encountered at crime scenes provide ample DNA for testing. However, in many cases analysis becomes challenging due to the direct deposit of DNA on an unusual surface or item. Bite marks are a piece of evidence that offer an odd, yet fairly common mode of DNA transfer when dealing with burglary, larceny, robbery, and at times, more serious and violent crimes. The number of cases involving bitten foodstuffs is increasing, suggesting a need to look into the DNA profiling of this type of evidence.

A potluck was staged as a mock crime scene in which foods such as pizza, corn on the cob, chicken wings and ribs, bite size Hershey's peanut butter cups, cheese, apple slices, and carrots were partially consumed and remnants discarded. The unconsumed food commodities were swabbed for biological evidence, analyzed for cellular material by microscopy followed by organic extraction, concentration and quantification by slot blot. The AmpF*l*STR® Profiler Plus™ PCR Amplification kit was used for all PCR reactions. Samples were concentrated to a final volume of 25µl of which 20µl was used in the amplification reaction. Amplicons were electrophoretically separated using the ABI Prism 310 Genetic Analyzer and analysis of raw data and calling alleles carried out by GeneScan® and Genotyper® softwares respectively.

The research results showed that high quality DNA could be extracted with successful STRs typing was obtained. Analyses of the profiles outcomes will be demonstrated. The presence of nucleated epithelial cells in preliminary microscopic results suggested that typing results could be obtained from bitten food products. It was indeed seen that full DNA profiles (9 STR loci + Amelogenin) were obtained from 43% of swabs collected, between 69 loci was seen in 33% of samples, 16% showed 1-5 loci and only 8% failed to type at all. Profile variation based on food-type dependent factors (portion size and eating style, food preparation and natural composition, and swabbing location), are also discussed. Poor profile quality manifesting as allelic dropout is attributed predominantly to PCR inhibition. Degradation and stochastic effects are also considered as sources of allelic dropout but only minimally. Mixed profiles as a ramification of improperly packaged samples are also addressed.

In conclusion, this research has largely shown that STR typing of food can be carried out in a highly successful manner, therefore when food evidence is available, DNA results should definitely be sought. Limitations due to low DNA yield and presence of PCR inhibitors can be overcome to produce high quality DNA profiles. Since cross transfer of cellular material was readily evident in a number of samples, any and all occurrences of food items touching must be noted while applying proper packaging protocol.

Bite Mark, STR Typing, Foodstuffs

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