Making invisible traces visible - forensic analysis

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Partial DNA-profile

Crime in today´s society makes all of us in the community influenced in some way. To reduce the number of crimes, a step in the right direction is to identify the ones that cause the crimes and not judging an innocent individual.

There are different kinds of techniques used for DNA analysis. The most common one is to use the short tandem repeats (STRs), which are repeated nucleotides in our genome that differ for every human being. But what happens when there is not enough DNA at a crime scene? Perhaps the DNA has been degraded, a small amount of a DNA-mixture is the only evidence found at the crime scene or maybe the culprit left no clear traces behind. Researchers have tried to come up with new methods to analyze DNA from a partial DNA-profile. The most common way to analyze a partial sample in the current situation is to use low copy number (LCN) analysis. When this method is used, the interference often increases and interpretation becomes more difficult which can lead to a person being wrongly convicted.

Ideas for new techniques

A primer, which is build up of a short sequence and starts the synthesis of the DNA can have unique design and thereby prevent interference and at the same time make the detection more reliable. Other markers combined with the standard STRs make DNA mixtures easier to interpret. The Society of Forensic Genetics DNA Commission has recommended the use of likelihood ratio (LR), which is a statistical test, used for mixtures. Two hypotheses are tested against each other and either the indicted- or defendants hypotheses are the more likely one. Purification of the DNA sample, which is what it allows a cleaning process of the sample, has also been shown to reduce interference.

When collecting DNA from a crime scene it is not always easy to identify the culprit. The ability to make invisible traces visible is a problem that today's researchers in forensics spend a lot of time on. They are developing and validating new techniques and develop new methods that are used today to analyze DNA that is in some way partial. Degraded DNA, mixtures of DNA and a small number of DNA at a crime scene are three examples that are very common in the crime scene world. By doing more research and testing new methods the number of wrongly convicted will hopefully decrease and also the ability to identify the guilty one. Maybe, and hopefully, the invisible traces will become visible in the future.

Read more

Andersson M. 2016. Analys av partiella DNA-profiler-metoder, problem och lösningar
Oldoni F, Castella, V & Hall D. 2015. A novel set of DIP-STR markers for improved analysis of challenging DNA mixtures. Forensic science international:Genetics 19:156-164.
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