B183 Developmental Validation of MicroRNAs (miRNAs) for Body Fluid Identification

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After attending this presentation, attendees will understand how miRNAs function and why they can be of significant value for body fluid identification in forensic casework. Attendees will be apprised of the markers that can distinguish different body fluids and understand why miRNAs may be a better molecular-based method for the identification of body fluids rather than the use of current serological tests, which are based on enzymatic activity and are often prone to false positives. Although molecular-based methods of identification have previously been introduced into the forensic science community, the research to discover body fluid-specific miRNAs was based on other methods and the data was often conflicting. Attendees will understand the concept of miRNAs as molecular markers for body fluids and be encouraged to promote the necessary research for implementation of miRNAs in forensic casework.

This presentation will impact the forensic science community by illustrating how forensic research on miRNAs continues to build evidence for their utility as forensic molecular markers.

MicroRNAs are small non-coding RNAs that are 18 to 22 nucleotides in length and have previously been identified as potential markers for the identification of forensically relevant body fluids. There is an increased interest in the use of miRNAs because their short length, cellular function, and resistance to degradation allow for easy detection in highly degraded samples, as is often the case in forensic casework samples.

High-Throughput Sequencing (HTS) of three to four donations each of feces, urine, peripheral blood, menstrual blood, vaginal fluid, semen, saliva, and sweat was performed. The data analysis identified several candidate miRNAs with potential body fluid specificity. Initial Real-Time quantitative Polymerase Chain Reaction (RT-qPCR) evaluations revealed that while no evaluated miRNA was absolutely body fluid specific, miRNAs were identified in most body fluids with significantly different relative expression levels, which allows for body fluid identification using a panel of miRNAs. Each of the candidate miRNAs was evaluated thoroughly using classic developmental validation methods including species specificity, limit of detection, abundance within the population, and abundance within an individual over a certain period of time. The miRNAs let-7g and let-7i were identified and validated as candidate miRNAs for internal control purposes as they were expressed with consistent levels in each body fluid from all tested donors. A standard curve using a synthetic miRNA of known quantity was developed to gain a more accurate quantitation method. Based on these data, miRNAs, or the combination of certain miRNAs, can be valuable forensic molecular markers for body fluid identification, especially in degraded or low copy-number samples.

MicroRNA, Body Fluid Identification, Validation

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