

RNA Profiling for the Identification of the Tissue Origin of Dried Stains in Forensic Biology

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ABSTRACT: Examination of crime scene items for biological evidence typically begins with a preliminary screening for the presence of biological fluids in order to identify possible sources of DNA. Conventional biochemical and immunological assays employed for this screening require multiple tests to be performed in a serial manner, can consume a significant amount of valuable evidentiary material, and can require a significant amount of time and labor for completion. Moreover, the presence of several biological fluids, such as saliva, vaginal secretions, and menstrual blood, cannot be conclusively identified using current methods. Due to the disadvantages of conventional body fluid testing, some operational crime laboratories have chosen to bypass the body fluid identification process and proceed directly to DNA analysis. However, while reducing the time spent on each case, this “shortcut” could result in a failure to provide important probative information regarding the nature of the crime as well as result in increased cost to crime laboratories if unnecessary DNA testing is performed. In the past several years, a number of forensic researchers have attempted to develop molecular-based approaches to body fluid identification that would provide operational crime laboratories with significantly improved specificity. This has resulted in an increased interest in the use of RNA profiling strategies for the identification of forensically relevant biological fluids. This review provides an overview of studies carried out on the use of both messenger RNA and small (micro) RNA profiling. The results of these studies are encouraging and presage the routine identification the tissue source(s) of forensic evidence using molecular-based approaches.

KEY WORDS: Body fluid identification, forensic science, mRNA, miRNA, RNA.
