

NUCLEIC ACIDS, NAILS AND THE POST-MORTEM INTERVAL

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Although the post-mortem interval (PMI) is important in the investigation of criminal cases, there are few available methods for accurately estimating post-mortem intervals over several years. This is because decomposition is heavily influenced by factors such as environmental conditions (moisture, temperature, ecosystem, insects, animals and season), the circumstances of the death and the location of the body.

The utilization of nucleic acid degradation (messenger RNA, ribosomal RNA and DNA) from bones, teeth and nails is likely to lead to the development of PMI indicators for longer time periods. These tissues are more stable against environmental conditions so the rate of degradation of nucleic acids will be less influenced by environmental conditions.

With a focus on using methods that are currently in forensic practice, we have successfully modified the Promega DNA IQ™ method to co-extract RNA and DNA from nail clippings. We are taking the time since the nails were clipped as being the PMI for this initial work. We are also currently optimizing methods for co-extracting RNA and DNA from bones and teeth.

Using reverse transcriptase PCR (RT-PCR), we have amplified four keratin mRNA transcripts and 18S rRNA from nail clippings. Placing nail clippings in different environments, including submerged in water, soil and at room temperature we have found that all four keratin mRNA transcripts are stable under different environmental conditions over a week and we are currently investigating longer time periods. Using these results, a statistical model is being developed to correlate the rate of degradation of the different keratin mRNA transcripts and 18S rRNA with the time since the nails were clipped (PMI).