H119 Apoptosis in Brain Tissues: Antemortem and Postmortem Cellular Responses

Justin C. Astin, 780 Country Road 58, Prattville, AL 36067; Shivani Soni, PhD, Alabama State University, 915S Jackson Street, Montgomery, AL 36104; and Gulnaz T. Javan, PhD, Alabama State University, Forensic Science Program, 915 S Jackson Street, Montgomery, AL 36104*

After attending this presentation, attendees will understand the intricate process of apoptosis at molecular level after death and will also gain insight into various signaling pathways and the proteins involved.

This presentation will impact the forensic science community by providing detailed information about the process of apoptosis at cellular and molecular levels postmortem and its prospective to be correlated to Postmortem Interval (PMI), which is a constant area of interest for forensic scientists.

Death is an unavoidable tragedy of life that everyone must face at some point. For forensic scientists, death is much more than just the loss of life. It is the opportunity to better understand how and perhaps even when the loss of life occurred. In terms of a criminal investigation, the determination of PMI may be the single most important task given to a forensic scientist. This determination allows the authorities to assess potential suspects. Over the years, technology has evolved to assist law enforcement agencies in the determination of PMI and although great strides have been made, there is still room for vast improvement. Cell signaling could be a key step in the right direction.

Apoptosis is commonly defined as an active, programmed, and normal physiological process of living organisms during embryogenesis and an indispensable part of eliminating damaged or unwanted cells. Although still being scrutinized, it is suggested that after the physical death of the person, cellular death, also known as apoptosis/necrosis, occurs. In simple terms, this means cellular death through apoptosis is correlated with the physical demise, which forms the rationale behind the present study.

This study will specifically target the cellular process of apoptosis related to the brain structure and function. Brain tissue has been the organ of choice for this study, with the hypothesis that being positioned far from a microbe-rich gut, decomposition will be slower in a postmortem brain. Apoptosis has two pathways that are primarily responsible to the trigger response known as the intrinsic and extrinsic pathway. The intrinsic pathway or mitochondrial pathway, as it is sometimes referred to, occurs when there are signs of cellular stress that can manifest themselves in various ways such as DNA damage or loss-of-survival factor. The second pathway, known as the extrinsic pathway, begins outside the cell, on the cellular surface. Pro-apoptotic receptors are triggered by ligands that initiate this process. Determination of the elapsed-time-since-death, more specifically PMI, is one of the biggest challenges in forensic science. After death, decomposition is activated by the process of autolysis causing cell damage, and finally directing toward cell death.

Ten brain tissues from cadaver and human healthy nerve cells from ATCC® were analyzed using human apoptotic Polymerase Chain Reaction (PCR) -array and 84 key genes were screened. The working hypothesis is: cell death is necessary for the decomposition of tissue to occur and therefore may be useful in determining the PMI. Research is underway to compare the expression profile of various pro- and anti-apoptotic proteins postmortem and antemortem from brain tissues using PCR arrays. Furthermore, the postmortem proteins expression pattern obtained will be correlated with PMI.

Apoptosis, Postmortem Interval, PCR Array