



W2 Electrocutation, Electrical Injury, and Lightning Death Investigations

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After attending this presentation, attendees will be able to: (1) identify both common and uncommon electrical low and high voltage circuits having the potential to produce electrical shock, injury or death; (2) properly document (photograph and draw) electrical injury defects; (3) properly document the scene of an electrical injury accident; and, (4) differentiate between lightning and non-lightning electrical injury.

This workshop will impact the forensic science community by equipping attendees with theoretical and practical knowledge to effectively investigate electrical injuries and deaths. The workshop will examine the concept of Ohm's Law and its application to case investigation. Included in this discussion will be the use of Ohm's law to estimate the current flow when the voltage is known.

Direct and alternating current and the differences in lethality and injury will be discussed along with the history of the dispute between George Westinghouse and Thomas Edison over the distribution of electrical current. As a corollary, an explanation of the electric chair will be explored, which was a spinoff of their dispute. Professor Dalziel's work on perception thresholds and no let-go thresholds in humans will be explored. Included in the presentation will be a chart showing the effects of current flow on humans at varying current amounts.

The stereotypic automatic response to current flows at or above let-go threshold will be examined, with case examples presented, including the differences between upper and lower extremities to the flow of electricity. The delay between repolarization and muscle action will be investigated and the effects of these phenomena upon case work explored. The amount of time required to lose consciousness following the onset of ventricular fibrillation will be elucidated and the reasons for this explored. The effect of this time lag upon civil litigation will be discussed and the varying interpretations of different state courts will be explained.

Examination of the effects of both high and low voltage exposure in humans will be presented. The biphasic response to current flows below and above one ampere will be explained, including the length of time required to initiate ventricular fibrillation. The concept of cellular poration, which is seen in high voltage electrical injury, will be discussed including the effects of poration upon the human body and the devastating tissue destruction which ensues.

Special consideration of lightning and other extremely high voltages will be shown, including the effects of explosive expansion of gases and the explosive effects upon ear drums and clothing. In the case of both lightning and distribution lines around 250,000 volts, if a person is near or in the circuit, the person's clothing is explosively torn and the ear drums ruptured from the explosion. The magnetization of ferrous metal objects in or near a lightning strike will be examined. The importance of lightning in explained death or injury has significance in the civil litigation arena, as generally lightning, as an "act of God," is not compensable.

Case examples from the experiences of Professor Brosz and Dr. Wright will be examined and utilized to illuminate the approaches to all deaths and injuries which may be from electrical current whether manmade or natural. Special consideration of the possibility of both over diagnosis and under diagnosis will be examined.

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