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### **E5      A Unique Case of Death by Misadventure Due to Electrocution Involving a Man and a Cat: The Utility of Electron Microscopy**

*Elvira Ventura Spagnolo\**, University of Palermo, Dept of Biotechnology and Legal Medicine, Via Del Vespro n. 129, Palermo 90127, ITALY; *Cristina Mondello*, BS, University of Messina, Dept of Biomedical Science and of Morphologi, Via Consolare Valeria - Gazzi, Messina 98123, ITALY; *Stefania Zerbo*, MD, Via Del Vespro, 127, Palermo 90100, ITALY; *Antonina Argo*, Via Del Vespro 127, Palermo 90100, ITALY; *Luigi Cardia*, via M. Amari 1, Messina, ITALY; *Francesca Giuffrida*, Via Enna 1/c, Catania 95128, ITALY; and *Giulio Cardia*, University of Messina, Dept of Biomedical Science and of Morphologi, Via Consolare Valeria - Gazzi, Messina 98123, ITALY

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After attending this presentation, attendees will understand the importance of a proper methodological approach which takes into consideration the different data available, including the autopsy on an animal, to identify the time, cause, and means of death as well as to reconstruct the crime scene.

This presentation will impact the forensic science community by providing a practical example of the utility that a multidisciplinary approach and cooperation among the different disciplines may have by making good use of the integration of forensic radiological, toxicological, chemical, and anatomic-histological investigations in the identification of the cause of death, especially in those cases with a total lack of certain distinctive elements and/or in the presence of confusing elements, as may happen in cases of death by electrocution.

The diagnosis of electrocution, in addition to being based on circumstantial and investigation data, is essentially based on the discovery of signs of electricity inside the body that, when latent and therefore unidentifiable, may be misleading. In these difficult cases, forensic investigation should use all tools available to the investigator (computed tomography, histology, optics, electronics, and chemical metal detectors) without underestimating any element of the scene investigation.

In this example, the body of a naked man with a widespread brownish color on his skin was found near the metal fence in the garden of his house. Some burnt scraps of material, pieces of jewelry, and other evidence were also found close to the body. The carcass of a cat was discovered some meters away from the body. After the crime scene investigation, the judiciary ordered an autopsy for the purpose of determining the cause, time, and means of death. The medical examiner also ordered an autopsy of the cat.

During the man's autopsy, the presence of second- and third-degree burns on most of his body surface was found, with clear evidence of burned eyebrows, eyelashes, and moustache. No further macroscopic findings were described. Skin and organ fragments as well as the heart were further analyzed. The histological examination of the heart highlighted a plurifocal presence of coagulative necrosis. The skin fragments that were examined revealed an elongated shape of the basal cells perpendicularly oriented compared to the basal lamina, which sometimes exhibited a "tuft" shape with a plurifocal aspect of coagulative necrosis of the superficial and deep dermis. The skin taken from the left hand showed a fragment of skeletal muscles with myofibril contraction bands and myocells undulation, as well as areas of elongation of those cells belonging to the epidermal basal layer, overtopped by micro-bubbles separating the epidermal superficial layers. Small frozen lung sections were fixed in glutaraldehyde at 2% with pH 7.4. Subsequently, samples were dried at critical point and metalized with a gold thickness of 15 angstrom. The scanning electron microscope examination showed the presence of ultramicropores at the cell membrane level of the lung arteries' endothelium.<sup>1,2</sup> Using specific equipment, the metallization evidence was searched and found on the skin.<sup>3</sup> Chemical and instrumental tests performed on the fragments of clothes and other evidence excluded signs of liquids and/or inflammables.

The autopsy on the cat did not show distinctive external signs, but highlighted the spread fragmentation of cardiac muscle fibers and plurivisceral congestion.

The forensic department investigations discovered electrical dispersion starting from an electrical transformer kiosk substation, which on the day the event occurred recorded a short blackout in the pertinent area.

In conclusion, this case highlights the importance of a multidisciplinary approach and the use of second-level techniques in the resolution of individual cases.



## General Section - 2016

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### Forensic Sciences, Electrocution, Electron Microscopy