



## Pathology & Biology Section – 2005

### G38 Analytical Electron Microscopic Detection of Aluminum Received Intravenously

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The goal of this presentation is for the attendees to realize the feasibility of detecting and identifying postmortem heavy metals in non-environmental exposure cases (i.e., mineral pneumoconioses).

This presentation will impact the forensic community and/or humanity by illustrating the utility of applying alternative methods, specifically scanning electron microscopy with electron dispersive spectrometry, for demonstrating the presence of aluminum intravascularly.

This presentation details the postmortem detection of aluminum inadvertently received intravenously. Careful consideration of investigative details can occasionally generate hypotheses that are difficult to conclusively prove using conventional forensic methods; however, focused collaboration with specialists from other fields can yield definitive causes of death as in this case of postmortem detection of aluminum as a result of a therapeutic misadventure.

A 77-year-old man with a past medical history of coronary artery disease and prior brachytherapy for localized prostate cancer was admitted to the hospital for continued urinary bleeding following direct visual internal urethrotomy for urethral stricture. At surgery, a persistent clot in the bladder and an inflamed prostate were discovered. The clot was removed and the prostate resected.

Alum bladder irrigation, containing aluminum ammonium sulfate, aluminum potassium sulfate, ammonium alum and potassium alum, was ordered, prior to and following the operation. The morning following the operation the man was discovered unresponsive. Both a nurse and doctor noted during resuscitative efforts that a bladder irrigation bag was connected to the man's intravenous catheter. In such cases, the involvement of hospital risk management is paramount; however, risk management from the hospital in this case could not conclude whether the Alum solution had infused intravenously, and if so, how much he had received.

The deceased underwent an autopsy. Gross autopsy findings were those of hypertensive and atherosclerotic coronary artery disease. Microscopic findings were most notable for thrombi in pulmonary arterioles and capillaries, which stained with periodic acid-Schiff stain.

Scanning electron microscopy (SEM) with back scattered electronic imaging (BEI) and energy dispersive spectrometry (EDS) was performed on the lung sections. The forensic community is more familiar with the role of analysis of gunpowder primer residues with SEM/EDS. These techniques are more often used on lung sections to determine composition of intrapulmonary materials that cause the different pneumoconioses. These same techniques were used in this case to determine if the aluminum-containing bladder irrigation material was present intravascularly. Smudgy material within some of the blood vessels demonstrated distinct peaks for aluminum with energy dispersive spectrometry.

Nitrogen and sulfur are commonly seen as endogenous tissue components; aluminum is not. It was concluded that the deceased had received intravenous Alum bladder irrigant solution and that this therapeutic misadventure was his underlying cause of death. This case demonstrates the benefit of selective use of non-conventional methods to solve a forensic case by the use of SEM with BEI and EDS in order to demonstrate intravascular aluminum.

**Aluminium, Intravascular, SEM/EDS**