K66 Case Study: A Suicide Death by Sotalol Overdose

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After attending this presentation, attendees will understand the dual mechanistic actions of sotalol that make it a preferential treatment option for individuals with symptoms of cardiac arrhythmias, as well as the potentiation of its adverse effects in a fatal overdose.

This presentation impacts the forensic science community by detailing the investigative and toxicological analyses that assisted in resolving the first report of a suicide by sotalol in Harris County, TX.

With the capacity to function as both a beta-adrenoreceptor antagonist and potassium channel inhibitor, sotalol is the preferentially prescribed b-blocker for the treatment of ventricular tachycardia and ventricular fibrillation. As a b-blocker, sotalol is a non-selective competitor for binding sites on the b_1 and b_2 adrenergic receptors that regulate the production of cAMP, and, subsequently, intracellular levels of calcium that are required in generating electrical signals for muscle contraction, as well as generating the force for contraction; however, later studies have also established sotalol as an inhibitor of potassium ion channels, an action that has been demonstrated to cause a concomitant decrease in the efflux of potassium ions. In this manner, sotalol can further delay the generation of electrical signals for contraction and serve a dual therapeutic application for the correction for type III cardiac arrhythmias. Taken together, solatol can function to decrease intracellular calcium concentrations while also inhibiting the efflux of potassium channels and these dual mechanistic actions can cause prolongation of both the PR and QT intervals that have been implicated in the treatment of rhythm disturbances of the heart and hypertension.

This study describes the case of a 61-year-old woman with a history of depression, who was found deceased in a secured and locked hotel room. A handwritten “last will and testament” were also found on the bed, near the decedent, as well as several prescription medications and loose pills. The decedent had a history of depression and prescription drug abuse, which, in combination with the scene description, indicated a likely suicide with toxicological relevance. Initial findings from the laboratory confirmed only modest amounts of nortriptyline, clonazepam, and tramadol consistent with the prescribed and therapeutic regimen for the decedent; however, these findings were inconsistent with the suicidal ideation described in the case details, thus prompting a re-evaluation of the blood specimen by Liquid Chromatography/Time-of-Flight/Mass Spectrometry (LC/TOF/MS) analysis. One advantage of LC/TOF/MS over other applications of chromatography with mass spectroscopy is the ability to screen, simultaneously, for a spectrum of drugs as comprehensive as the content of the drug library data. A review of the LC/TOF/MS results indicated an unidentified peak consistent with sotalol, suggesting its possible contribution in the cause of death for this case. Additional testing confirmed the presence of sotalol, with reported amounts of 38mg/L in blood and 83mg/L in the stomach contents. For comparison, the therapeutic target range of sotalol is 0.5-3mg/L in blood.

In conclusion, the acute poisoning potential of a combined b-blocker and potassium-channel inhibitor with an emphasis on the toxicological findings and an application for screening by LC/TOF/MS for the implication of sotalol in an intentional overdose death will be discussed. This case highlights a rare fatality since scant information exists on this subject. As sotalol gains widespread use, these events may become more prominent. The lessons learned from this presentation will raise awareness about the methods to identify sotalol, including interpretive support for postmortem toxicology consultations.

Sotalol, LC/TOF/MS, Overdose