B177 The Indirect Detection of Bleach (Sodium Hypochlorite) in Bleach-Tainted Infant Eye Drops

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After attending this presentation, attendees will better understand the methodology that can be used to test a matrix for the presence of bleach (sodium hypochlorite), even if all of the active ingredient in the bleach has broken down, will learn how suspect eye drops were determined to be positive for bleach, and how this information was used in court to convict a mother of assaulting her daughter.

This presentation will impact the forensic science community by shedding light on bleach detection in difficult matrices and by illustrating the possibility of identifying bleach in a matrix even when all of the active ingredient in bleach has broken down.

An eye drop sample that reportedly left a pharmacist ill after inhaling its fumes, left a detective with a chemical burn on her skin after spilling it, and left a toddler blind after receiving it as treatment for a month from her mother was received for analysis at the Forensic Chemistry Center (FCC). The suspect eye drops tested positive for an oxidizer, had a pH of 6.1 when received, contained chloride and chlorate, but tested negative for bleach.

Sodium hypochlorite (NaOCl) is a strong oxidizer that is used as a bleaching agent, a sanitizer, a clothing whitener, and a deodorizer. It is readily available in most households. It is caustic, causes damage to tissues when it comes in prolonged contact with the human body, has chloride and chlorate as breakdown products, and rapidly degrades in matrices that can be oxidized. Methodology to characterize the stability of sodium hypochlorite in beverages has been developed and published by the FCC.

Twenty-three beverages were spiked at three levels with sodium hypochlorite and were monitored for sodium hypochlorite stability, pH, chloride and chlorate content, and visual and organoleptic characteristics over a 13-day period. This study revealed that sodium hypochlorite adulteration can be determined in a suspect matrix even when all of the active hypochlorite has broken down. This is accomplished using spot tests for oxidizing agents and Ion Chromatographic (IC) anion analysis for bleach degradation products. Based on the excess chloride found in the suspect eye drops, the amount of equivalent bleach was estimated and spiked into control eye drops to be used for comparison to the suspect eye drops. Comparisons were made using IC, Gas Chromatography/Mass Spectrometry (GC/MS), Stereoscopic Light Microscopy (SLM), Fourier Transform Infrared (FTIR) spectroscopic imaging, and Liquid Chromatography/Charged Aerosol Detection (LC/CAD). It was determined that the laboratory-fortified control eye drops were very similar to the suspect eye drops using the above-listed techniques. These results were presented in court and led to the conviction of the toddler's mother, who was sentenced to 40 years in prison for the assault.

Sodium Hypochlorite, Bleach, Eye Drops