A188 Forensic Examination of Artificial Sweeteners

Vincent J. Desiderio, MS, Andrew M. Bowen, MS*, and Robert B. Moberley, MS, U.S. Postal Inspection Service, National Forensic Laboratory, 22433 Randolph Dr, Dulles, VA 20104-1000*

After attending this presentation, attendees will: (1) become aware of the analytical challenges posed by the forensic examination of artificial sweeteners, occasionally submitted to the laboratory as unknown materials in "white powder" cases; and, (2) understand the advantages and disadvantages of various instrumental approaches to characterizing and identifying these products when they are encountered as evidence.

This presentation will impact the forensic science community by providing recommended analytical approaches for the most effective characterization and identification of artificial sweeteners. This will improve their ability to examine this type of evidence in the event that they encounter it in their laboratories.

After the 2001 Amerithrax case that involved mailed letters containing anthrax spores, "white powder" incidents became relatively common events in the news. Law enforcement officials focused significant resources on the development of capabilities for responding to and identifying suspicious white powders encountered in public spaces. These efforts resulted in the creation of a variety of first-response teams affiliated with police departments, firefighters, National Guard, and other federal law enforcement groups. After an initial assessment of the threat posed by the white powder (often utilizing portable instrumentation or mobile laboratories designed to rule out specific weapons of mass destruction), the material is typically collected for submission to a laboratory for more specific identification. These powders, therefore, have the potential to end up in forensic laboratories as evidence. Another result of the widely publicized anthrax case is the relatively common occurrence of copycat individuals who include white powders in threatening communications often mailed to victims. Many of these letters are submitted as evidence to the National Forensic Laboratory of the U.S. Postal Inspection Service, or to other forensic laboratories around the country. As a result, there is a continuing need for forensic laboratories to be well prepared to identify unknown materials in general, and white powders in particular.

Although some of these powders are hazardous materials, the vast majority end up being common household products or commercially available chemicals. It is the job of the laboratory to identify these materials and, in many cases, to subsequently compare them with products obtained from the residence or workplace of a suspect. The majority of these commercial products are fairly straightforward to characterize and identify; however, some materials pose analytical challenges for the typical forensic laboratory. Several of the commonly used artificial sweeteners are so sweet that they are used in very small quantities in the final consumer product. The vast majority of the powder in these products consists of fillers (typically D-glucose). The fact that the sweetening agent is present in such small quantities can make it challenging to unambiguously determine the identity of the product or compare it to similar products submitted to the laboratory. The National Forensic Laboratory has received artificial sweeteners as evidence associated with threatening letters in the past, prompting the laboratory to acquire and characterize standard artificial sweeteners using a wide variety of analytical techniques, including stereomicroscopy, polarized light microscopy, Fourier Transform-infrared spectroscopy, scanning electron microscopy, energy dispersive spectroscopy, X-ray diffraction, Raman spectroscopy, and gas chromatography-mass spectrometry.

This presentation will introduce the audience to the commonly encountered sweetening agents and discuss their occurrence in commercial products. The results obtained during characterization of several of the most common artificial sweeteners will also be discussed. The advantages and disadvantages of the various instrumental techniques for the purpose of identifying these sweetening agents will be considered. Suggestions will be made to the audience related to appropriate analytical approaches to the examination of suspected artificial sweeteners. The work presented here will provide the foundation for the future development of an analytical scheme for characterizing and identifying all of the common artificial sweetening agents.

Sweeteners, White Powders, Chemical Unknowns

 ** Presenting Author*