Gas Phase Ion Chemistry and Ion Mobility of Pharmaceutical Substances in Counterfeit Formulations: Technology for Measurement and Confidence of Detection

Lee, Jeongmin

The health and well-being of populations in certain critical regions of the world are threatened today by the presence of counterfeit pharmaceuticals which are often authentic materials diluted to clinically ineffective levels and sold as authentic medicine. Those paying for the medicine are defrauded with little hope of recovery. Relatively inexpensive, portable, and reliable methods are needed to examine pills or formulations for chemical composition within vulnerable communities to eliminate or suppress counterfeit pharmaceutical trade. Measurements and technology based on ion mobility spectrometry (IMS), already proven in military and security venues, may enable fast, on-site inspections although neither gas phase ion chemistry of anti-malarial compounds nor this mobility behavior has been described. In this investigation, gas phase ion chemistry of key anti-malarial medicines was favored over that of inert materials in pills. A laser ionization based method combined with an ion mobility spectrometer showed limits of detection of 2.5 nanograms or better in a false matrix. Methods may favor rapid field screening based on electrospray ionization of counterfeit pharmaceuticals, even in remote locations of the world. The relationship between the concentration of the sample and the intensity of mobility spectra was determined. Findings here may also impact broader issue of national security of pharmaceuticals with misrepresented manufacture or composition.

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