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Signature analysis of bacteria, toxins and anthrax in Microbial forensics

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A newly emerging discipline, microbial forensics, is dedicated to the characterization, analysis and interpretation of evidence including bacteria, viruses, and toxins from the scene of acts of bioterrorism or biocrimes. Microbial forensic scientists employ comprehensive assays to identify the origin of a pathogen or toxin using a number of techniques. Since the 2001 anthrax attacks, forensic community has expressed a growing sense of alarm at the threats of biological attacks. The need to conduct microbial forensic analyses to combat bioterrorism and biocrime in a rigorous scientific manner is urgent. The main areas in microbial forensics are forensic analysis of bacteria pathogens, rickettsia and coxiella diseases, fungal pathogens, plant toxin ricin, influenza virus, and biological toxins. Microbial forensics is highly disciplinary, relying upon microbiology, computer technology, biochemistry, and biophysics to drive the traditional criminalistics aspects of forensic examination and investigation. The different methodologies include the traditional use of host factors, genomics, proteomics, electron beam-based, high-throughput sequencing, and non-biological measurements. Previous studies on detection and identification of microbial agents are generally DNA-based analyses. The primary focus is placed on classification, detection, and identification of these microorganisms and pathogens. However, there is relatively limited information available on the detailed characterizations of biological samples. Future efforts should be to continue the development of the sensitive, fast, and accurate analytical methodologies for detection and identification of the pathogens including biosensors and nanotechnology, as well as detailed characterizations of these pathogens under diverse conditions. In this talk, I will share with you the progress and the strategies of "signatures analysis" in microbial forensics in evaluating the five bacteria (*Klebsielle pneumonias, Escherichia coli, Proteus vulgaris, Pseudomonas aeruginosa, and Enterobacter cloacae*), two cyanobacteria (*Acaryochloris marina and Synechocystis* sp. PCC 6803), botulinum neurotoxins (BoNT), and anthrax using bioanalytical methodologies including high performance liquid chromatography and mass spectral proteomics. These "microbial forensic signatures" may provide specific and insightful information to combat bioterrorism and biocrimes.

Biography

Harvey J M Hou has completed his PhD in Chemistry from Peking University in China and Postdoctoral studies at Rockefeller University. Currently, he is an Associate Professor of Forensic Science at Alabama State University. He has published 80 papers in books and peer-reviewed journals including *Proc. Natl. Acad. Sci. USA, J. Am. Chem. Soc.,* and *Angew. Chem. Int. Ed*. and served in the editorial board of *J. Photochem. Photobiol. B, J. Forensic Res*. and *Air Water Borne Diseases*. He is also the Editor of *Teaching Bioanalytical Chemistry* (ACS Symposium book) and the Editor of *NanoPhotoBioScience*. He has organized or co-organized 15 conferences/symposia since 2004. He is passionate about microbial forensics, nanoforensics, forensic drug analysis, DNA profiling, and firearm/explosive analysis.

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