OMICS Group Conferences
Accelerating Scientific Discovery

International Conference on
Animal & Dairy Sciences

July 23-24, 2013 Embassy Suites Las Vegas, NV, USA

Integrating highly sensitive fiber optic spectrometry with biotechnologies for quick detection of food pathogens

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Food borne microbial pathogens are the leading threat to a safe food supply. Present methods for detecting microbial pathogens in food safety inspection programs involve long-time enrichment processes due to the limited sensitivity of detection technologies. The long waiting-time feature adds a high cost to agricultural products related to storage and freezing, and causes deterioration of food quality. Therefore, there is a pressing need for quick detection technologies in food safety inspection programs. Optical spectroscopic technologies, including optical absorption spectrometry, fluorescence spectrometry, chemiluminescence, have been used in traditional biotechnologies for microbial pathogen detections. These traditional optical spectroscopic techniques have limited sensitivity due to the limited light-analyte interaction pathlength. In fiber optic spectroscopy, the application of specific optical fibers can significantly increase the analyte-light interaction pathlength (up to hundreds of times compared with traditional optical spectrometric methods), and thus increase the sensitivity of optical spectroscopic techniques. Fluorescence immunoassay and enzyme-linked immunosorbent assay techniques were used for separating and labeling microbial pathogens. A special optical fiber, liquid core waveguide (LCW), was used as a sample cell for fiber optic UV/Vis absorption spectrometry, fluorescence spectrometry and chemiluminescence detection. We will report recent progresses in our effort in integrating LCW with biotechnologies for developing highly sensitive methods for quick detection of microbial pathogens.

Biography

Shiquan Tao is an Assistant Professor of Chemistry at West Texas A&M University (WTAMU). He has completed his Ph.D from Hiroshima University. After five years serving as the principle investigator for the fiber optic sensor research program at the Diagnostic Instrumentation and Analysis Laboratory at Mississippi State University, He joined WTAMU as an Assistant Professor of chemistry in 2007. His research program is focused on the development of highly sensitive fiber optic spectroscopic technologies/fiber optic sensors for applications in food safety and environmental monitoring.

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