Automated Analysis of Microbial Pathogens using Smart Biosensing with Machine Learning.[1]

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Translational technologies are advances that transform life, business, and the global economy. The current gold standard for detecting microbial pathogens in foods and agricultural samples is time-consuming, do not provide fast information about food contaminations, and thus unable to provide timely protection against consumer microbial hazards. This presentation provides an overview of sensor technologies with a focus on the design and implementation of an Autonomous Microbial Cell Culture and Classification (AMC^3) system for the rapid detection of food pathogens. AMC^3 introduces a "one-click approach" to the detection and classification of pathogenic bacteria. Once the cultured materials are prepared, all operations are automatic. AMC^3 is an integrated sensor array platform in a microbial fuel cell system composed of a multi-potentiostat, an automated data collection, and a powerful classification program. The classification scheme consists of Probabilistic Neural Network (PNN), Support Vector Machines (SVM), and General Regression Neural Network (GRNN) oracle-based system. AMC^3 uses preset feature extractions and quality control to analyze data with the intelligent classification system. This sensor could revolutionize food processing and the diagnostic process. It will directly benefit society by providing a new diagnostics category similar to the glucose monitor. It may empower users to take control of the safety of the food they consume.