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Abstract

An Array-Based Sensor for Identifying Foodborne-Associated Genotypes of Human Noroviruses and Hepatitis A Virus †

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Human noroviruses are the leading cause of human gastroenteritis in populations of all ages and are linked to most of the foodborne outbreaks worldwide. Hepatitis A virus is another important foodborne enteric virus and is considered a common agent causing acute liver disease worldwide. Laboratory surveillance networks revealed a subset of virus genetic types, associated frequently with consumption of various food commodities in the United States and Europe. In the present study, a focused, array-based biosensor was developed and validated for the simultaneous identification of foodborne-associated genotypes of norovirus and hepatitis A. By employing a novel algorithm, oligonucleotide capture probes were designed to target variable genomic regions, commonly used for typing these foodborne viruses. Validation results showed that probe signals, specific for the tested virus genotypes, were on average 200-times or 38-times higher than those detected for non-targeted genotypes, respectively. To improve the detection sensitivity of this sensor, a 12-mer oligonucleotide spacer sequence was designed and further attached to the capture probes, and the results indicated a detection of less than 10 cRNA virus transcripts, a sensitivity threshold below the infectious dose of these foodborne viruses. These findings have indicated that this virus-typing sensor has the accuracy and sensitivity for identifying relevant genotypic profiles of norovirus and hepatitis A, predominantly linked to food poisoning. This virus-typing sensor provides highly relevant and valuable information for use in outbreak attribution and has led to the development of an emerging detection platform for the real-time and automated surveillance of foodborne viral pathogens.