Salmonella Emerging Serotypes in Northwestern Italy: Genetic Characterization by Pulsed-Field Gel Electrophoresis

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Abstract : This work presents the results obtained by the Regional Reference Centre for Salmonella Typing (CeRTiS) in a retrospective study aimed to investigate, through Pulsed-field Gel Electrophoresis (PFGE) analysis, the genetic relatedness of emerging Salmonella serotypes of human origin circulating in North-West of Italy. Furthermore, the goal of this work was to create a Regional database to facilitate foodborne outbreak investigation and to monitor them at an earlier stage. A total of 112 strains, isolated from 2016 to 2018 in hospital laboratories, were included in this study. The isolates were previously identified as Salmonella according to standard microbiological techniques and serotyping was performed according to ISO 6579-3 and the Kaufmann-White scheme using O and H antisera (Statens Serum Institut®). All strains were characterized by PFGE: analysis was conducted according to a standardized PulseNet protocol. The restriction enzyme XbaI was used to generate several distinguishable genomic fragments on the agarose gel. PFGE was performed on a CHEF Mapper system, separating large fragments and generating comparable genetic patterns. The agarose gel was then stained with GelRed® and photographed under ultraviolet transillumination. The PFGE patterns obtained from the 112 strains were compared using Bionumerics version 7.6 software with the Dice coefficient with 2% band tolerance and 2% optimization. For each serotype, the data obtained with the PFGE were compared according to the geographical origin and the year in which they were isolated. Salmonella strains were identified as follow: S. Derby n. 34; S. Infantis n. 38; S. Napoli n. 40. All the isolates had appreciable restricted digestion patterns ranging from approximately 40 to 1100 kb. In general, a fairly heterogeneous distribution of pulsotypes has emerged in the different provinces. Cluster analysis indicated high genetic similarity (≥ 83%) among strains of S. Derby (n. 30; 88%), S. Infantis (n. 36; 95%) and S. Napoli (n. 38; 95%) circulating in north-western Italy. The study underlines the genomic similarities shared by the emerging Salmonella strains in Northwest Italy and allowed to create a database to detect outbreaks in an early stage. Therefore, the results confirmed that PFGE is a powerful and discriminatory tool to investigate the genetic relationships among strains in order to monitoring and control Salmonellosis outbreak spread. Pulsed-field gel electrophoresis (PFGE) still represents one of the most suitable approaches to characterize strains, in particular for the laboratories for which NGS techniques are not available.

Keywords : emerging Salmonella serotypes, genetic characterization, human strains, PFGE

Conference Title : ICFQFSMFS 2022 : International Conference on Food Quality and Food Safety Management System in Food Science

Conference Location : Amsterdam, Netherlands

Conference Dates : May 16-17, 2022