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BATTERIOLOGIA

TYPING OF SALMONELLA ENTERICA ISOLATES BY FOURIER TRANSFORM INFRARED (FTIR) SPECTROSCOPY

M. Cordovana [3], N. Mauder [1], A. Zignoli [3], S. Pongolini [2], L. Soliani [2], S. Ambretti [3], M. Kostrzewa [1]

[1]*Bruker Daltonik GmbH, Bremen, Germany*

[2]*Risk Analysis and Genomic Epidemiology Unit - Istituto Zooprofilattico Sperimentale della Lombardia e dell'Emilia-Romagna, Sezione di Parma*

[3]*U.O. Microbiologia, A.O.U. Policlinico Sant'Orsola-Malpighi, Bologna*

INTRODUZIONE

Salmonella enterica represents a major public health burden worldwide, both in underdeveloped and industrialized countries. The differentiation at infra-species level is crucial for clinical and epidemiological investigations, and control of foodborne outbreaks. Several methods are widely used for this purpose, but they all are laborious and cost-intensive. Fourier transform infrared spectroscopy (FTIRS) is widely used to identify the chemical content of many kind of samples. Applied to bacteriology, it allows the exploration of the molecular composition of the bacterial surface. The infrared light region corresponding to the absorption wavelength of carbohydrates proved to have a high discriminatory power for bacterial discrimination at infra-species level, and FTIRS has been successfully applied both for bacterial species identification and for typing at different levels.
In this study, we investigated the discriminatory power of the FTIRS for S. enterica typing, in comparison with classical serotyping methods based on somatic and flagellar antigen .

METODI

A total of 128 clinical, foodborne and environmental S. enterica isolates (belonging to 19 different serogroups), well characterized in the reference center, were analyzed by the FTIRS-based IR Biotyper system (IRBT - Bruker Daltonik).
Infrared spectra were acquired in transmission mode from dried bacteria, that had been suspended in a water/ethanol solution and placed on a silicon sample plate in three technical replicates.
The IRBT software automatically evaluated the similarity between spectra within the wavelength range 1300-800 cm-1(carbohydrates absorption region), applying hierarchical cluster analysis (HCA) with Euclidean metric and single linkage. Congruence of IR Biotyper HCA and O-serogroups defined by the reference method was evaluated with adjusted Wallace algorithm.

RISULTATI

Evaluation of the congruence between IR Biotyper HCA and O-serogroups indicated that IRBT could predict the O serogroup with 95% accuracy, with only two isolates wrongly clusterized in the O:8 group (1 S. Glostrup and 1 S. Ndjamena).
The 19 different serogroups were clustered separately with a threshold set at 0.20. In addition, at a lower threshold, further intra-serogroup clustering was possible for some serotypes. Among them, particularly relevant were the separation of S. Typhi from other O:9 serotypes, and the classification of S. Typhimurium monophasic variant in a sub-cluster of O:8 group.

CONCLUSIONI

In this study, IR Biotyper enabled an accurate discrimination of Salmonella enterica isolates at serogroup, and in some cases also at sub-serogroups level, showing a very good resolution power. This technique proved to be a fast, user-friendly, high throughput and low-cost alternative methodology for bacterial typing at infra-species level, suitable for any kind of microbiology laboratory.