**Title:** Hierarchical clustering of bacteria based on Fourier-transform infrared spectroscopy and molecular data

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**Abstract:**
Introduction: Up to now, several methods of classifying bacteria based on morphology, metabolism, pathogenicity, and molecular properties have been introduced. Recently, hierarchical clustering of bacteria based on biochemical profile and cell surface characteristic has been developed. Fourier-transform infrared spectroscopy (FTIR) is a rapid, culture-independent and economic physico-chemical method to analyze the biochemical characteristics of bacterial surface and used successfully as a fingerprinting technique for classification of bacteria such that it is comparable with 16s rRNA classification. In this study, to investigate the phenotype differences between halophilic bacteria and classification based on cell surface organic compounds, FTIR data is used. Also, hierarchical clustering according to FTIR information is compared with phylogenetic tree based on 16s rRNA.

Method: Four different halophilic bacteria were isolated and molecular identification PCR reaction was performed. Also, hierarchical clustering according to partial sequence of 16s rRNA by CLC sequence viewer software was drawn. To identification of cell surface compounds of each bacterium FTIR spectroscopy analysis was performed. Hierarchical cluster analysis based on FTIR spectra using the Specwin 32 and SPSS software was carried out and compared with 16s rRNA phylogenetic tree.

Results: Sequence blast analysis against the 16s ribosomal RNA sequences (bacteria and Archaea) in the NCBI database showed 4 isolated bacteria are members of different taxonomic groups. Hierarchical clustering based on 16s rRNA and FTIR spectroscopy data indicate two clusters have approximately the same branching pattern.

Conclusion: FTIR spectroscopy is a powerful and easy technique to discrimination and classification of bacteria and is comparable with phylogeny of bacteria based on 16s rRNA.

**FTIR, Hierarchical clustering, bacteria**

**Presentation:** Poster