

Distinguishing between bacterial and viral infections based on peripheral human blood tests using infrared microscopy and multivariate analysis

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Viral and bacterial infections are responsible for variety of diseases. These infections have similar symptoms. Thus, physicians may encounter difficulties in distinguishing between viral and bacterial infections based on these symptoms. Bacterial infections differ from viral infections in many other important respects regarding the response to various medications and the structure of the organisms. In many cases, it is difficult to know the origin of the infection. The physician orders a "culture test" methods to diagnose the infection type when it is necessary. Using these methods to diagnose the infection type is typically too long (> 24 hours). Blood was collected from 80 patients with confirmed viral infection and 80 with confirmed bacterial infection. White blood cells (WBCs) and plasma were isolated and deposited on a zinc selenide slide, dried and measured under a Fourier transform infrared (FTIR) microscope to obtain their infrared absorption spectra. The obtained spectra of WBCs and plasma were analyzed to differentiate between the two groups of infections. In this study, the potential of FTIR microscopy in tandem with multivariate analysis, was evaluated for the identification of the agent that causes the human infection during 20-30 minutes (including blood separation preparation). The differentiating between the investigated groups were obtained due to minute spectral changes in several bands of the FTIR spectra of WBCs. Employing feature extraction with linear discriminant analysis (LDA), a accuracy of ~92% and sensitivity of ~87% for infection type diagnosis was achieved. This study suggest that FTIR spectroscopy of WBCs is a feasible tool for the diagnosis of infection type.

Biography

Hamody Agbaria has completed his MSc from Beer-Sheva, Israel, Dept. of Physics, Faculty of Natural Sciences under the supervision of Prof. Ilana Bar with the title of thesis: "Studying Photodissociation of Molecules by Velocity Map Imaging of Ions via Electrostatic Lenses". He is pursuing his PhD in Ben-Gurion University of the Negev, under the supervision of Prof. Daniel H Rich, Prof. Shaul Mordechai and Prof. Mahmud Huleihel.

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