

Rapid Detection of the Etiology of Infection as Bacterial or Viral Using Infrared Spectroscopy of White Blood Cells

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Abstract : Infectious diseases cause a significant burden on the public health and the economic stability of societies all over the world for several centuries. A reliable detection of the causative agent of infection is not possible based on clinical features, since some of these infections have similar symptoms, including fever, sneezing, inflammation, vomiting, diarrhea, and fatigue. Moreover, physicians usually encounter difficulties in distinguishing between viral and bacterial infections based on symptoms. Therefore, there is an ongoing need for sensitive, specific, and rapid methods for identification of the etiology of the infection. This intricate issue perplex doctors and researchers since it has serious repercussions. In this study, we evaluated the potential of the mid-infrared spectroscopic method for rapid and reliable identification of bacterial and viral infections based on simple peripheral blood samples. Fourier transform infrared (FTIR) spectroscopy is considered a successful diagnostic method in the biological and medical fields. Many studies confirmed the great potential of the combination of FTIR spectroscopy and machine learning as a powerful diagnostic tool in medicine since it is a very sensitive method, which can detect and monitor the molecular and biochemical changes in biological samples. We believed that this method would play a major role in improving the health situation, raising the level of health in the community, and reducing the economic burdens in the health sector resulting from the indiscriminate use of antibiotics. We collected peripheral blood samples from young 364 patients, of which 93 were controls, 126 had bacterial infections, and 145 had viral infections, with ages lower than 18 years old, limited to those who were diagnosed with fever-producing illness. Our preliminary results showed that it is possible to determine the infectious agent with high success rates of 82% for sensitivity and 80% for specificity, based on the WBC data.

Keywords : infectious diseases, (FTIR) spectroscopy, viral infections, bacterial infections.

Conference Title : ICAMCS 2022 : International Conference on Advanced Medical Chemistry and Spectroscopy

Conference Location : Amsterdam, Netherlands

Conference Dates : January 21-22, 2022