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**Study of Viral Ribonucleic Acid Structures Through Fourier Transform Infrared Spectroscopy (ftir).**

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FTIR spectroscopy has been widely used for the analysis of both protein and deoxyribonucleic acid secondary structures, as it is one of the vibrational spectroscopy methods, including FTIR spectroscopy, that is highly sensitive to changes in molecular structure. However, there are few discoveries related to ribonucleic acid analysis. Here, we have used FTIR microspectroscopy to investigate an in vitro transcripted synthetic single-stranded RNA containing the main structural proteins encoding genes of SARS-CoV-2 virus. The IR analysis identifies four main spectral regions of interest associated with the out-of-plane base and sugar vibrations spectral domain (540-840 cm-1), sugar and phosphate backbone vibrations spectral domain (840-1120 cm-1), base-sugar vibrations spectral domain (1120-1500 cm-1) and the in-plane base vibrations (1500-1840 cm-1). In addition, we applied two folding prediction servers to the ssRNA fragment, obtaining the most likely RNA fragment's secondary and tertiary structures, for comparison with the experimental data. Finally, through the FTIR spectroscopic analysis, and by the combined interpretation of theoretical and experimental data, a unique fingerprint of the SARS-CoV-2 ssRNA fragment was obtained. Our results represent a step forward in understanding the structure of the ssRNA and, a promising potential starting platform for sensing application.