

Currently, we do not know the proportion of asymptomatic COVID-19 carriers because only the most severe cases are tested. In parallel, the virus also appears to be indolent in children. These carriers can have a high viral load and symptoms often only appear within the second week after the disease onset, which highlights the need for a rapid screening tool. The only available tool to screen for infections is PCR tests of swabs that were put in the nose. However, these tests are not meant for mass population as they are costly, require significant quantities of medical materials, and take up 2h to obtain results. Currently, there is an urgent need to develop a robust, label-free (no need of contrast agent) screening technique that allows for rapid diagnosis.

To address this need, we propose to develop a novel screening test based on label-free Raman spectroscopy coupled with machine learning technology to study the biomolecular signature of the virus in blood from both children and adults. This work will occur in collaboration with ODS Medical (our industrial partner), which has extensive expertise in the development of Raman spectroscopy for cancer detection. Raman spectroscopy is an emerging optical technique to detect and identify biomolecules. Previously, Raman spectroscopy was used to study the respiratory syncytial virus and changes in blood from patients with Dengue or Malaria fever. We hypothesize that human has a specific signature of COVID-19 and that our novel technique is capable to identify these biomolecular changes in a label-free approach.

This project will elucidate the Raman biomolecular signature of blood from human infected with SARS-CoV-2, allowing the development of new methods to characterize biofluids through learning models. As Raman spectroscopy acquisition takes seconds to minutes and is low-cost, its potential for rapid-screening could allow control of virus spread, particularly if there is more than one wave with more mutations.