Contributor | TAS iGEM team supply solutions to COVID-19 testing problems

October 22, 2020

iGEM team members from left to right, Wilson (project head), Matthew and Derek observes the contents of a centrifuge tube. (Photo courtesy of the TAS iGEM team)

The ongoing spread of Influenza A and B epitomizes the challenge our world faces against virus-caused diseases.

Even before the COVID-19 pandemic, these types of seasonal flu have been responsible for 250 to 500 thousand deaths per year. Now, the COVID-19 outbreak has only exacerbated the situation, bringing viruses under the public spotlight.

The COVID-19 pandemic further calls for the high demand for virus detection test kits, which do more than identify infected individuals: they provide extensive data about the pandemic that local governments or international organizations can harness to impose or adjust plans and policies accordingly.

The importance of information collected from this test kit cannot be stressed more.

The members of TAS iGEM team gather for a group photo. (Photo courtesy of the TAS iGEM team.)

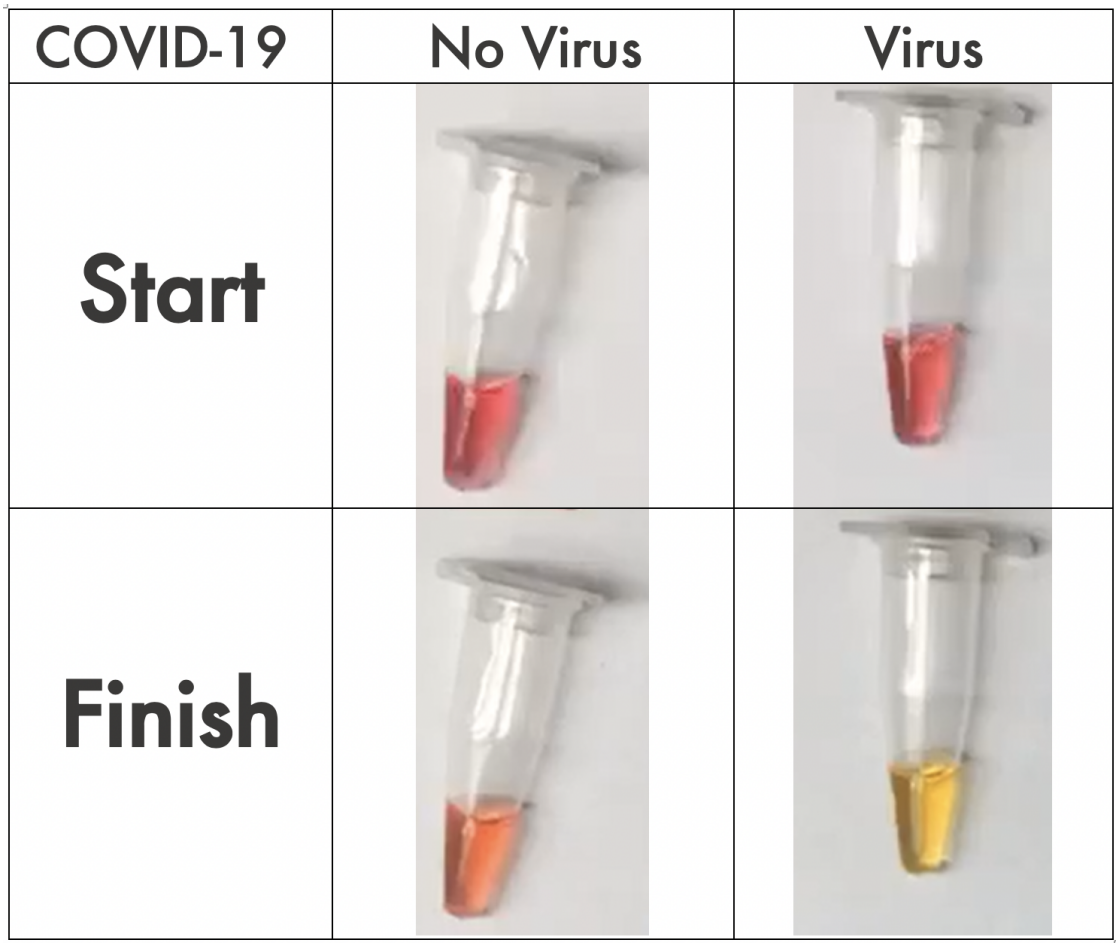
There is a myriad of virus tests out on the market, but none are exactly ideal. The American FDA delineates that test kits are classified based on what virus-associated structure they target, namely antigens of the virus, antibodies produced by our immune systems, and the virus's genetic material.

However, they all have their respective shortcomings.

The process of developing antigen tests is quite rigorous as synthetic antibodies that will bind to antigens (if any) within the test kit's instrument to determine the presence of the virus are extremely difficult to manufacture.

Researchers first have to wait for individuals to get infected and one of them to manifest antibodies, then finally, synthesize exact replicas of these antibodies, which costs substantial time and energy.

Plus, the typical antigen tests employed in local clinics, at least for influenza, have low sensitivity. When urgency and accuracy are crucial in a test kit, especially under current circumstances, antigen tests cannot suffice.



This diagram shows positive and negative results. (Photo courtesy of TAS iGEM team)

Antibody tests have similar drawbacks; it takes time for antibodies to emerge within a population.

Most importantly, the human immune system is imperfect. When different viruses invade, the exact same antibodies can still be produced despite differences between the structures of the antigens.

This means that even when synthetic antigens bind to antibodies (opposite mechanism of antigen tests) thus showing a positive result, it is difficult to specifically identify the kind of virus.

Molecular tests targeting the genetic information of viruses are the most accurate, especially during the onset of infection. However, current gold standards like PCR not only take a long time to produce results but are also expensive to execute in terms of the medical personnel and costly equipment it entails.

To address such shortcomings, the Taipei American School iGEM team (International Genetically Engineered Machines) has developed a room temperature, saliva-based, a molecular test that is accurate, fast, and can be used in the convenience of your own home.

The test kit created by the team can yield an easy-to-read visible color change that indicates if the user has a viral infection or not.

The team will present their project findings and exchange insightful ideas with others from around the world at the iGEM competition which will take place virtually, due to the COVID-19 pandemic, from Nov 14-22nd 2020.

By Derek Chan, member of the Taipei American School iGEM team

---