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## A Sustainable Approach to COVID-19 Testing -Forging a Public-Private-People Healthcare Initiative

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### Introduction

According to the World Health Organization (WHO), the immediate emphasis for COVID-19 diagnostics research is the development of nucleic acid, antigen and antibody tests as well as detection at the point-of-care [1]. Point-of-care tests are economical, hand-held devices used to diagnose patients outside of centralized facilities. Viral protein antigens and antibodies that are formed in response to a SARS-CoV-2 infection can be employed for diagnosing COVID-19. In Malaysia, there has been a spike in Covid-19 cases as can be seen from the increase in the number of cases from three digits since the implementation of the first movement control order (MCO) in March 2020 to four digits with the recent implementation of the second MCO in January 2021. As such, the government healthcare facilities including the testing facilities has been overwhelmed. The spike in Covid-19 cases has caused the frontliners to be stretched to the limit due to the lack of manpower. There is also inadequate facilities and capacities in public hospitals to sustain the surging numbers. Not to mention, government's financial resources have been strained. The vaccine for Covid-19 is not forthcoming yet and not everyone will be vaccinated simultaneously as the community will be vaccinated in phases according to

priority when the vaccine is made available. Hence, the private sector could contribute towards managing the pandemic including conducting various Covid-19 testing to lessen the burden of the government. This paper illustrates the various types of Covid-19 testing currently available for the public. It also briefly reports the Covid-19 tests conducted by a private healthcare organization (i.e. Osel Clinic) (Figure 1).



**Figure 1:** Covid-19 tests conducted by a private healthcare organization.

### Antigen Test

The test is qualitative and uses a nasopharyngeal or nasal sample, which can be used directly or can be put in viral transport media to be transported to a laboratory. It is a point-of-care test that utilizes lateral flow technology. Antigen tests are very specific but are not sensitive [2]. In commercial lateral flow assays, a paper-like membrane strip is coated with two lines: gold nanoparticle-antibody conjugates are found in one line and capture antibodies in the other. The patient's sample is deposited on the membrane, and the proteins are drawn across the strip by capillary action. As they pass the first line, the antigens bind to the gold nanoparticle-antibody conjugates, and the complex flows together through the membrane. As they reach the second line, the complex is immobilized by the capture antibodies, and a red line becomes visible [3]. Rapid test kit (RTK-Ag) is used as screening tests for point-

of-care testing (POCT) for Covid-19. RTK-Ag is a screening test and confirmation is by RT-PCR for RTK-Ag which is positive [4].

### PCR-based Test

Nucleic acid testing is the main method of diagnosing COVID-19. A number of reverse transcription polymerase chain reaction (RT-PCR) kits have been developed to detect SARS-CoV-2 genetically. RT-PCR includes the reverse transcription of SARS-CoV-2 RNA into complementary DNA (cDNA) strands, followed by amplification of specific regions of the cDNA. SARS-CoV-2 is a positive-sense, single-stranded RNA virus. The various PCR tests developed amplify different segments of the genome. The genome encodes 27 proteins including an RNA-dependent RNA polymerase (*RdRp*) and four structural proteins. The four structural proteins of SARS-CoV-2 consist of the spike surface glycoprotein (S), small envelope protein (E), matrix protein (M), and nucleocapsid protein (N) [5-8]. Positive results indicate the presence of SARS-CoV-2 nucleic acid but patient infection status should be ascertained from testing together with clinical history. Negative results do not rule out SARS-CoV-2 infection and should be considered with other clinical features and testing to determine patient management [9-12]. Recent advancements in rapid molecular testing enable faster case detection, diagnosis and management of COVID-19 patients using rapid, robust, point-of-care test with results accessible in less than an hour. The components are usually self-contained, demanding less laboratory resources with minimum necessity for specialized equipment than other laboratory-based instruments [13].

### Antibody Test

Antibody tests can be predominantly beneficial for surveillance of COVID-19. Antibody-based testing evaluates for the presence of IgM and IgG specific to SARS-CoV-2 in whole blood, plasma, or serum [14-15]. The timing of the development of IgM and IgG specific to SARS-CoV-2 during COVID-19 has been illustrated in a few publications. It was indicated that IgM and IgG appear almost concurrently approximately one week after the onset of first symptoms, similar to reports of antibody kinetics from SARS-CoV-1 infections [16] (Table 1).

Month	RTK-Antibody	RTK-Ag	RT-PCR	Rapid PCR	Total Positive	Total Negative	Total tested
20-Apr	2	-	-	-	-	2	2
20-May	897	-	-	-	-	897	897
20-Jun	852	-	-	-	-	852	852
20-Jul	279	-	2	-	-	281	281
20-Aug	159	-	1	-	-	160	160
20-Sep	106	5	-	-	-	111	111
20-Oct	306	143	1	-	-	450	450
20-Nov	147	175	10	-	2	330	332
20-Dec	164	377	31	-	3	569	572
21-Jan	38	1659	104	61	41	1821	1862

**Table 1:** Covid-19 Testing Data at Osel Clinic, Jaya One, Selangor, Malaysia. Table 1 shows Covid-19 testing

conducted on patients at Osel Clinic, Jaya One, Selangor. Various tests were conducted over the duration stated. There was a total of 46 positive tests detected in which the breakdown includes antigen test (8), RT-PCR (29), Rapid PCR (5) and SD Biosensor (4).

Month	RTK-Antibody	RTK-Ag	RT-PCR	Rapid PCR	Total Positive	Total Negative	Total tested
20-May	299	-	-	-	-	299	299
20-Jun	150	-	-	-	-	150	150
20-Jul	98	-	-	-	-	98	98
20-Aug	67	-	-	-	-	67	67
20-Sep	11	-	-	-	-	11	11
20-Oct	72	2	-	-	-	74	74
20-Nov	38	17	-	-	-	55	55
20-Dec	21	53	-	-	-	74	74
21-Jan	6	119	55	44	20	204	224

**Table 2:** Covid-19 Testing Data at Osel Clinic, HQ Macalister, Penang, Malaysia. Table 2 shows Covid-19 testing conducted on patients at Osel Clinic, HQ Macalister, Penang. After conducting various tests over the duration stated, 20 positive Covid-19 tests were found in which the breakdown includes rapid PCR (8) and RT PCR (12).

## Conclusion

Government healthcare facilities in Malaysia have been overly strained due to the increase in Covid-19 cases. Osel Group as a private healthcare facility has contributed by conducting various Covid-19 testing such as antigen tests (RTK-Ag), antibody tests (RTK-Antibody) and rapid molecular tests for the community to allow faster turnaround time as well as to reduce the burden of the government towards managing the pandemic. This effort is in line with United Nations' Sustainable Development Goal (SDG) No. 3 which is to ensure healthy lives and promote well-being for all. As a whole, considering the current circumstances, Osel Group's initiative to conduct various Covid-19 tests is a commendable effort where public-private partnership between the private sector and government will go towards achieving United Nations' Sustainable Development Goal (SDG) No. 17 which is partnerships for sustainable healthcare development in Malaysia (Figure 2).



**Figure 2:** Sustainable Development Goals.

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