EMPHNET
The Eastern Mediterranean Public Health Network

EMPHNET WEBi Series

Online interactive sessions addressing public health issues challenging the Eastern Mediterranean Region

Webinar Brief

September 29, 2020 WEBi: PH-01 • 16062020

The Role of Public Health Laboratories and Testing in the COVID-19 Response

Introduction

On September 15, 2020, over 29,0000000 confirmed cases of COVID-19 were reported worldwide, including 926,544 deaths. Thus, the widespread of COVID-19 highlighted the need for strong early detection measures to interrupt its spread. Moreover, governments and public health agencies worldwide have been enhancing the capacities of public health laboratories and increasing the volume of diagnostic testing and their rate of administration.

At present, there are two main types of diagnostic tests, and although the WHO has set guidelines for testing their eligibility, testing strategies have varied across countries. Antigen testing determines whether an individual has the disease, yet PCR testing remains the gold testing standard, and it is currently used in labs around the world to test for COVID-19. Furthermore, the WHO had urged countries from the onset of the pandemic to begin mobilizing research efforts towards creating rapid point of care tests for use at the community level. To date, there has been progress amongst private companies in the area of developing point of care tests with faster turnaround. From another angle, Antibody tests identify who had contracted the disease and whether or not they have developed an immunity. They serve as crucial indicators for ongoing surveillance and determining who gets to go back to work, thus directing the next phase of the COVID-19 response.

About EMPHNET

EMPHNET is a regional network that was founded in 2009 with the focus on strengthening Public Health Systems in the Eastern Mediterranean Region (EMR). EMPHNET works in partnership with Ministries of Health, non-government organizations, international agencies, private sector, and other public health institutions in the region and globally to promote public health and applied epidemiology. In 2015, EMPHNET created Global Health Development (GHD) as a regional initiative to advance its work in the EMR and support countries strengthen their health systems to respond to public health challenges and threats.

Webinar Specifics

GHD|EMPHNET launched the webinar "The Role of Public Health Laboratories and Testing in the COVID-19 Response" to highlight the importance of public health laboratories in responding to COVID-19 and discuss the different types of available tests for the diagnosis of COVID-19 and their performance. The webinar took place on September 29, 2020, from 17:00 – 18:30 Jordan Local Time (UTC+3).

Webinar Objectives

"The Role of Public Health Laboratories and Testing in the COVID-19 Response "

The webinar was conducted with the following focus:

- Highlighting the importance of public health laboratories in COVID-19 response.
- Describing the available diagnostic tests including molecular, serological, and rapid tests.
- Discussing safe handling of COVID-19 specimens in the public health laboratory.
- Highlighting the importance of antibody-based tests as another element of bio surveillance by enabling identification of people with past exposure to the virus.
- Identifying Laboratory challenges and limitations during the COVID-19 Pandemic.

Webinar Speakers

In seeking to bring experts opinion and experience to discuss the COVID-19 causative agent, main characteristic, molecular and laboratory testing strategies in addition to global testing challenges and recommendations.

The Webinar hosted the following distinguished experts:

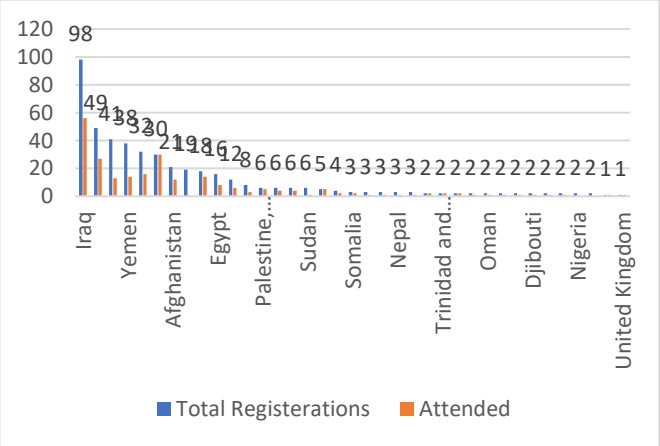
- **H.E Prof. Azmi Mahafzah -** Professor, Department of Pathology, Microbiology and Forensic Medicine, University of Jordan.
- **Prof. George F. Araj** -Director of Clinical Microbiology Department of Pathology & Laboratory Medicine American University of Beirut Medical Center
- **Dr. Erin M. Sorrell -** Assistant Professor, Department of Microbiology and Immunology, Georgetown University and member of the Center for Global Health Science and Security.

The webinar was facilitated by:

- **Dr. Tarek Al-Sanouri**- *Disease Control Team Leader, GHD|EMPHNET*

Webinar Attendees

Registration was open one week prior to the webinar and was announced through EMPHNET's communication and networking channels. In total, 472 registered to attend, 53% (n= 249) attended the webinar. The following graph displays the distribution of registered and attendees by countries.



Overview of Presentations

The webinar was conducted in English and included three presentations (15 minutes each), reflecting on

the main roles of public health laboratories in the COVID-19 testing response and the approved testing methods, the difference between the viral and antibody testing, sample management, laboratory capabilities to test large numbers of specimens, quality control measures in addition to global testing challenges and recommendations for improvement**.**

The webinar started and ended on scheduled time, with a duration of 90 minutes.

Webinar Introduction

Dr. Tarek Al-Sanouri

As the webinar facilitator, Dr. Tarek presented the webinar as a space to discuss the role of laboratories in COVID-19-response. He described the current situation regarding COVID-19 testing, available kits, and testing strategies in the region. Dr. Tarek stated the labs played an important role in COVID-19 especially in the areas of case identification, diagnosis, and confirmation of COVID-19 illness.

He specifically said that laboratories play an important role in preventing, detecting, and responding to the outbreak of novel pathogens. Public health laboratories provide essential services including disease and outbreak detection. During the COVID-19 pandemic, the National Laboratory System confirmed this importance.

COVID-19, The Virus, Molecular Testing & RT-PCR Method for COVID-19 Diagnosis, Specimens' Collection, and Management.

H.E. Prof. Azmi Mahafzah

H.E. Prof. Azmi stated that the global situation as of 28 September 2020, reveals a total of 33 million deaths while in Jordan, and as of 27 September 2020, the number of cases increased notably. Symptoms of these confirmed cases can range from the common cold to fatal pneumonia. The virus can be described as a pleomorphic, enveloped, positive single-strand RNA, ranging in size from 80mm to 160mm with distinctive morphology. Its genome is the largest genome among

RNA viruses (26-30kb) encoding 16 non-structural proteins, four structural proteins, and some putative accessory proteins. Furthermore, it has an RNA proofreading mechanism that keeps the mutation rate low.

Its distinctive morphology comes in the form of a halo surrounded by a spine protein, thus giving the virus its name. More specifically, the coronavirus comes from the family of Coronaviridae, the subfamily of Orthocoronavirinae, and there are four generations of it. These generations are as follows; the first is the Alphacoronaviruses; under which the human pathogen falls, and it includes CoV-229E which is the oldest coronavirus, and CoV-NL63. The second generation includes the Betacoronaviruses and this generation encompasses five members, the most important of which are: SARS (pointing to the endemic in 2002-2003), MERS, and SARS-CoV. The third and fourth generations are the Gammacoronaviruses and the Deltacoronaviruses, respectively.

He further added that SARS-CoV-2 is related to the SARS virus and that it has the typical genetic structure, like the other coronaviruses. He also explained that coronaviruses can be cultured in different cell types, in tissue culture, and that they have a latent period of five to seven hours.

However, cell culture is not widely utilized in the diagnosis of COVID-19 infection and it requires high containment measures. H.E. Prof Azmi further explained the replication process of the coronavirus. He started his explanation by stating that it is important to note that only five to ten percent of viral particles are infectious and the others are defective interfering particles that may interfere with diagnosis.

The molecular diagnosis of coronavirus relies on the detection of the genome sequencing that varies depending on the test, and the methods used. The methods used involve the reverse transcriptase quantitative PCR, or the reverse transcription loop amplification, or the clustered regularly interspaced short palindromic report, or technology and gene sequences.

He also added that the reverse transcriptase is more widely used for diagnosis. He then went on to explain the types of specimens used in the diagnosis of coronavirus stating that they are mainly respiratory specimens although the virus can be detected from other types of specimens like blood and stool. He confirmed that upper and lower tract specimens are more widely used, as these specimens are collected in a special environment media. He then explained that specimens can be refrigerated and stored for a few days or a long period if frozen at minus 70.

The PCR Assay that is most widely used; starts with reverse transcription of the genome into single-stranded DNA, and then a complementary strand DNA with DNA polymerase is produced then it denatures into two single-strand DNA as primers are added. In addition to fluorochrome probes to detect DNA strands and similar cycles of annealing and polymerization takes place with the detection of the fluorescent. PCR tests have improved during the pandemic.

Nasal swab specimens and even saliva samples are also used for testing, and if they are collected correctly the results can be just as good as those that are collected using that gold standard nasopharyngeal swab.

H.E. Prof Azmi further added that various real-time RT-PCR protocols have been proposed for the diagnosis of COVID-19, these protocols differ in the genes they detect. Some examine two genes using a two-step interpretation algorithm. One gene is used for screening, and the second is for a confirmatory test.

However, the WHO recommends the use of three genes to detect beta coronavirus, the n gene, and the RdRp gene are both used as confirmatory genes. Different genes are used in different parts of the world, different countries, and different companies, and they offer different combinations to diagnose coronavirus.

Regarding the reliability of reverse transparency PCR, H.E. Prof. Azmi explained that there is a chance for the readings to reveal false-negative and false-positive results, that is why it is important to have quality control in place. The timing of when the sample is collected, the type of sample collected, and the quality of the sample can all influence the accuracy of the COVID-19 results.

He further explained that results can be categorized as negative, (inconclusive, indeterminate, equivocal). These terms are used variably in different labs; however,

retesting is always recommended using new specimens. Guidelines do not differentiate these terms; the laboratory physician can decide the term to use for positive results.

He also stated that the criteria for determining positive and negative results in the screening and confirmatory tests are as follows: Positive control (+), Negative control (-). Threshold cycle (Ct) value of the target gene ≤cut-off Ct value: positive for the gene. No target gene detected or Ct value >cut-off Ct value: negative for the gene. All results of the negative control (-) or positive control (+) should be valid regardless of the target gene and internal control amplification; retesting is necessary. Values close to the cut-off values in specimens with low viral loads may indicate false-negative or false-positive results. Thus, a laboratory physician should interpret the results and if necessary, retest using residual or new specimens.

Basic information regarding the collected specimen including patient name, age, sex, specimen number, ward, test order date, specimen type, and collection time should be collected. When the test results turn out to be invalid or questionable, the patient should be resampled and retested. Some companies and labs use the isothermal amplification incorporating the CRISPR technology for the detection of COVID-19, where the results are out within 30 minutes and can be used to confirm a COVID-19 diagnosis.

Two issues should be considered in diagnosing COVID-19 namely: safety and quality assurance. Safety is very important, whereby H.E. Prof. Azmi confirmed that we should use a biosafety cabinet level 2, policy for diagnostic testing in laboratories certified to perform high complexity testing under CLIA- FDA, aerosolization control, personal protective equipment, and disinfection procedures.

Finally, he said that before introducing a new testing method, a new assay, new batches of materials, or a new PCR technician into the laboratory, validation, or verification should be carried out, to ensure that the laboratory testing system is performing adequately.

For manual PCR systems, each Nucleic Acid Amplification Test (NAAT) sample should include internal controls and ideally a specimen collection control (human gene target). Additionally, external controls are recommended for each test run. Laboratories that order their primers and probes should carry out entry testing or validation to look for functionality and potential contaminants. Laboratories are also encouraged to define their assays' detection limits, and senior staff should recognize how disease prevalence alters the predictive value of their test results.

Once the number of cases goes down, the positive predictive value will decrease, therefore, the interpretation of tests should continue to be part of a stringent quality assurance scheme, with an interpretation based on time of sampling, sample type, test specifics, clinical data, and epidemiological data.

Antibody Response and Rapid Serological Tests Used in COVID-19 Infection and Interpretation of Results.

Prof. George F. Araj

Prof. George F. Araj stated that the immune system comes with two major arms: the cell-mediated one, and the humoral one, in addition to the other regular immune macrophages and monocytes that innate immunity. He further added that the immunization system undergoes an orchestration within the different cells to have an efficient encounter against any invader of the body, whether antigenic determinant, pathogenic, viral, parasite or bacteria, etc. He went on to say that the most important part is coordination. In the case of COVID-19, this does not just involve the antibodies, although they are the major protective parts or defenders in terms of the viral encounter. In fact, there are a lot of studies now that are talking about the cell-mediated part and the t-cells involved there.

Generally, in any infection, Prof. Araj explained, there is an initiation. This usually occurs when we are exposed to an anti-antigen and the IgM is first initiating them. This phase is followed by the IgG. For COVID-19, there are reports that both IgG and IgM are being developed at the same time. To test these antibodies, generally, we have different classes and generations, the first-class includes Agglutination, Precipitation, CF, Neutralization, and Flocculation, while the second class

includes FA, RIA, CIE, LA. The third includes ELISA, while the fourth includes the membrane chromatography test. For COVID-19, the ELISA and the membrane chromatography tests are used.

Prof. Araj also spoke about COVID-19 infectivity aspects, whereby he stated that the antigens of the COVID-19 spike protein are Nucleocapsid and that they are the receptor-binding protein. They are used to produce monoclonal antibodies to do an antigen or an antibody detection test. He then spoke about the infectious doses of different agents and their routes, stating that he is not sure what is the infectious dose of the virus for COVID-19 to infect humans. He also showcased a group of agents/diseases and their routes and the doses needed to infect a human.

Prof. Araj further stated that the virus is highly infectious due to its widespread around the world, its virulence is also efficient where it is active on different levels worldwide. The exact infectious dose remains to be determined. But wearing face masks prevents and minimizes infectious viral dose, allowing the immune response to handle it without consequences. The incubation period and duration of COVID-19 infectivity is said to be at a median of five days, but it ranges from two to seven days. Furthermore, the detectable virus level is determined by the PCR. In numbers, it takes two to three days before symptoms onset and then seven to eight days for their decline. However, the duration of PCR positivity can prolong for weeks, mostly due to having a non-complete virus. In this regard, Prof. Araj explains that at times, one is not picking up the virus, he/she is picking up parts of the virus. He also explained that there is no viral recovery when the PCR cyclic threshold is over 35 days. He also adds that there is no validity in a specimen taken after eight days following the onset of the symptoms. Culture positive rate decreases with rising PCR Ct values. Samples can remain PCR positive for more than 20 days with no viable virus for more than eight days. He added that in human respiratory samples, infectivity is around:

- 10 days among mild to moderate ill positive.
- 15 days among severely critically ill-immunocompromised.
- 20 days longest reported for competent virus infectivity.

In the case of COVID-19 IR Antibody-CMI, infectious agents stimulate the immune response by triggering mobilization of the T and B cells of the immune system, thus initiating a cell-mediated and humoral immune response. The test can detect IgM, IgG, and IgA classes. For COVID-19 exposure, the evolution, and the role of CMI as a diagnostic or detriment of exposure remains unclear. The specific Ig's were reported to be used as immune response indicators of viral exposure and can have diagnostic value. The basis for most COVID-19 serological assays is antibody detection against different viral antigens such as immunogenic spike protein, viral nucleocapsid proteins, and developed recombinant antigens. Some of these antigens share homology with other human coronaviruses.

Prof. Araj also spoke about tests conducted globally, and the importance of validating the tests. He then shared numbers revealing FDA test status:

- There are 224 antibody tests in the market.
- 72 number of tests that should no longer be offered.
- 193 tests in the market with no FDA approval.
- Six approved tests from the FDA.

He also stated that we need to rely on what has been assessed and published because many tests are being withdrawn and they can give misleading results of false positive and false negative results, thus further misleading the diagnosis and the work of physicians. Timing of Antibody- Response- Production occurs when we have the infectivity of the virus going up to eight or nine days before the patient starts building up the antibodies. Antibodies start being initiated or developed between by eight to eleven days and they should have been built by 14 days. In the case of COVID-19 Antibody Testing, extensive ongoing research is a top priority for appropriate and accurate clarification of the serodiagnostic features and immune responses of COVID-19.

There are three Serodiagnostic Testing formats namely: Immunochromatographic LF immunoassay, Enzyme-

Linked Immunosorbent Assay, Chemiluminescent immunoassays (CLIA) and they are highly reliable. Regarding the utility and potential use of RDT, Prof. Araj added that we still need to assess seroprevalence, contact tracing, surveillance, and tracking the spread of the virus in communities, as they help define the size and nature of the epidemic and in guiding lockdown, reopening and integrating society decisions. The suggestion to use both tests concurrently can give a better value in relation to the diagnosis and assessment. It is also useful to test Asymptomatic or Presymptomatic HCW's or patients.

Current Testing Situation Worldwide and Challenges

Dr. Erin M. Sorrell

Dr. Erin M. Sorrell explained that diagnostic and public health laboratories are essential for providing early warnings of disease outbreaks at the local, national, and regional levels. After several years of analyzing public health networks, we have learned that tiered and integrated laboratory networks provide the capacities needed to detect and confirm priority diseases in a timely, efficient, and cost-effective manner at all levels of a health system. Furthermore, achieving accurate, reliable, timely, and safe diagnostic and confirmatory testing from all levels of the laboratory network requires the continuous implementation of a laboratory quality management system at all levels.

She further listed the roles of labs as follows:

- Sentinel labs are to recognize, rule out, and refer.
- Reference labs are to conduct confirmatory testing.
- National labs are to provide definitive characterization.

She further explained that in an ideal world we have a process for surveillance, for testing, for treatment, for tracing, for quarantine, and also for implementing infection prevention control, for social distancing when necessary, and for administering vaccinations when possible. Through this process, it is important to think about communication, both risk communication to the public and communication within the various sectors involved in outbreak management and response.

She further confirmed that testing is a must; it allows us to do the most basic task in disease control. It enables us to identify the sick and separate them from the well. Without testing, there is no data. There are several interim guides on testing offered by WHO. The WHO also posts several resources on their website. One of the things that has been challenging from a global perspective is finding the absolute key number of tests that should be held on a daily, weekly, and monthly basis for each country, region, and state.

Regarding the positivity rates that have been reported, Dr. Sorrell explained that there has been a high positivity rate. This suggests that higher transmission rates are being captured and that there are members of the community who are infected and who haven't been tested, and therefore there is a risk of transmission in the community.

She further explained that the WHO recommended in May that if positive rates remain below five percent for at least two weeks, the government can consider reopening.

A low percentage of positive rate indicates that the level of the coronavirus transmission, relative to the amount of testing, is low at that point of time. This is due to communities/regions practicing social distancing, aggressive testing, and isolation.

When we have high positivity rates, there are two ways we can lower them: reduce the amount of coronavirus transmission or increase the number of people who get tested. Testing promotes our understanding of rates of transmission and the extent of incidence, but increased testing needs to align with tacking and documenting where cases are coming from.

Dr. Sorrell went on to talk about COVID-19 daily tests vs. daily new confirmed cases per million. She explained that the current testing capacity in comparison with the positivity rates and tests in a graph that shows the seven-day moving average of each country's daily positivity and daily tests conducted per capital.

She stated that there is a need to move faster than the virus. Another challenge faced is caused by the disrupted

supply chains for test kits, supplies, consumables, and reagents. High demand for test results and delayed test results and challenges for control are obstacles that we need to overcome. Other challenges involve; constrained financials and human resources, lack of reliable transportation routes and laboratory networks at the subnational level, the lack of integrated data management and reporting systems, and the existence of numerous test kits of variable quality yielding different results. Furthermore, there is a challenge regarding the repurposing of lab facilities for COVID-19 testing, re-directed attention towards pandemic response, and decreased diagnostic for national priority diseases.

To find solutions for the above-mentioned challenges, the creation of successful pooling samples for PCR testing, the integration of rapid antigen tests for surveillance, the initiation of testing programs to the size of a state's epidemic, not the size of the population are all recommended.

Several platforms for discussion have been created including; the integrated diagnostic consortium, the African Society for Laboratory Medicine resources (ASLM), online training, EMPHNET'S WEBi series on COVID-19, the African CDC-led African Taskforce for coronavirus preparedness and response (AFTCOR), and finally, EMPHNET promoting the role of FETPs and RRTs in response to COVID-19.

Click here to listen to the recorded webinar

Discussion

The webinar concluded with Dr. Tarek facilitating the question and answer session. The following questions were answered.

How many tests should a person take when he/she become infected with COVID-19? and how many tests should be taken to be considered as a negative test?

The best time to test a COVID-19 patient using a molecular assay is early in the course of the disease. In symptomatic COVID-19 patients, SARS-CoV-2 viral RNA can be detected about one day prior to symptom onset and remains detectable at high levels for about 6-7 days. Then it substantially decreases to negligible levels after 10 days post symptom onset, and typically does not represent infectious virus, though PCR can remain positive for some time due to its high sensitivity in the detection of nonviable genetic particles of a dead virus. Retesting is advised for initially negative PCR patients with a deteriorating respiratory clinical course consistent with COVID-19 infection and have had exposure to a COVID-19 positive individual.

What is the probability of being sick in case of COVID-19 positive test results

It is better here to talk about Positive and negative predictive values:
The Positive Predictive Value: Probability of being sick in the event of a positive test.
The Negative Predictive Value: Probability of being healthy in the event of a negative test.
We cannot evaluate the proportion of false positive or false negative, knowing only the sensitivity and the specificity of the test. We need to take into account the prevalence of the disease in the population in which the test is applied. Both positive and negative predictive values are affected by the prevalence of the disease. The PVP of a test is affected by its specificity. The PVN of a test is affected by its sensitivity.

Why result still giving positive even after all symptoms and signs had been cured?

PCR can remain positive for some time due to its high sensitivity in the detection of nonviable genetic particles of a dead virus. Detection of viral RNA by PCR does not equate with infectivity, unless infectious virus particles have been confirmed through virus isolation and cultured from particular samples. Viral load can, however, be a potentially useful marker for assessing disease severity and prognosis.

How long would the virus stay viable inside the body after a patient's death?
According to WHO, if the person died from COVID-19 while he or she was infectious, the lungs and other organs may still contain live virus. To date, there is no scientific evidence of transmission of the virus through a dead body from COVID-19 deceased case, yet it is vital to ensure precautionary measures while handling the bodies of suspected or confirmed cases.
Current knowledge supports that spread of SARS-CoV-2 (the virus that causes COVID-19) usually happens when a person is in close contact (i.e., within about 6 feet) via respiratory droplets produced when an infected person coughs, sneezes, or talks. This route of transmission is not a concern when handling human remains or performing postmortem procedures.

Is the rapid test effective in the situation of community transmission of COVID-19?
Where there is widespread community transmission, RDTs may be used for early detection and isolation of positive cases in health facilities, COVID-19 testing centers, care homes, prisons, schools, front-line and health-care workers and for contact tracing. The safe management of patients with RDT-negative samples will depend on the RDT performance and the community prevalence of COVID-19. A negative Ag-RDT result cannot completely exclude an active COVID-19 infection, and, therefore, repeat testing or preferably confirmatory testing (PCR) should be performed whenever possible, particularly in symptomatic patients.

Is the negative confirmation test needs to be repeated after a specific incubation window period? Or is it considered as a conclusive result from the first time?
Retesting is advised for initially negative PCR patients with a deteriorating respiratory clinical course consistent with COVID-19 infection and have had exposure to a COVID-19 positive individual. Suspected patients with repeated negative PCR testing, up to 3 times, and at least 24 hours apart in an upper respiratory specimen, should be tested with an alternative specimen type.

Could you elaborate more on the role of cell-mediated immunity in response to COVID-19 exposure?
SARS-CoV-2 - Cell-mediated Immune Response Notes:
T-cell responses against the SARS-CoV-2 spike protein have been characterized and correlate well with IgG and IgA antibody titers in COVID-19 patients, which has important implications for vaccine design and long-term immune response.
It is currently unknown whether antibody responses or T-cell responses in infected people confer protective immunity, and if so, how strong a response is needed for protective immunity to occur.
CD8+ T cells are the main inflammatory cells and play a vital role in virus clearance.
Total lymphocytes, CD4+ T cells, CD8+ T cells, B cells, and natural killer cells showed a significant association with inflammatory status in COVID-19, especially CD8+ T cells and CD4+/CD8+ ratio.
Decreased absolute numbers of T lymphocytes, CD4+ T cells, and CD8+ T cells were observed in both mild cases and severe cases but were accentuated in the severe cases.
In multivariate analysis, a post-treatment decreases in CD8+ T cells and B cells and increases in CD4+/CD8+ ratio was indicated as independent predictors of poor treatment outcomes.
The expression of IFN-γ by CD4+ T cells also tends to be lower in severe cases than in moderate cases.

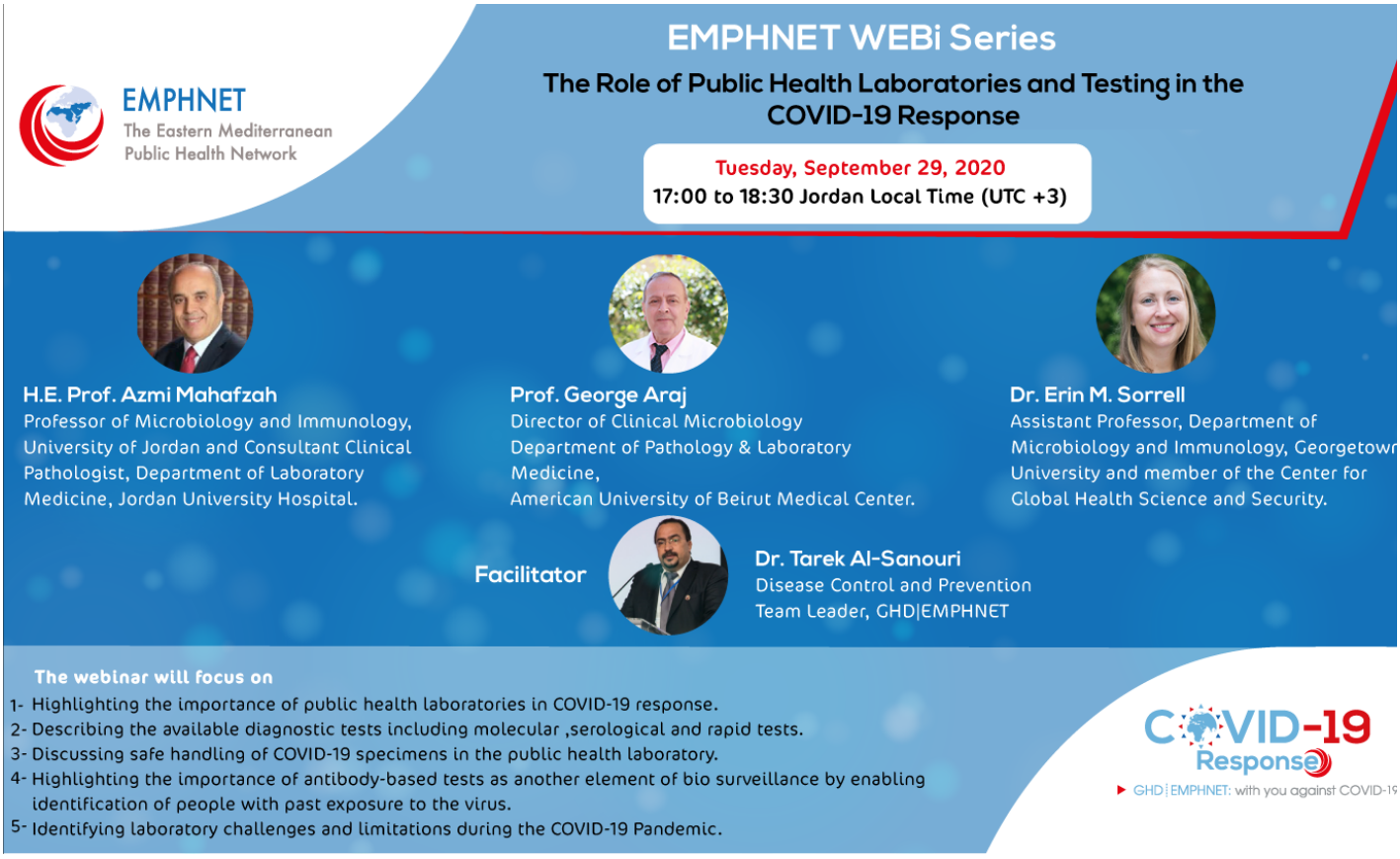
How is the COVID-19 pandemic affecting lab testing of other diseases? Is it leading to a reduction of tests or no change?
Many other laboratory tests have been neglected due to the burden caused by the examination of a huge number of SARS-CoV-2 samples in laboratories. The process of purchasing various testing and diagnostic materials and supplies has been affected, and it has been warned that neglecting other diseases will affect the diagnostic capabilities and proper diagnosis of other important infectious diseases.

Poor sensitivity is a challenge, though rapid antigen test will improve accessibility. How to best use rapid antigen test for controlling the disease?

Rapid antigen test directly detects the presence of the virus, indicating active infection (i.e. replication of the virus) and enables fast, decentralized access to direct testing for the virus, relieving the burden on the laboratory testing system, if used for contact tracing or provides an objective marker to define chains of transmission. The number of true positives and true negatives is dependent on the prevalence of the population being tested.

Is there a relationship between viral load and the severity of clinical manifestation of COVID-19?
The initial dose of virus and the amount of virus an individual has at any one time might worsen the severity of COVID 19 disease. Viral load is a measure of the number of viral particles present in an individual. Higher SARS-CoV-2 viral loads might worsen outcomes, and data suggests the viral load is higher in patients with more severe disease. The amount of virus exposure at the start of infection – the infectious dose – may increase the severity of the illness and is also linked to a higher viral load.

Does the severity of disease affect the infectivity period? Are those with severe disease more infectious?
Infectivity of patients with symptoms of ≥ 8 days is likely very low. The duration of viral shedding in severely ill patients, such as those in intensive care units or with immune suppression, is unknown but may be prolonged. The time period in which an individual with COVID-19 is infectious remains uncertain. The clinical criteria for non-infectiousness, including 14 days from symptom onset or being symptoms free for 72 hours (whichever is longer) are being used in some jurisdictions. Laboratory criteria based on two negatives Nasopharyngeal (NP) RT-PCR results 48 hours apart (after 14 days of symptom onset), were initially used and are still being used in some circumstances.



Biographies of Guest Speakers and Facilitators

H.E. Prof. Azmi Mahafzah- Professor, Department of Pathology, Microbiology and Forensic Medicine, University of Jordan.

Prof. Mahafzah got his Ph.D. in Microbiology and Immunology from the American University of Beirut, Lebanon. He then completed a postdoctoral fellowship training in Virology at Yale University School of Medicine.

Prof. Mahafzah has been working in the Faculty of Medicine at the University of Jordan and the Jordan University Hospital for about thirty years, where he served in several high-level positions. In 2016, he was appointed as the President of the University of Jordan. Furthermore, he is a member of several scientific societies and committees. His research interests include immunology, diagnosis of infectious diseases, Nosocomial infections, and the epidemiology of infectious diseases. He was also the former minister of education in Jordan

Prof. George Araj, Director of Clinical Microbiology Department of Pathology & Laboratory Medicine American University of Beirut Medical Center

Prof. Araj got his Ph.D. In Medical Microbiology from the American University of Beirut, Lebanon. He is a Diplomat of the American Board of Medical Microbiology (ABMM) since 1986, and a fellow of the American Academy of Microbiology (FAAM) since 2000.

He is currently working as a Professor and the Director of Clinical Microbiology at the AUB Medical Center. His research interests are the development of tests related to the diagnosis of infectious diseases, specifically tuberculosis and brucellosis, and the characterization of antimicrobial resistance. His research studies culminated to over 200 publications spanning over a wide range of topics related to clinical microbiology and infectious diseases aspects.

Dr. Erin M. Sorrell - Centre for Global Health Science and Security, Assistant Professor, Department of Microbiology and Immunology, Georgetown University.

Dr. Sorrell received her undergraduate degree in Animal Science from Cornell University and got her M.Sc. and Ph.D. in Animal Science and Molecular Virology from the University of Maryland. She was a postdoctoral fellow both at Erasmus Medical Center, the Netherlands, and the University of Maryland.

Dr. Sorrell works as an Assistant Professor in the Department of Microbiology and Immunology at Georgetown University as well as a member of the Center for Global Health Science and Security. She works with partners across the U.S. government, international organizations, and ministries around the world to support health systems strengthening and laboratory capacity building for disease detection, reporting, risk assessment, and response.

Dr. Tarek Al-Sanouri- Disease Control and Prevention Team Leader, GHD|EMPHNET

Dr. Al-Sanouri got his Ph.D. in Microbiology from the National Medical University in Ukraine. He is currently the Team Leader for the Disease Control and Prevention Department at GHD|EMPHNET. His role is to oversee technical and administrative tasks related to Biosafety, Biosecurity, Biorisk management, and laboratory-based surveillance activities.

Furthermore, he is the former Head of the Central Public Health Laboratories (CPHL)/ Ministry of Health (MOH), where he worked there for 14 years. During his work, he coordinated and monitored laboratory work and activities related to public health, outbreak investigation and disease surveillance, laboratory quality management system, and laboratory network.