Laboratory Networks in the Americas and the response to emerging diseases

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The context: Emerging Infectious Diseases (EID)

- The impact of emerging pathogens has been especially critical during the last years.
Infections that have recently appeared in a population, and are quickly increasing in frequency or geographic range (Morse, 1995)
The context: Emerging Infectious Diseases (EID)

- Adaptation (some pathogens require it*)
- Human behavior
- Ecology

Expansion of human population
Global connectivity
Disturbance of habitats/zoonosis
The response to Emerging Infectious Diseases

Regardless of geographic location, an outbreak or epidemic represents an emergency and a potential international threat.

There are no countries or institutions that have the complete capacity to respond by themselves to epidemics, especially those generated by new (emerging) pathogens with pandemic potential.

For this reason, a system is required that coordinates alert and response mechanisms at the global and regional levels.
The response to Emerging Infectious Diseases

- Beyond surveillance of endemic pathogens, WHO Member States should be prepared to detect and characterize in a timely manner the emergence of new agents with epidemic potential*

- Mechanisms for a timely access to National and Regional reference laboratories as well as laboratory networks, must be granted

- Quality of the results should be ensured

*Core capacity #8 IHR
The response to Emerging Infectious Diseases

To improve the epidemiological surveillance and response to outbreaks, PAHO has strategically strengthen networking between National public health laboratories (NPHL), Regional reference laboratories, and PAHO/WHO Collaborating Centers (WHO-CC).
Laboratories Network in the Americas

- Sireva II Nm
- PulseNet
- RELAVRA
- RELDA/Emerging viruses
- SARInet
Priority emerging viral diseases

Hemorrhagic fevers (VHF)
- Arenavirus
- Filovirus*
- Hantavirus

Emerging arboviruses
- Yellow Fever
- Mayaro
- Oropouche
- West Nile
- VEE

Respiratory viruses
- Influenza
- MERS/SARS
- MPNV
- RSV

Non-polio Enteroviruses
- EV 71
- D 68
Priority emerging viral diseases

- Arenavirus
- Filovirus*
- Hantavirus
- Yellow Fever
- Mayaro
- Oropouche
- West Nile
- VEE
- Influenza
- MERS/SARS
- MPNV
- RSV
- EV 71
- D 68
WHO Global Influenza Surveillance and Response System (GISRS)

- World Health Organization Global System for Influenza Surveillance and Response.
- Monitors the influenza virus evolution and provides recommendations in several areas such as laboratory diagnostics, vaccines compositions, antiviral susceptibility and risk assessment.
- Serves as a global alert mechanism for the emergence of influenza viruses with pandemic potential.
OPS/OMS

GISRS in the Americas Regions

WHO Collaborating Center

Centers for Disease Control and Prevention (CDC)

29 National Influenza Centers (NICs)

25 Countries / WHO Member States

SARInet
Laboratory Response to COVID-19 in the Americas Region

First case of 2019-nCoV reported outside China Jan 22
Isolation of a novel coronavirus confirmed by WHO Jan 27
WHO declares Public Health Emergency of International Concern (PHEIC) Jan 30
First 2019-nCoV genetic sequences released in open platform (Virological and GitHub) Jan 19
First Molecular Protocol (China-BF) available on WHO webpage Jan 14
First SARS-CoV-2 molecular diagnostic implementation in the Caribbean Subregion (CARICOM) Feb 5
First SARS-CoV-2 molecular diagnostic implementation in 11 countries (CARICOM) Feb 5
First SARS-CoV-2 molecular diagnostic implementation in 24 countries (CARICOM) Feb 5
First SARS-CoV-2 molecular diagnostic implementation in 30 countries (CARICOM) Feb 5
First PAHO technical laboratory guidelines shared with the countries Jan 21
First SARS-CoV-2 molecular diagnostic implementation in Latin America (Meks) Jan 30
SARS-CoV-2 molecular diagnostic implemented in 24 laboratories (CARICOM, USA, BOL, BOC, ECU, PAR, PRY, PER, SUR, URU) Feb 6
SARS-CoV-2 molecular diagnostic implemented in 30 laboratories (CARICOM, USA, BOL, BOC, ECU, PAR, PRY, PER, SUR, URU) Feb 6
SARS-CoV-2 molecular diagnostic implemented in 24 laboratories (CARICOM, USA, BOL, BOC, ECU, PAR, PRY, PER, SUR, URU) Feb 6

2019-nCoV named SARS-CoV-2 by ICTV Feb 11
First SARS-CoV-2 molecular diagnostic capacity in 20 countries (CARICOM) Feb 11
First SARS-CoV-2 molecular diagnostic capacity in 30 countries (CARICOM) Feb 11
First SARS-CoV-2 molecular diagnostic capacity in 40 countries (CARICOM) Feb 11

HALLMARK EVENTS

SEVERE PNEUMONIA CASES IN CHINA
Notification of unknown atypical pneumonia to WHO Dec 31
First 2019-nCoV genetic sequences released in open platform (Virological and GitHub) Jan 19
First Molecular Protocol (China-BF) available on WHO webpage Jan 14
First SARS-CoV-2 molecular diagnostic implementation in the Caribbean Subregion (CARICOM) Feb 5
First SARS-CoV-2 molecular diagnostic implementation in 11 countries (CARICOM) Feb 5
First SARS-CoV-2 molecular diagnostic implementation in 24 countries (CARICOM) Feb 5
First SARS-CoV-2 molecular diagnostic implementation in 30 countries (CARICOM) Feb 5

LAWRENCES COUNTRIES LABORATORY READINESS

D COUNTRIES SARS-CoV-2 MOLECULAR DIAGNOSTIC CAPACITY
30 National Reference Centres in National Laboratories with molecular diagnostic platform available Jan 1

11 COUNTRIES SARS-CoV-2 MOLECULAR DIAGNOSTIC CAPACITY
First SARS-CoV-2 molecular diagnostic implementation in Latin America (Meks) Jan 30
First SARS-CoV-2 molecular diagnostic implementation in 11 countries (CARICOM) Feb 5
First SARS-CoV-2 molecular diagnostic implementation in 24 countries (CARICOM) Feb 5
First SARS-CoV-2 molecular diagnostic implementation in 30 countries (CARICOM) Feb 5

24 COUNTRIES SARS-CoV-2 MOLECULAR DIAGNOSTIC CAPACITY
First SARS-CoV-2 molecular diagnostic implemented in 24 laboratories (CARICOM, USA, BOL, BOC, ECU, PAR, PRY, PER, SUR, URU) Feb 6
First SARS-CoV-2 molecular diagnostic implemented in 30 laboratories (CARICOM, USA, BOL, BOC, ECU, PAR, PRY, PER, SUR, URU) Feb 6
First SARS-CoV-2 molecular diagnostic implemented in 40 laboratories (CARICOM, USA, BOL, BOC, ECU, PAR, PRY, PER, SUR, URU) Feb 6

30 COUNTRIES IN ALL AMERICAS REGION SARS-CoV-2 MOLECULAR DIAGNOSTIC CAPACITY
First SARS-CoV-2 molecular diagnostic implemented in 30 countries (CARICOM) Feb 5
First SARS-CoV-2 molecular diagnostic implemented in 40 countries (CARICOM) Feb 5
First SARS-CoV-2 molecular diagnostic implemented in 50 countries (CARICOM) Feb 5
Laboratory Response to COVID-19 in the Americas Region

37 Countries / WHO Member States

National Influenza Centers (NIC)

WHO COVID-19 Reference Laboratories
- CDC – USA
- FIOCRUZ – Brazil
- InDRE - Mexico

National Public Health Laboratories
**Molecular Diagnostics**
Influenza detection – IRR reagents – WHO CC at US-CDC
SARS-CoV-2

**Genetic Sequencing**
Influenza Sequencing Project
COVID-19 Genomic Surveillance Regional Network

**Viral isolation**
Only for influenza and after SARS-CoV-2 infection have been excluded

**Antigenic characterization**
Standard antiserum against the influenza strains present on the vaccine composition

**Antiviral resistance assays**
Genetic sequencing
NA inhibition (NAI) assay

**Laboratory capacity in the Americas Region**
Laboratory Surveillance and Response to Respiratory Viruses

Based on Influenza and ORV platforms (NICs and National Labs Network)

- Following in-country mechanisms established for routine influenza surveillance
- Maintaining testing algorithm recommended by PAHO
- Maintain biosafety recommendations (BSL2 / BSL 3 containment and procedures)
Laboratory Surveillance and Response to Respiratory Viruses

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INFLUENZA REMAINS A TREAT

Influenza surveillance must be continued
Operational considerations for COVID-19 surveillance using GISRS
Interim guidance
26 March 2020

Background

Several countries have demonstrated that COVID-19 transmission from one person to another can be prevented through simple actions to stop transmission include active case finding, care and isolation, contact tracing, and laboratory testing. WHO. In addition to active case finding and testing, it is critical to enhance surveillance for COVID-19 transmission in the community. WHO has outlined surveillance requirements for different scenarios (countries with no cases, sporadic cases, clusters of cases, and community transmission) and considers using existing hospital-based severe acute respiratory infection (SARI) and respiratory infection surveillance systems or whichever syndrome respiratory disease systems may already be in place. Existing influenza surveillance networks, such as the Global Influenza Surveillance and Response System (GISRS), play a critical role in monitoring the spread of COVID-19 and will be relied on if comprehensive active surveillance systems are not in place to detect community transmission.

GISRS is a well-established network of more than 150 national public health laboratories (NPHLs) worldwide that monitor epidemiology and virologic evolution of influenza disease and viruses. Influenza antiviral treatment and drug resistance are monitored using a similar clinical presentations. Notably, as of 25 March, approximately 85% of members currently testing for COVID-19 globally are laboratories closely associated with GISRS, which provides an efficient and cost-effective approach to enhancing COVID-19 surveillance.

Purpose of the document

Laboratory Guidelines for the Detection and Diagnosis of COVID-19 Virus Infection

8 July 2020

Coronaviruses are a group of highly diverse RNA viruses in the Coronaviridae family that are divided in 4 genera: alpha, beta, gamma and delta, and cause disease varying from mild to severe in human and animals (1-3). There are endemic human coronavirus as alphacoronaviruses 229E and NL63 and betacoronaviruses OC43 and HKU1 that can cause influenza-like illness or pneumonia in humans (1, 3). However, two zoonotic coronaviruses have emerged causing severe disease in humans: Severe acute respiratory syndrome coronavirus (SARS-CoV) in 2002-2003 and Middle East respiratory syndrome coronavirus (MERS-CoV) (1-5).

In January 2020, the etiologic agent responsible for a cluster of severe pneumonia cases in Wuhan, China, was identified as being a novel betacoronavirus, distinct from SARS-CoV and MERS-CoV (6). On 11 February 2020, the International Committee on Taxonomy of Viruses (ICTV) announced that the virus was named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (7) while, on the same day, WHO named the disease as coronavirus disease COVID-19 (8). For communication purposes we will refer the virus as “the virus responsible for COVID-19” or “the COVID-19 virus”. Complete genomic sequences of the COVID-19 virus have been released and different molecular detection protocols developed (9). Given the current circulation of COVID-19 in the world, it is important to have a strategy for the detection and diagnosis of COVID-19.
Final Remarks

• Surveillance of unusual SARI supports the implementation of the IHR and enables the timely identification of new events or pathogens or new genetic variants with pandemic potential

• Surveillance for SARI (should) be complemented by surveillance for unusual SARI (unusual)

• The laboratory is critical to confirm (or rule out) new agents: MERS / SARS-CoV-2, Avian Influenza *, ORV

• NPHLs must be prepared to detect and inform new agents in a timely manner (mandatory notification in 24 hours, IHR)
Final Remarks

• A good Lab diagnosis depends on a good sample and a good capture of the case.

• Articulation of the laboratory with the epidemiology component and the clinic are essential to ensure an appropriate response to IHR.

• LSPs must be prepared to detect and inform new agents in a timely manner (mandatory notification in 24 hours, RSI).

• A good Lab diagnosis depends on a good sample and a good capture of the case.

• Strengthening surveillance in the human / animal interface: Articulation and response.
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• PAHO Laboratory Response Team

• PAHO Influenza Team

Influenza Regional Reports: http://www.paho.org/influenzareport
Severe acute respiratory infections network – SARInet: http://www.sarinet.org