AJMHR
Asian Journal of Medical and Health Research
Journal home page: www.ajmhr.com

Covid-19 and Dengue With Emphasis in *Aedes Aegypti* (Diptera:Culicidae): Integrated Surveillance for your control in Cuba.

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ABSTRACT

Currently, health systems in the Americas region face two fundamental problems: the COVID-19 pandemic and dengue, mainly in countries where the last one is endemic, hence the Pan American Health Organization (PAHO) emphasized the need to maintain efforts to prevent, detect, and treat vector-borne diseases during the COVID-19 pandemic since the combined impact of both could have severe consequences on the population at risk. It is argued that in the Americas there is no scientific evidence of cases of co-infection between dengue and COVID-19, so it is time to make efforts to reduce the mosquito population and avoid an increase in the occurrence of dengue cases to maintain or reduce the possibility of co-infection of these diseases. This article provides some integration of the measures used in the confrontation of COVID-19 with an impact on the surveillance and effective and timely control of *Aedes aegypti*, the main vector of dengue in Cuba.

Keywords: COVID-19, Dengue, *Aedes aegypti*, integrated surveillance, Cuba.

Received 15 August 2020, Accepted 22 September 2020

Please cite this article as: Marquetti MC *et al., Covid-19 and Dengue With Emphasis in Aedes Aegypti (Diptera:Culicidae): Integrated Surveillance for your control in Cuba.*. Asian Journal of Medical and Health Research 2020.

INTRODUCTION

Today the world suffers from a serious situation where more than 13 million people have been affected by COVID-19, a disease caused by a little-known virus, SARS-CoV-2, belonging to the group of coronaviruses that has accumulated more than 700 000 deaths [1]. This coronavirus was first registered in late 2019, in China, in the province of Hubei, specifically in the city of Wuhan [2], massively affecting the population and in a short time caused an epidemic that went out of control and quickly spread to the rest of the world, causing a pandemic [3]. On January 30, 2020, the World Health Organization (WHO) declared the current coronavirus epidemic as an international emergency situation [4].

The COVID-19 pandemic is considered the greatest health challenge in the world, since the one known as the Spanish flu in 1918, which killed between 20 and 40 million people worldwide [5,6]. The virus is generally transmitted from person to person through the tiny droplets of saliva that are emitted by speaking, sneezing, coughing, or breathing [7.8]. Therefore, to try to limit and break the transmission chain, the health systems of all countries have only been able to use general containment measures, such as limiting travelers and social distancing measures [9-11].

On the other hand, the WHO warned that today it is very difficult to predict how long the new coronavirus will circulate, since the investigations of several countries show that only a low percent of the world population has been infected despite its rapid dispersal in the world. Furthermore, COVID-19 can follow the course of other viruses that are active in the world and become an endemic virus, which represents its presence in an area permanently, at all times and for many years, as has happened with other diseases. viral and non-viral such as malaria, dengue, Chagas, whooping cough, yellow fever, measles, and the Acquired Immunodeficiency Virus (HIV) [12].

In Cuba, the first cases of COVID-19 occurred late in relation to the epidemic that occurred in Asia, Europe and some countries in the Americas, with the first case being recorded on March 11, 2020 [13, 14]. In the rest of the world, there have been numerous countries with an alarming presence of the disease and high mortality for more than a month. In order to search for cases in the population, massive inquests were carried out to locate people who were contacts of positive or suspected cases of the disease, as an innovative and unique measure, involving thousands of health professionals and university students in these disciplines [15].

Another disease that could worsen the health situation and join the pressure that COVID-19 is exerting on health care and management systems in the Region of the Americas is Dengue, a disease caused by viruses within arbovirosis group and transmitted by the *Aedes aegypti* mosquito. The year 2019 witnessed an unprecedented dengue outbreak in many countries of

the Americas, with more than 3.1 million reported cases, including 28,176 serious cases and 1,535 deaths [16]. These data demonstrate that the combined impact of COVID-19 and dengue epidemics could have potentially devastating consequences for the population at risk [17].

Objective

This article intends to analyze the impact of the general containment measures used to control COVID-19 on the Dengue and *Ae, aegypti* surveillance in Cuba conditions.

Integration of measures in COVID-19 and Dengue with emphasis on *Ae. aegypti* control

Arbovirosis transmitted mainly by mosquitoes of the *Aedes* genus are currently a challenge worldwide. Globalization, unplanned urbanization, population growth, inadequate environmental hygiene, increased migration and travel, inefficient vector control, resistance to insecticides, climate change and different social and economic factors, among others, determine the increase, in extension and density of the *Ae. aegypti* mosquito, and consequently the expansion of the viruses transmitted by this vector [18, 19].

Dengue transmission, one of the viral diseases with the highest incidence in the Americas, is related to the existence of three main patterns: 1) occurrence of recurrent cycles of epidemics of this disease every 3 to 5 years in the last 30 years [20] ; 2) presence of endemicity or hyperendemicity of dengue viruses in several countries [21,22] and 3) the seasonality of peak dengue transmission during the second half of the year in the northern hemisphere and the first half of the year in the southern hemisphere mainly associated with increases in temperature and rainfall [23-26].

At this time when the world is facing the COVID-19 pandemic, we must not forget the fight against *Ae aegypti*, mosquito since dengue and other arboviruses are improve more and more on the American continent and in the world. The most affected countries, for the moment during 2020, are in South America. Topping the list is Brazil, which records 65% of cases, followed by Paraguay (14%), Bolivia (5.0%), Argentina (5.0%) and Colombia (3.0%), of which Brazil it is the first country of infections by COVID-19 in this area [27]. Regardless of these values, it is important to mention that dengue cases registered until mid-2020 in the American continent are below those confirmed in 2019, classified as an epidemic year [27].

Cuba until July 2020 has achieved effective control of COVID-19 cases and jointly develops intense control activity on *Ae. aegypti* to avoid an increase in its density and possible occurrence of Dengue cases in the second half of the year, a period belonging mostly to the rainy months. Although there is still no scientific evidence in a large number of countries in the American continent, there could be the possibility of a temporary coincidence of co-infection between dengue and COVID-19. This situation would lead to overlapping symptoms, misdiagnosis, and case management [28]. Hence the need to establish for the future; protocols and guidelines for clinical care for the management of patients [28] and the essential

need for joint efforts to reduce the mosquito population and the number of dengue cases during the high season [17].

There are four essential factors to adequately face any health problem and aspire to its solution, they are: 1) permanent political will; 2) existence of intersectional work; 3) awareness and active participation of the community and 4) a strong national health system joined with scientific-professional work [19].

With these elements, which constitute strengths in Cuba, a prioritized national strategy to confront the pandemic of COVID-19 and dengue was designed, led by the highest political, health and government authorities in the nation. These general containment measures, such as ***limiting travelers (closing borders), social distancing*** measures and ***isolation at home*** to eliminate the transmission chain of Covid-19 [9-11]. All of them are also effective in controlling the dengue. It is known that the DENV spreads in the community due to the mobility of the cases and, upon notification of these, focused control actions are carried out on *Ae. aegypti* denominated in Cuba ("**Radiobatidas"** consisting of the application of larval insecticide in mosquito breeding sites in addition to adults insecticide and other measures where the population is involved). These are carried out on the perimeter of the case's home (up to 200 meters in all directions) taking into account the mosquito's flight radius [29].

Studies carried out in Argentina demonstrated through spatial-temporal analysis that human mobility is essential in dengue epidemics and that models that do not take it into account strongly underestimate the impact that these can lead to since they can only correctly describe the beginning of the epidemic, and do not predict the final size of it [30]. In models that include the spread of the virus due to the flight of mosquitoes, epidemics are concentrated in one place. However, in real epidemics it is observed that during the evolution of the same multiple epidemic conglomerates occur. It is not strange to consider that an infected individual could spread the virus over long distances, which could not otherwise be reached by the limited flight of mosquitoes [30]

Targeted treatment is a central element of control over the peri-domestic transmission of the DENV [31]. The closure of the borders, knowing that dengue does not have surveillance in them, contributes to the breakdown of part of the transmission chain provided by the individuals entering the country carrying the virus, while the spread in cities is avoided through social isolation, which disrupts the mobility of individuals.

Furthermore, it is known that Dengue endemicity is favored by the persistent production of mosquitoes in water tanks managed by the population [32] which in previous studies in Cuba was demonstrated as the most productive mosquito containers of *Ae. aegypti* [33]. Taking this aspect into account, during home isolation, the participation of the population in the

management of these breeding sites is essential since it contributes to the decrease mosquito population and human vector contact, a fundamental factor in dengue transmission.

The presence of eggs in containers by great time period (from dry season to rainy season) could cause in a short time, high adult mosquito populations, giving this vector a great "resilience" or ability to recover after a disturbance [34]. The possibility of infected eggs by vertical transmission described for DENV1, DENV2, DENV3 and DENV4 in *Ae. aegypti* as previously reported in Cuba [35] could to initiate a dengue transmission in any area of the country. It should be mentioned that in the National *Ae. aegypti* and *Ae. albopictus* in Cuba there is what is called "**autofocal"** (review of the house in search of breeding sites by the inhabitant and subsequent removal or modification of it). The active and conscious participation of the entire community and of all individuals is necessary to increase in the country for to maintain isolation and social distancing for to break the transmission chain and control COVID -19, as to avoid the collapse of health services, [36, 37] in moments of pandemic and a favorable climatic season for the increase of the populations of *Ae. aegypti* and possible cases of Dengue.

Other measures include 1) ***active inquest*** in the population to search for patients with symptoms for early detection of the disease. This function of this measure is also integrated into the monitoring and surveillance of possible cases of Dengue; 2) ***Sanitation of the streets***, a measure of high impact also on diseases transmitted by vectors, since existing solids waste in public places are eliminated. On the other hand, as a unique measure in Cuba is; 3) ***self-inquest*** (in the case of COVID-19 it was established for the first time for the each person could to report possible cases). Given the validity of this measures, it would also be convenient to integrate this informational tool for reporting solids waste at the street that contribute to the proliferation of mosquitoes, as well as reporting poor work by vector control operators during the visit to homes in search of breeding sites of *Ae. aegypti* contributing to the control of dengue.

There are other measures, such as specific isolations (quarantine), where a certain number of cases of COVID-19 are concentrated until their certification, which leads to the closure of the epidemiological event once the isolation time has expired. Both measures together with the active inquest in the population have their origin in the models used in the country for a long time in the control of dengue cases, which shows the comprehensiveness of the epidemiological surveillance existing in Cuba.

Historically, the national vector program has identified entomological risk blocks in each health area of each municipality in the provinces of Cuba, so in this moment the *Ae. aegypti* surveillance must be prioritized in these places, providing effective use of human resources in current circumstances in which personnel are also diverted for response to COVID-19.

The purpose of vector control in areas of high entomological risk is in general to prevent mosquito bites, maintain populations at "acceptable" densities, minimize vector-human contact, and reduce longevity of adult females [29]. It is expected that these measures will translate into a reduction in the incidence, prevalence and morbidity and mortality of diseases to an acceptable level (which does not exceed the care capacity of health systems) or, if possible, in their elimination, a factor of great importance in the current confrontation against COVID-19.

In addition to the aforementioned, there are other aspects of interest in the surveillance of both diseases (Dengue and COVID-19) such as the presence of asymptomatic patients. In the case of dengue, there is an important justification for the preventive control of *Ae. aegypti*. The high rate of asymptomatic transmission [39] prevents the initial detection of outbreaks, which means that reactive actions to cases always lag behind the wave of transmission. However, there is a conviction that the strategies and tools selected have an effective impact to contain transmission if they are focused during the appearance of the first cases in the areas of greatest risk [40].

Among the challenges posed by the current COVID-19 pandemic is the ***high rate of asymptomatic transmissions*** of the SARS-CoV2 virus, as individuals who do not develop symptoms usually escape health surveillance and isolation measures, contributing to the spread of the pandemic. The reports available in the literature reveal that of the total of transmissions, 6 to 25% originate in people who do not present symptoms, but when the isolation measures of symptomatic cases are applied, this percentage can rise to 80% [41]. Cuba does not escape this phenomenon, since our community surveillance and research system allows us to detect and isolate a significant number of healthy carriers, but this does not exclude that the presence of several of these individuals still persists in our communities.

In Cuba during the COVID-19 pandemic until July 23, 2020, 54.7% of the cases were asymptomatic at the time of their detection, increasing to 66% for the total number of those diagnosed during the month of July [41, 42]. Therefore, it is necessary to intensify our epidemiological research actions at the primary health level and for the population to comply with government measures that promote social isolation with greater responsibility.

The highest incidence and persistence of dengue transmission is concentrated in urban areas which are characterized by greater deficiencies in public services such as garbage collection and frequency of water supply[19]. Among the preventive measures against COVID-19 is continuous hand washing and adequate personal hygiene, where the availability of water is essential, which is sometimes stored for several days in a large part of the population due to the frequency in your supply. Guarantee the coverage of these deposits to avoid the breeding of *Ae. aegypti* is essential in the fight against these two diseases.

CONCLUSION

The article serves as evidence to demonstrate the feasibility of carrying out an integrated surveillance focused on the control of both diseases (COVID-19 and dengue) in addition to complying with the call of PAHO where Member States are urged to do effective use of the human and material resources available at this time when the world is suffering major pandemic. On the other hand, if we are able to control dengue vector populations and carry out early identification and timely case management of this disease, the number of hospitalizations would be reduced, alleviating the additional burden on more complex levels of care necessary in severe cases of infection by COVID-19. In order to comply with each one of these measures, it is essential to maintain a collective response that favors the non-occurrence of dengue cases and to reduce the number of COVID-19 cases in the country, so the collective response must be emphasized of the entire population in the confrontation of both diseases in Cuba.

ETHICAL APPROVAL

This study was approved by ethical review committee of the Institute of Tropical Medicine, La Habana, Cuba and the ethical standards of the National Control Program of *Aedes aegypti* and *Aedes albopictus* established in Cuba.

REFERENCES

1. INFOMED. Infecciones por coronavirus-COVID-19.MINSAP, Cuba 3 Agosto, 2020.temas.sld.cu.
2. Velázquez-Pérez L, La COVID-19: reto para la ciencia mundial. Editorial Rev Anales de la Academia de Ciencias de Cuba 2020; 10:2 edición especial COVID-19.
3. Wu Z, Mc Gorgan JM. Characteristics of and Important Lessons from the Coronavirus Disease 2019 (COVID-19) Outbreak in China Summary of a Report of 72 314 Cases from the Chinese Center for Disease Control and Prevention. JAMA. February 24, 2020. doi:10.1001/jama.2020.2648. Consultado el 1 marzo 2020). Disponible en: https://jamanetwork.com/journals/jama/fullarticle/2762130.
4. WHO. Declaración sobre la segunda reunión del Comité de Emergencias del Reglamento Sanitario Internacional (2005) acerca del brote del nuevo coronavirus (2019-nCoV). 30 de enero de 2020.Consultado el 25 de junio 2020.https://www.who.int/es/news-room/ detail/30-01-2020-statement-on-the-second-meeting-of-the-international-health-regulations-(2005)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-(2019-ncov).
5. Ramírez Vázquez H, Reyes González ME. Al Día, Noticias de Salud. Cien años de la ‘gripe española’, la primera pandemia global. Enero 06(dpa) - Tomado del Boletín

temático en Medicina. Prensa Latina. Copyright 2018. Agencia Informativa Latinoamericana Prensa Latina S.A. [internet] [citado 14 abr 2020]

6. Coronavirus: semejanzas y diferencias con "la gripe española" de 1918. Texto del canal español de TV "Antena 3". 12 abril 2020. Disponible en: https://www.antena3.com/noticias/sociedad/coronavirus-semejanzas-y-diferencias-con-la-gripe-espanola-de-1918_202004125e92d2d7b26be5000127f097.html?ps=ps:sour-indigitall
7. Álef Libera el Conocimiento, ed. Carl Flügge y las gotas de saliva que se expulsan al hablar. Publicado el 11 de octubre de 2013. Consultado el 26 de marzo de 2020.Disponible en: http://alef.mx/carl-flugge-y-las-gotas-de-saliva-que-se-expulsan-al-hablar/
8. Wu Z, Yang XL, Wang XG, Hu B, Zhang L, Zhang W, et al. Pneumonia outbreak associated with a new coronavirus of probable bat origin. Nature. 2020; 579, 12 Mar: 270. Available in: https://doi. org/10.1038/s41586-020-2012-7).
9. Sharmila D. Travel restrictions hampering COVID-19 response. The Lancet: 2020; 395(25): 1331- 32. DOI: https://doi. org/10.1016/S0140-6736 (20) 30967-3.
10. Layne SP, Hyman JM, Morens DM, Taubenberger JK. New coronavirus outbreak: Framing questions for pandemic prevention. Sci Trans Med 2020;12, eabb1469. DOI: 10.1126/scitranslmed.abb1469
11. Kraemer MUG, et al. The effect of human mobility and control measures on the COVID-19 epidemic in China, Science 10.1126/science.abb4218 (2020), published on line March 25, 2020; http://science.sciencemag.org/content/early/2020/03/25/science.abb4218.
12. Emergencias Sanitarias de la Organización Mundial de la Salud. OMS advierte que el SARS-Cov2 tiene el potencial de convertirse en un virus endémico y no irse nunca. Redacción Digital | internet@granma.cu15 de mayo de 2020.
13. Ministerio de Salud Pública. Partes Diarios oficiales de la COVID-19, Cuba. Disponibles en: https://temas.sld.cu/coronavirus/covid-19/
14. Nota informativa sobre el nuevo coronavirus: primeros casos confirmados en Cuba. En: Actualización epidemiológica, COVID-19, Nota informativa del MINSAP. mar 11th, 2020. Disponible en: https://temas.sld.cu/coronavirus/covid-19/.
15. Beldarraín Chaple E, Alfonso Sánchez IR, I Morales Suárez I, Durán García F. Primer acercamiento histórico epidemiológico a la COVID-19 en Cuba. Anales de la Academia de Ciencias de Cuba 2020; 10(2): especial COVID-19.
16. OPS/PLISA Plataforma de Información en Salud para las Américas: Casos reportados de dengue en las Américas. Washington, D.C.: OPS; 2020. Disponible en:

https://www.paho.org/data/index.php/es/temas/indicadores-dengue/dengue-nacional/9dengue-pais-ano.htm [Consultado el 15 de junio, 2020].

17. OPS/OMS. Prevención y control del dengue durante la pandemia de COVID-19.Washington,DC 20037, 2020. www.paho.org.
18. Guzmán MG, Gubler DJ, Izquierdo A, Martínez E, Halstead SB. Dengue infection. Nat Rev Dis Primers. 2016; 18(2):16055.
19. Bisset JA, Marquetti MC, Rodríguez MM. Contribución de estudios entomológicos sobre *Aedes aegypti y Aedesalbopictus*. Retrospectiva y Retos para su control en Cuba, 1981- 2016. Revista Cubana Medicina Tropical, 2017; 69:3.
20. Dick OB, San Martin JL, Montoya RH, del Diego J, Zambrano B, Dayan GH. Review: The history of dengue outbreaks. Amer J of Trop Med and Hyg. 2012; 87(4):584-593. doi:10.4269/ajtmh.2012.11-0770. Disponible en: http://ajtmh.org/content/journals/10.4269/ajtmh.2012.11-0770
21. Rigau-Pérez JG, Clark GG, Gubler DJ, Reiter P, Sanders EJ, et al. Dengue and dengue haemorrhagic fever. Lancet1998; 352: 971–977.
22. Ooi EE, Gubler DJ.nGlobal spread of epidemic dengue: the influence of environmental change. Future Virol.2009; 4: 571–580.
23. Johansson MA, Cummings DAT, Glass GE. Multiyear climate variability and dengue—El Niño Southern Oscillation, weather, and dengue incidence in Puerto Rico, Mexico, and Thailand: A longitudinal data analysis. PLoS Med 2009; 6: e1000168.
24. Tipayamongkholgul M, Fang CT, Klinchan S, Lui CM, King CC. Effects of the El Niño-Southern Oscillation on dengue epidemics in Thailand, 1996– 2005. 2009; BMC Public Health doi:10.1186/1471-2458-9-422.
25. Amarakoon D, Chen A, Rawlins S, Chadee D, Taylor M, et al. Dengue epidemics in the Caribbean-temperature indices to gauge the potential for onset of dengue. Mitig Adapt Strat Glob Change 2008;13: 341–357.
26. De Souza SS, da Silva IG, da Silva HHG. Associação entre incidência de dengue, pluviosidade e densidade larvária de *Aedes aegypti* no Estado de Goia´s. Rev Soc Bras Med Trop2010; 43: 152–155.
27. OPS /OMS. Actualización Epidemiológica: Dengue. 10 de junio de 2020, Washington, D.C. OPS/OMS. 2020. www.paho.org
28. 28.Saavedra-Velasco M, Chiara-Chile C, Pichardo-Rodríguez R, Grandes-Urbina A, Inga-Berrospi F. Co-infección entre dengue y COVID-19: Necesidad de abordaje en zonas endémicas. Rev Facultad de Ciencias Médicas de Córdoba 2020; 77:52-54. DOI: http://dx.org/10.31053/1853.0605.v77.n1.28031.

29. 29. OPS/OMS. Documento técnico para la implementación de intervenciones basados en escenarios operativos genéricos para el control de *Aedes aegypti*. Washington, D.C. 2019. ISBN: 978-92-75-32109-6 eI SBN: 978-92-75-32110-2. 50pp www.paho.org.
30. Barmark DH. Rol de la movilidad humana sobre epidemias de dengue en ciudades con clima templado (Buenos Aires). Tesis Doctoral. Facultad de Ciencias Naturales. Universidad de Buenos Aires. Biblioteca Lenoir, 2015.157pp.
31. 31. Martínez Vega RA, Danis Lozano R, Díaz Quijano FA, Velasco Hernández J, Santos Luna R, Román Pérez S, *et al*. Peridomestic infection as a determining factor of dengue transmission. PLoS Negl Trop Dis.2015;9 (12): e0004296.
32. Barrera R, Amador M, MacKay AJ. Population Dynamics of *Aedes aegypti* and Dengue as Influenced by Weather and Human Behavior in San Juan, Puerto Rico.PLoS Neglected Tropical Disease 2011; 5:12 e1378.
33. 33. Bisset J, Marquetti MC, Suárez S, Rodríguez M, Padmanaba H. Multicountry study of *Aedes aegypti* pupal productivity survey methodology, Finding and Recommendations. TDR/IRM/DEN/06.1.
34. Barrera R. Considerations for disrupting dengue virus transmission; ecology of A*edes aegypti* and current (non-genetic) methods of control. En: Adelman Z. *Genetic control of malaria and dengue*. London: Elsevier. Capítulo 2015;6:103-124.
35. Gutiérrez-Bugallo, G, Rodriguez-Roche R, Díaz G, Vazquez A, Alvarez M, Rodriguez M. *et al.* First record of natural vertical transmission of dengue virus in *Aedes aegypti* from Cuba. ActaTropica2017; **174;** 146 DOI: 10.1016/j.actatropica.2017.07.012
36. Espinosa Brito A. Reflexiones a propósito de la pandemia de COVID-19 [I]: del 18 de marzo al 2 de abril de 2020. Anales de la Academia de Ciencias de Cuba [revista en internet] 2020;10(2). [citado 14 abr 2020] [aprox. 21 p.] Disponible en: http://www.revistaccuba.sld.cu/index.php/revacc/article/view/765/797
37. Espinosa Brito A. COVID-19: rápida revisión general. Anales de la Academia de Ciencias de Cuba.2020; 10(2) especial COVID-19.https://orcid.org/0000-0003-0746-9349.
38. Marquetti Fernández MC, Bisset Marquetti A. Surveillance of *Aedes aegypti* (Diptera:Culicidae) and COVID-19 in Cuba. General Considerations. Open J. Trop Med.2020; 4(1): 020-022. DOI: https://dx.doi.org/10.17352/ojtm.000015.
39. Ten Bosch QA, Clapham HE, Lambrechts L, Duong V, Buchy P, Althouse BM, *et al.* Contributions from the silent majority dominate dengue virus transmission. PLoSPathog.2018; 3: 14 (5): e1006965.

40. Gómez Dantés H, San Martín JL, Danis Lozano R, Manrique Saide P, Grupo de Dengue Integrated prevention and control strategy for dengue in Mesoamerica. Salud Pública Mex. 2011:53 (suppl 3): S349-S357.
41. Labrada Rodríguez R, Vázquez-Mojena Y, Velázquez- Pérez L. Transmisión asintomática y pre sintomática del SARS-CoV-2: la cara oculta de la COVID-19.Anales de la Academia de Ciencias de Cuba. 2020;10(2) especial COVID-19
42. MINSAP. Mesa Redonda. Ahora más que nunca resulta esencial no actuar con exceso de confianza. Comparecencia del Ministro de Salud Pública www.cubadebate.cu.