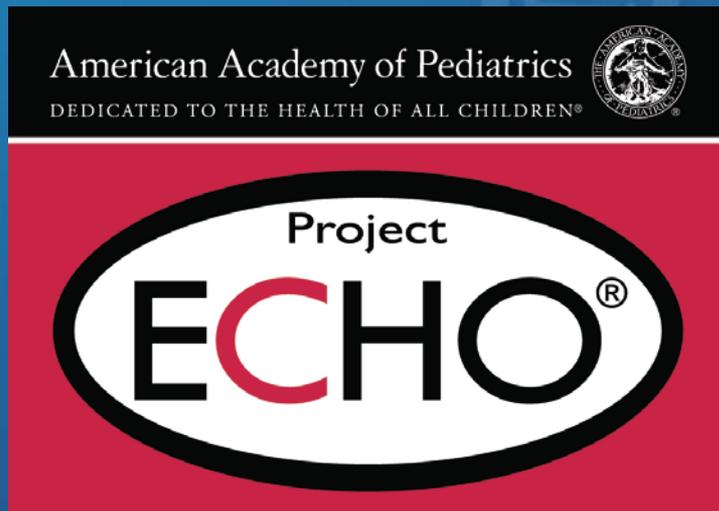


AAP ZIKA ECHO

(EXTENSION FOR COMMUNITY
HEALTHCARE OUTCOMES)



HOUSEKEEPING ITEMS

- For educational and quality improvement purposes, this ECHO session will be recorded
- Project ECHO® collects participation data for each ECHO session. This data allows Project ECHO to measure, analyze, and report on the ECHO movement's reach. Data is used in reports, on maps and visualizations, for research, for communications and surveys, for data quality assurance activities, and for decision-making related to new initiatives.
- To protect patient privacy, please do not provide any (PHI) protected health information.
- Please mute your microphone when not speaking. If you have video capability, please enable it.
- There is a chat function in Zoom that may be used to send messages to the group. For IT help, please chat to the AAP Admin and we will assist you.



ACKNOWLEDGMENTS

This project is supported by the Maternal and Child Health Bureau, Health Resources and Services Administration (HRSA) of the U.S. Department of Health and Human Services (HHS) under grant number U43MC09134



Hearing Loss, Auditory and Communication Disorders in Infants Affected by Zika Virus

Soami Santiago de Snyder, PhD, FAAA, CCC-A
Professor of Audiology and Hearing Science
Medical Sciences Campus, University of Puerto Rico

Presented June 12, 2018

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN®



LEARNING OBJECTIVES

- Review recommendations related to hearing screening and management for infants and children infected with Zika virus
- Understand possible etiologies of hearing loss and communication disorders in infants infected with Zika virus
- Learn about experiences in Puerto Rico in regard to management of infants with hearing loss related to Zika virus infection



INTRODUCTION

- Pediatric patients infected with Zika virus are at risk of birth defects including inner ear problems and communication delay.
- The American Academy of Audiology warns that infants contracting the virus through infected mothers might have absent or poorly functioning hearing at birth, or develop hearing loss at a later time.

<https://www.audiology.org/news/zika-virus-disease-outbreak-and-infant-hearing-loss>



REVIEW OF CDC HEARING SCREENING RECOMMENDATIONS

For infants with findings consistent with CZS and/or infants with lab evidence of maternal zika virus infection:

- All newborns should receive a hearing screen at birth, preferably with automated auditory brainstem response
- Automated ABR by 1 month of age if newborn hearing screen passed but performed with otoacoustic emission (OAE) methodology
- As a change from the previous guidance, a diagnostic ABR is no longer recommended at age 4–6 months for infants who passed the initial hearing screen with automated ABR because of the absence of data suggesting delayed-onset hearing loss in infants with congenital Zika virus infection.

<https://www.cdc.gov/pregnancy/zika/testing-follow-up/evaluation-testing.html>

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN®



LITERATURE REVIEW

- Brazilian retrospective study of hearing assessments in 70 infants aged 0-10 months with microcephaly and lab evidence of Zika virus infection:
 - 5 infants (7.1%) had sensorineural hearing loss
 - 4 of 69 (5.8%) when one infant with a potential other cause was excluded
- Conclusion: Congenital Zika virus infection should be considered a risk factor for hearing loss

Leal MC, Muniz LF, Ferreira TS, et al. Hearing Loss in Infants with Microcephaly and Evidence of Congenital Zika Virus Infection — Brazil, November 2015–May 2016. *MMWR Morb Mortal Wkly Rep* 2016;65:917–919. DOI: <http://dx.doi.org/10.15585/mmwr.mm6534e3>.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN®



POSSIBLE ETIOLOGIES

- Some evidence points to calcifications in the brains of the infants, while other points to insufficient neurons or to eighth nerve damage.
 - In the Leal et al. 2016 Brazilian study, all Zika-infected babies who developed hearing loss developed a type associated with nerve damage.
- Tang et al. revealed that the Zika virus tends to target developing brain cells, such as progenitor cells in the fetus.
- Garcez et al show that Zika virus targets human brain cells, reducing viability and growth as neurospheres and brain organoids.

Tang H, Hammack C, Ogden SC, et al. (2016). Zika Virus Infects Human Cortical Neural Progenitors and Attenuates Their Growth. *Cell Stem Cell*. S1934-5909(16) 00106-5. <http://dx.doi.org/10.1016/j.stem.2016.02.016>.

Garcez PP, et al. (2016) Zika Virus Impairs Growth in Human Neurospheres and Brain Organoids. *Science*. Vol 352, Issue 6287, pp 816-18. <http://dx.doi.org/10.1126/science.aaf6116>.



ZIKA ASSOCIATION TO COMMUNICATION AND AUDITORY PROCESSING DISORDERS

- Whitehouse et al (2012) found an association between smaller head circumference and language disorders.
 - Consider monitoring cases for language development, cognitive skills and auditory processing disorders in order to intervene appropriately.

Whitehouse, AJ, Zubrick, SR, Blair, E, Newnham, JP, and Hickey, M. Fetal head circumference growth in children with specific language impairment. Arch Dis Child. 2012; 97: 49–51.



THE PUERTO RICAN EXPERIENCE

- Although our results are preliminary we already have four cases diagnosed with hearing loss.
 - Three of those cases were normocephalic infants and one microcephalic.
 - All cases reported were infants born from mothers with confirmed Zika infection during pregnancy.



THE PUERTO RICAN EXPERIENCE

CASE 1

- **Normocephalic** infant who did not pass hearing screening in the left ear. Has a negative familial history for hearing loss. The health history is otherwise unremarkable.
- Eventually diagnosed with a unilateral sensorineural hearing loss in the left ear and normal hearing on the right.
- However is it important to point out that even when his physiological threshold in the right ear was 30 dB nHL the ABR waves waves I, III and V were resolved but delayed at 80 dB nHL resulting on prolonged inter-latencies I-V and III-V which supports the need of Auditory Processing follow-up.
- Had normal middle ear function.



THE PUERTO RICAN EXPERIENCE

CASE 2

- **Normocephalic** patient referred to audio-physiological battery due to maternal Zika infection and for failing neonatal hearing screening on both ears.
- Product of natural birth without complications. Negative familial history for hearing loss.

CLINICAL IMPRESSION:

- Audiological physiological battery results consistent with a bilateral sensorineural hearing loss; moderately-severe to severe from 1 to 4 K in the right ear and mild to severe on the left ear from 500 Hz to 4 K.
- Adequate middle ear function but cochlear dysfunction at the external hair cell level on both ears.
- No cochlear microphonic reversal registered consistent with negative results for Auditory Neuropathy.



THE PUERTO RICAN EXPERIENCE

CASE 3

- **Microcephalic** patient referred to audio-physiological battery due to maternal Zika infection and for failing neonatal hearing screening on the right ear.
- Product of natural birth without complications. Negative familial history for hearing loss.
- Audiological physiological battery results were consistent with an apparent mild unilateral sensorineural hearing loss in the right ear but normal peripheral hearing on left ear.
- Adequate middle ear function bilaterally.
- Cochlear dysfunction at the external hair cell level on the right ear but normal cochlear function on left.



THE PUERTO RICAN EXPERIENCE

CASE 4

- **Normocephalic** infant who did not pass hearing screening in the right ear. Has a negative familial history for hearing loss. Health history otherwise unremarkable.
- Audiological physiological battery results were consistent with normal peripheral hearing sensitivity in the left ear. Adequate middle ear and cochlear function at the external hair cell level on left ear were also registered.
- Right ear ABR results were consistent with a sensorineural hearing loss of a projected mild degree, which is consistent with cochlear dysfunction in the intermediate frequencies registered by the emissions in lieu of normal middle ear function.



PUERTO RICO ACTIONS

- The PR Department of Health has implemented a protocol following CDC guidelines (Administrative Order 360-2016), which includes:
 - Periodic developmental re-evaluations during the first three years of age, beginning at one month of age, re-assessing them at 6 and 18 months and then at 3 years.
- This supports one of WHO's long term objectives which states that appropriate research and development efforts should be intensified for Zika virus vaccines, diagnosis and intervention.

WHO statement on the first meeting of the International Health Regulations (2005) (HR 2005). Emergency Committee on Zika virus and observed increase in neurological disorders and neonatal malformations.

Available at: <http://www.who.int/mediacentre/news/statements/2016/1st-emergency-committee-zika/en/>.

Accessed July 6, 2017.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN®



NEXT STEPS IN PUERTO RICO

- Additional studies should be performed to understand the **incidence and prevalence of hearing loss** in pediatric patients with congenital Zika virus. Therefore it is our team's goal to conduct such research in Puerto Rico.
- Focus should also include **protocols to rule-out communication and auditory processing disorders**. It is important to follow-up not only the infants that are diagnosed with hearing loss but all Zika-infected babies and assess development in these areas.
- Working on developing a protocol that will cover all of the mentioned areas in our ZIKA-CHIPS project.



QUESTIONS?

