**AUDITORY OBJECTIVE MEASURES** 

# Overcoming Limitations to the Utilization of Extended-High Frequency Otoacoustic Emissions for Ototoxicity Monitoring SDSU National Institute on Deafness and Other Deafness and Other

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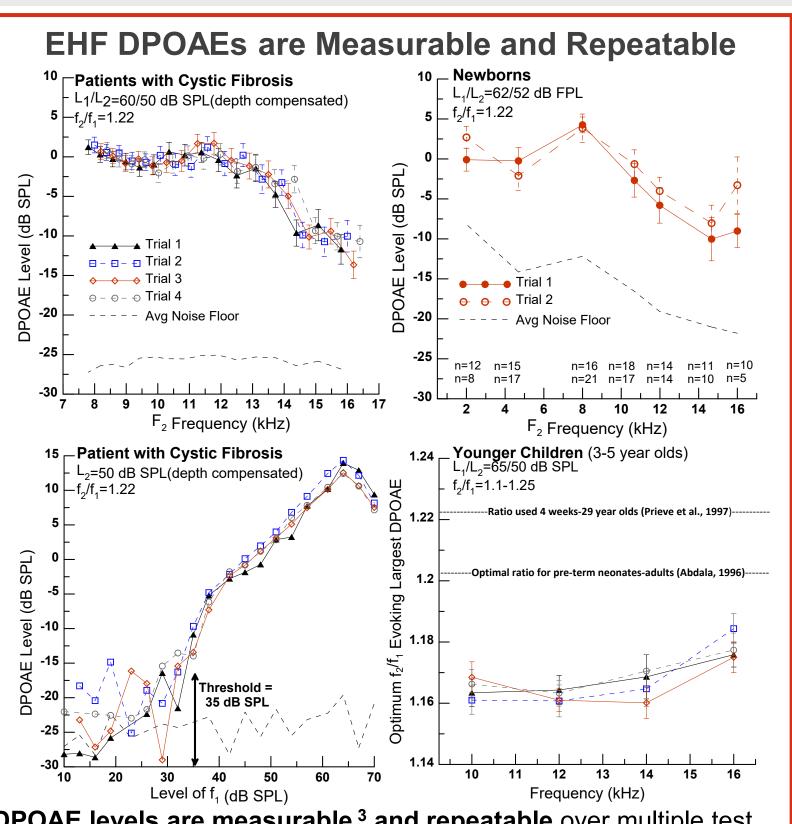
Aims

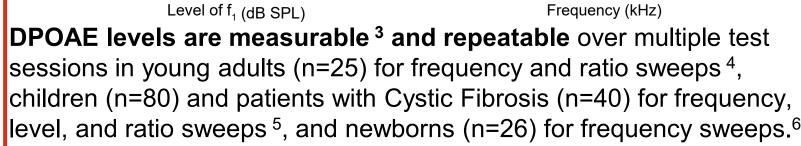
- Extended-high frequencies (>8 kHz; EHF) are sensitive to ototoxic exposures.<sup>1</sup>
- Measurement challenges, including ear canal acoustics and limited transducer bandwidths, exist for the measurement of distortion product otoacoustic emissions (DPOAEs).<sup>2</sup>
- Purpose: Characterize EHF DPOAEs and challenges to explore sensitivity to ototoxic exposures.

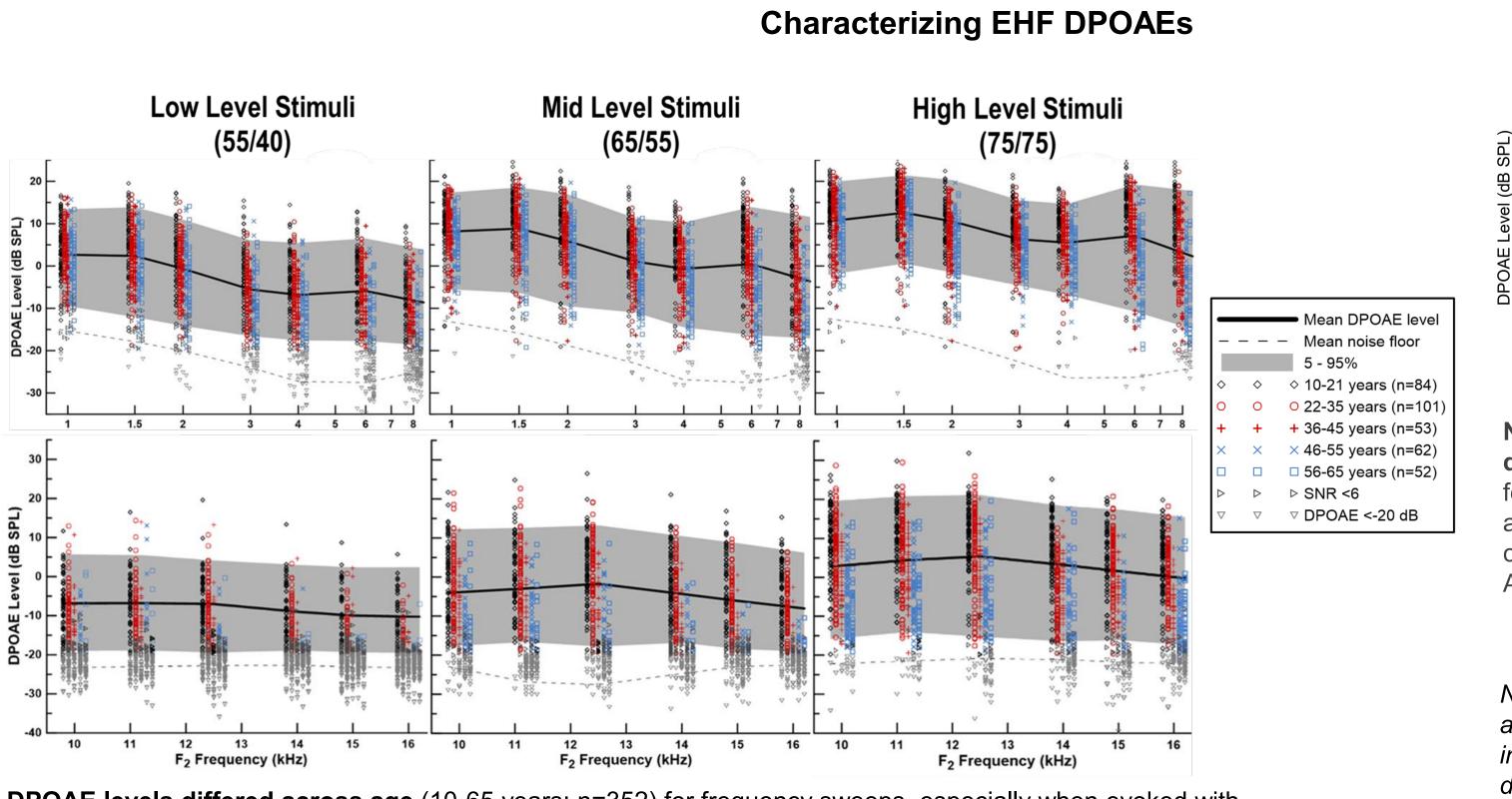
### Methods

- Ethnically diverse participant and patient groups from newborns through 65 years.
- DPOAEs measured from 10 to 16 kHz (EHFs) with varied stimulus parameters, frequencies, levels, and ratio. Traditional or advanced (depth-compensated simulator sound pressure level or SPL, forward pressure level or FPL) in-ear calibration methods utilized.

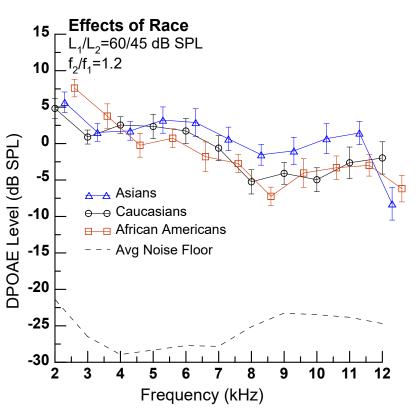
## Results





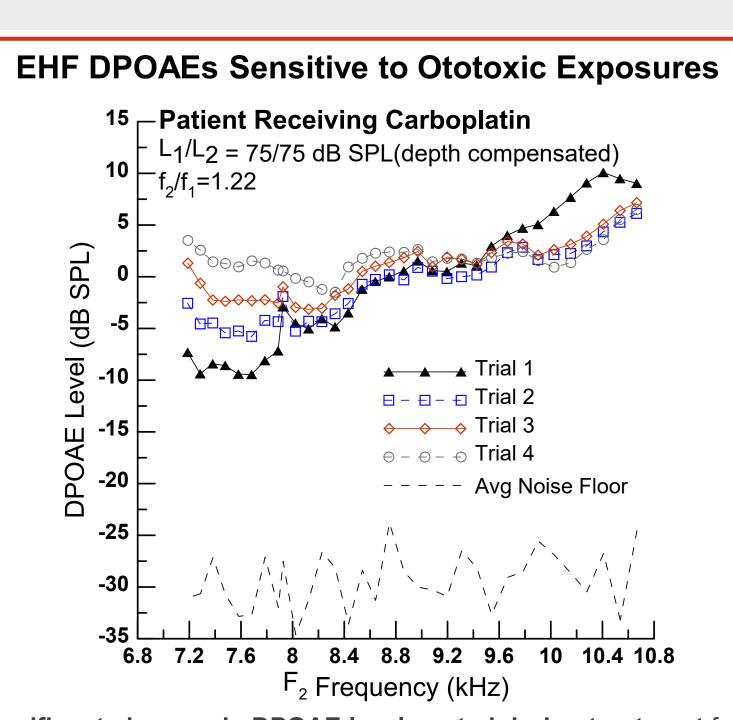


**DPOAE levels differed across age** (10-65 years; n=352) for frequency sweeps, especially when evoked with low-level stimuli ( $L_1/L_2$ =55/40 dB FPL) and EHFs.



No significant DPOAE level differences across race (n=60) noted for frequency sweeps, despite females and Asians having larger responses compared to Caucasian and African American participants.<sup>7</sup>

Note: DPOAE level differences noted across sex (n=37) with a significant interaction between sex and group delay values at conventional frequencies (1-8 kHz) and between sex and DPOAE levels at EHFs (9-15 kHz)<sup>8</sup>. Data not shown.



Significant changes in DPOAE levels noted during treatment for concentrated frequency, level, and ratio sweeps at the highest frequencies where responses could be measured pre-treatment in patients receiving cisplatin, carboplatin, or oxaliplatin (n=13). DPOAE changes noted prior to changes in behavioral hearing thresholds at the same frequencies. Decreased levels were noted at the highest frequencies tested, while increased levels could be noted at lower frequencies, as seen above.

# Interpretation/Conclusions

- Overcoming technical limitations has proven that EHF DPOAEs are measurable and repeatable across the lifespan, differ across age and can yield significant contributions to the audiological test battery, especially for those exposed to a variety of ototoxicants.
- EHF DPOAEs are a viable and critical tool for the earliest identification of cochlear damage from ototoxic exposures.

# References

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