

# Could a Simple Blood Test Detect Tinnitus?

## Serum Prestin as a Potential Blood Biomarker for Sound Induced Tinnitus



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### Introduction

Tinnitus is the perception of sound without any external auditory stimuli, often perceived as a "ringing" or "buzzing". It is believed to originate in the central auditory system and affects millions of people, particularly those exposed to loud noises like blasts, such as military personnel. The root cause of tinnitus remains unknown, and there are currently no definitive tests or treatments for it.

Prestin, a protein found in the outer hair cells of the cochlea, plays a vital role in hearing and sound amplification. Recent studies suggest that prestin levels in blood serum could potentially serve as a biomarker for various auditory disorders, such as tinnitus, providing insights into the health and function of cochlear outer hair cells. Based on these findings, this study hypothesizes that a decrease in prestin levels will be seen in mice with sound induced tinnitus.

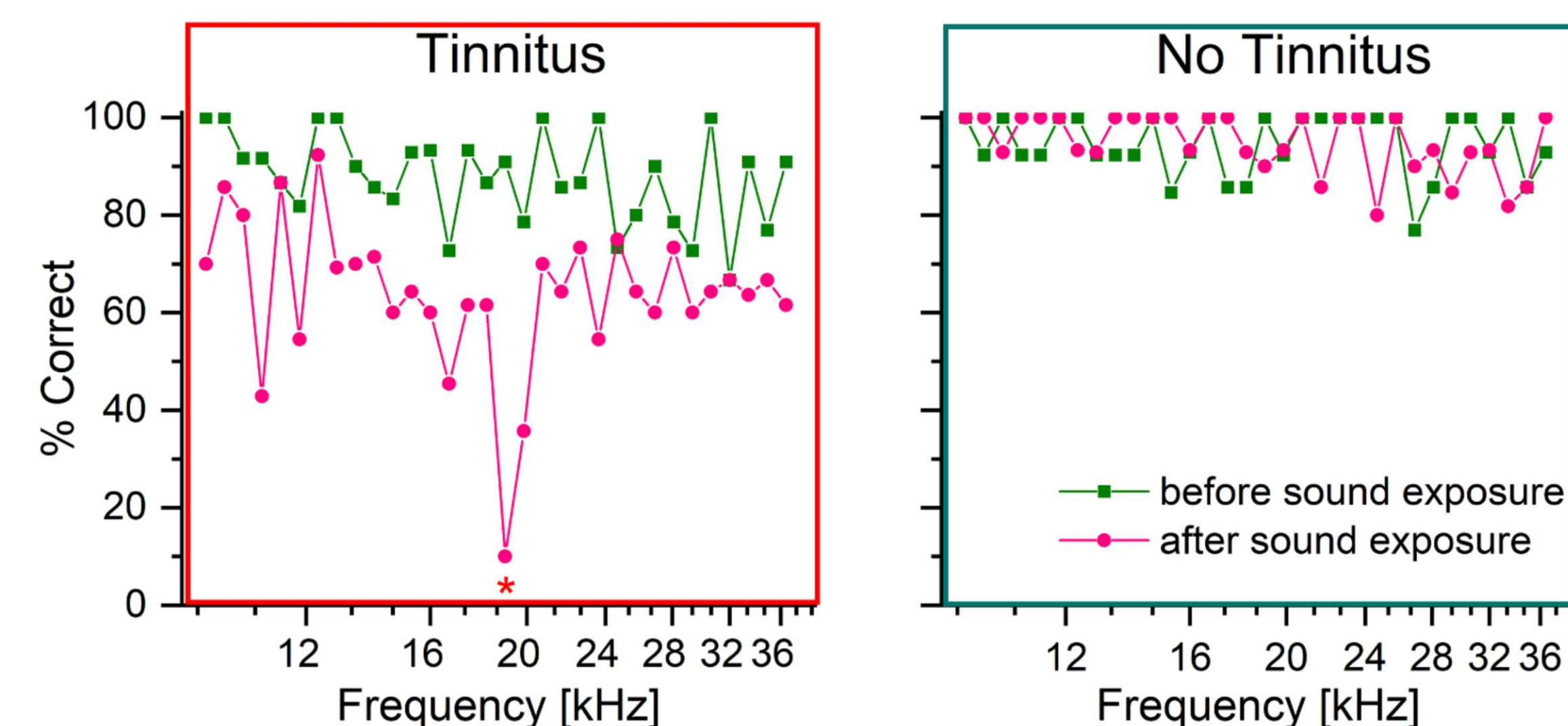
### Inducing Chronic Tinnitus



### Study Design

*CBA/CAJ mice of either sex*

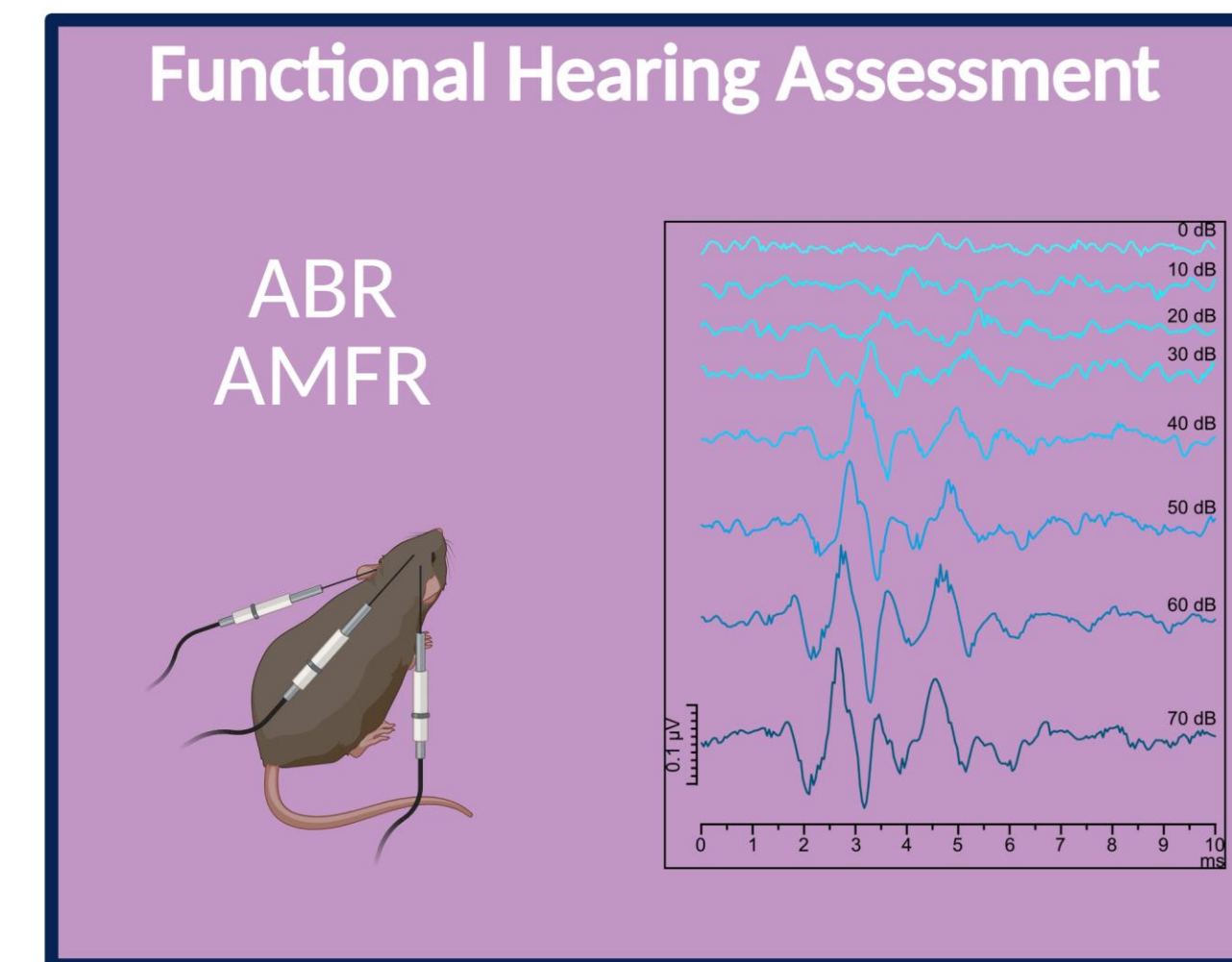
1. Mice only completing hearing test & being measured for prestin level (control 1)
2. Mice completing behavioral training & being measured for prestin level (control 2)
3. Mice completing behavioral training, sound exposure, tinnitus testing, and being measured for prestin level (tinnitus and non-tinnitus mice)



Frequency profile for an example mouse with tinnitus being tested in the AA paradigm (Figure 1. A), Frequency profile for an example mouse without tinnitus being tested in the AA paradigm (Figure 1. B).

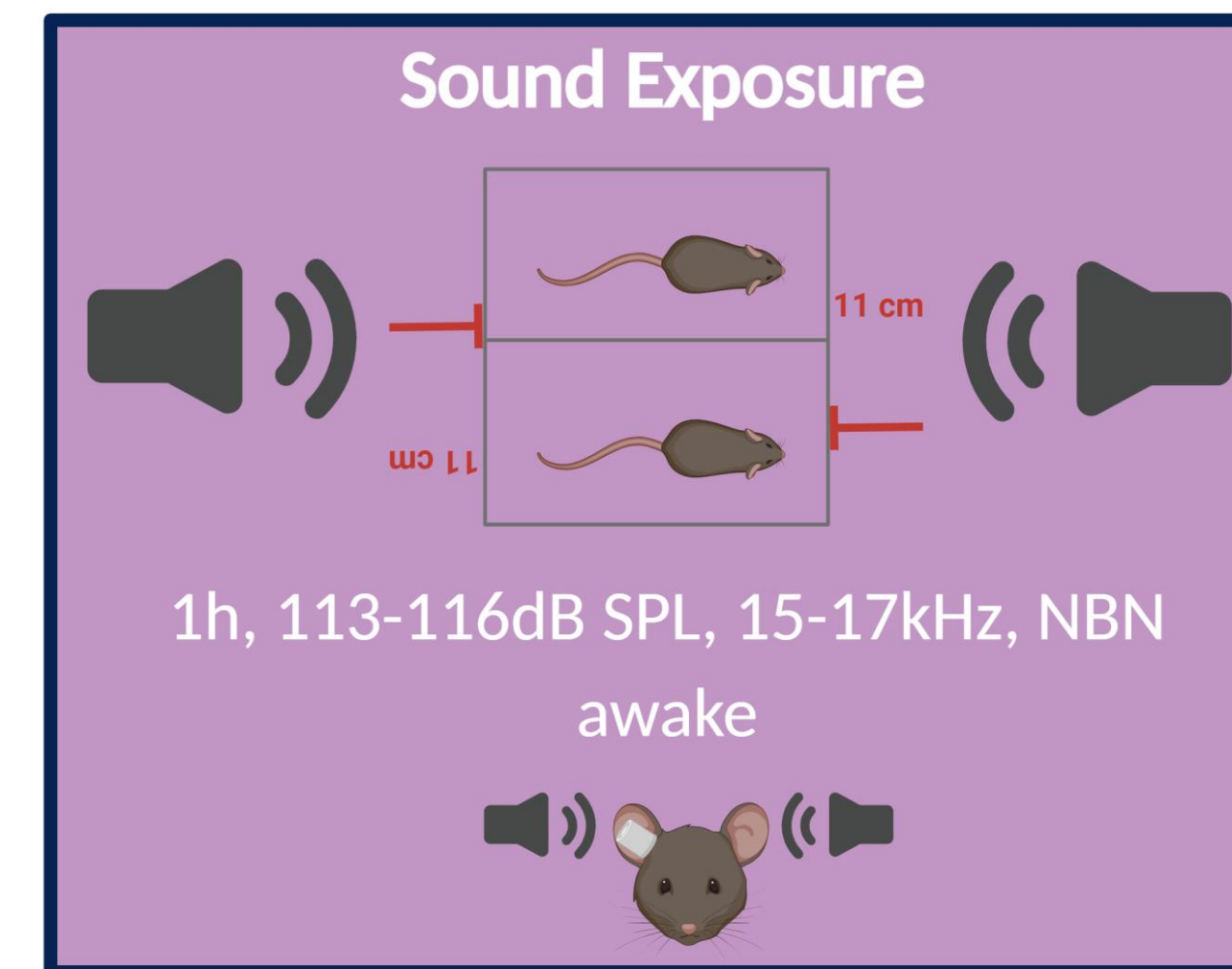
### Methods

1.



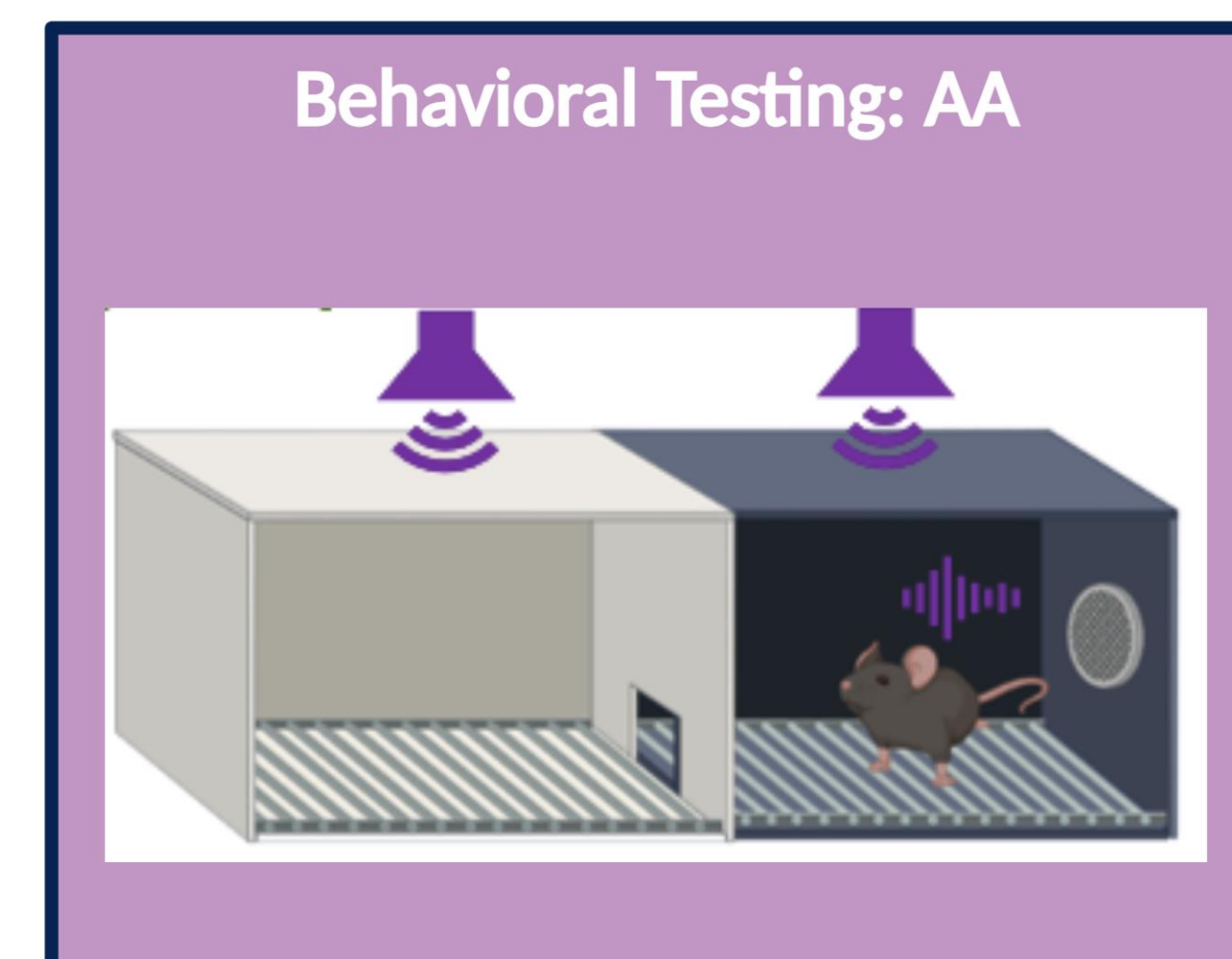
- Anesthesia: 90-100 mg/kg ketamine, 5-10 mg/kg xylazine
- Mice with poor hearing were excluded before behavioral testing
- Mice with bilateral hearing loss (HL) were excluded
- Evaluated single ear hearing thresholds post sound exposure

3.



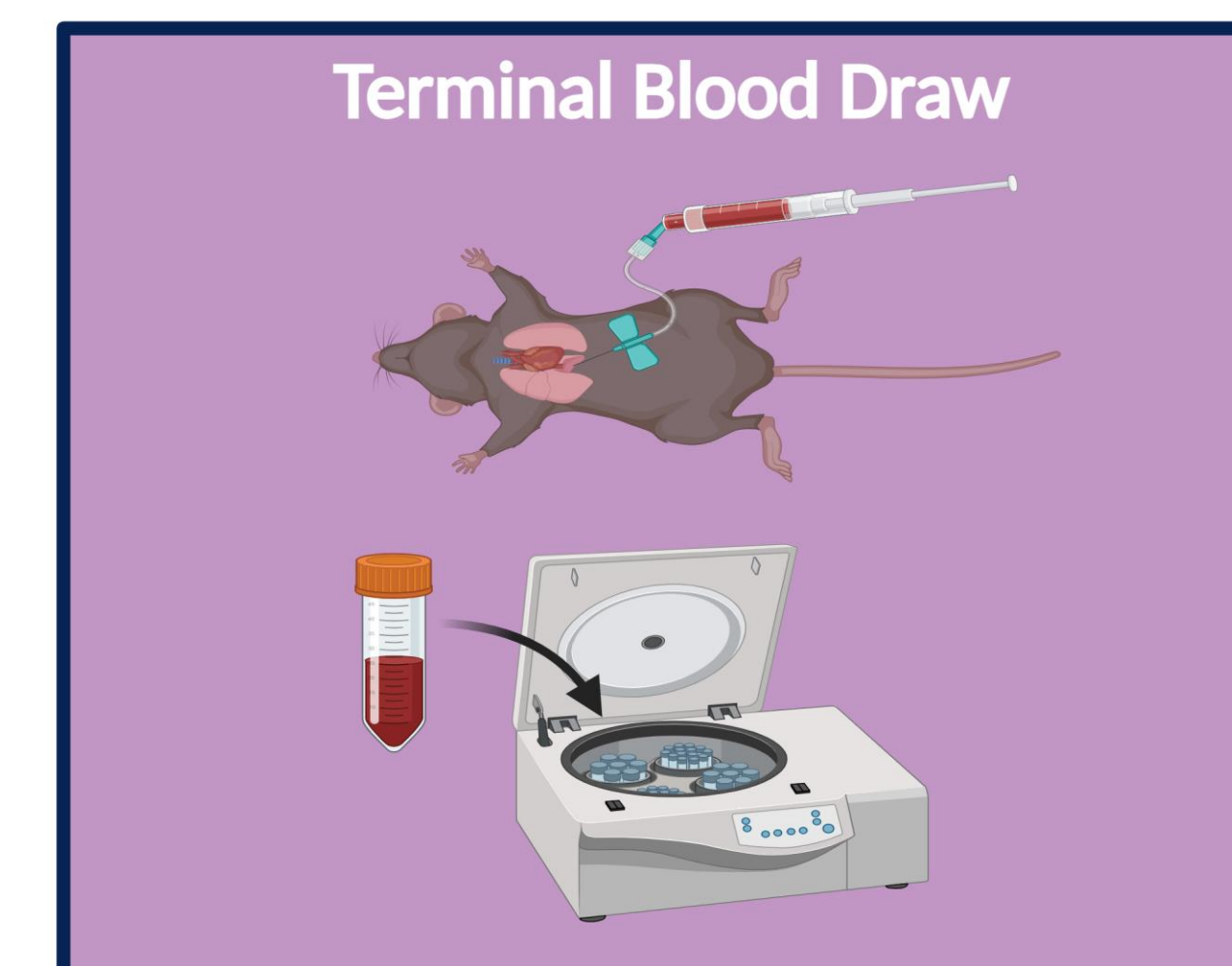
- Continuous narrow-band noise
- Mice were housed for 4-8 weeks post-sound exposure for tinnitus induction; no testing occurred during this period

2.



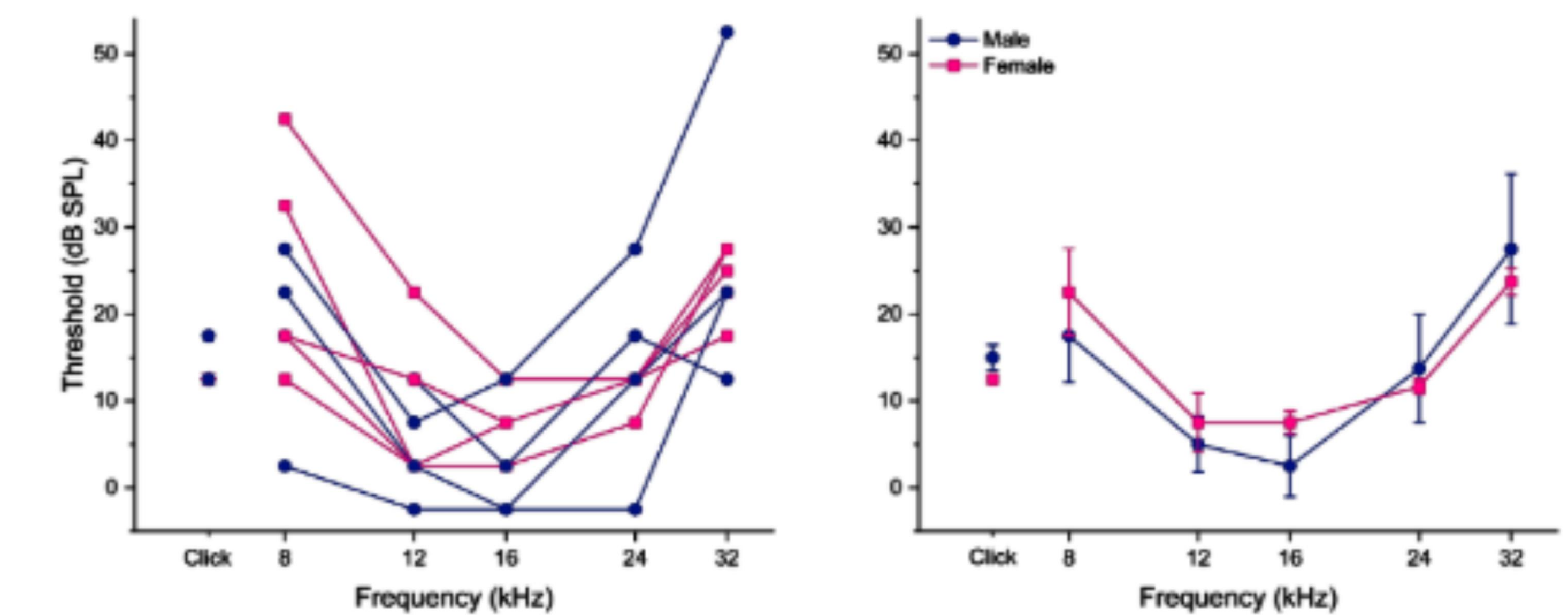
- Learned behavior paradigm (daily testing)
- Presentation of pure tones (8-32 kHz) preceding an aversive shock stimuli
- Had to learn that tone warns of imminent shock, and that silence was 'safe'
- Criteria for success: 75% avoidance for 3-4 consecutive training days; mice who failed to meet criteria were dropped from the study
- AA testing performed once or twice/week to distinguish tinnitus from non-tinnitus mice following sound exposure

4.

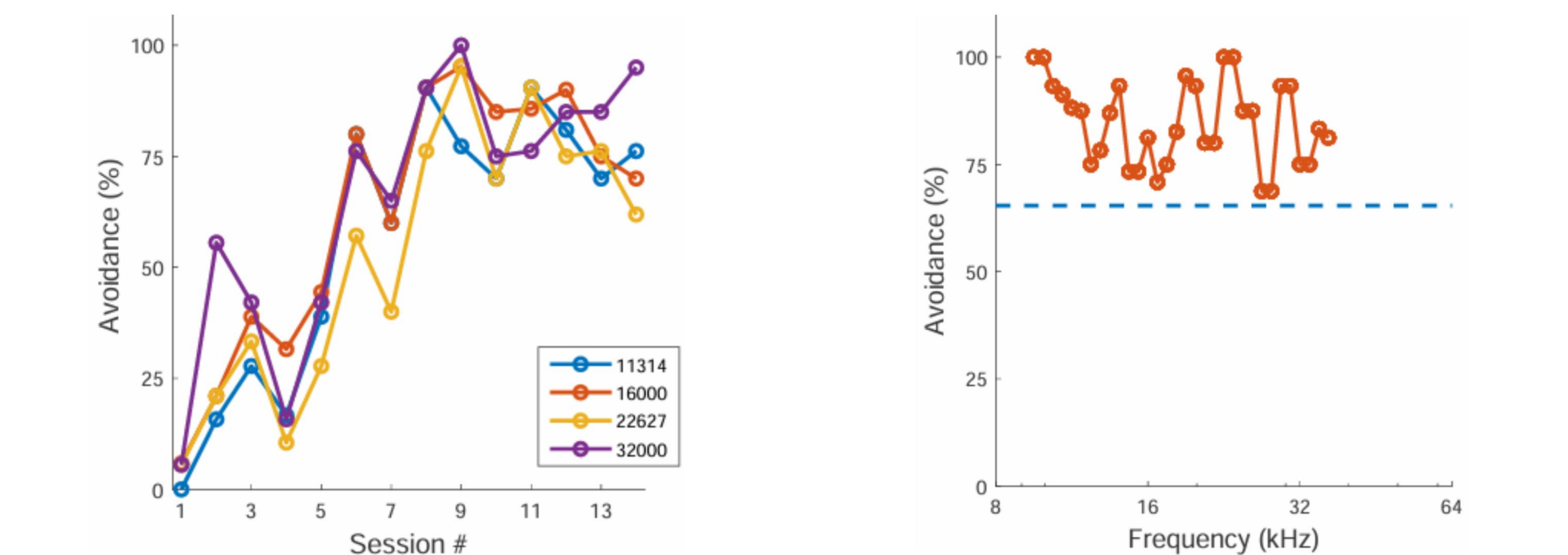


- Mice deeply anesthetized
- Cardial puncture performed to collect ~ 0.5-1 mL of blood
- Blood serum collected and stored at -70 °C until further processing
- Enzyme-linked Immunosorbent Assay (ELISA) kits will be utilized to measure prestin levels in the blood serum samples

### Preliminary Results

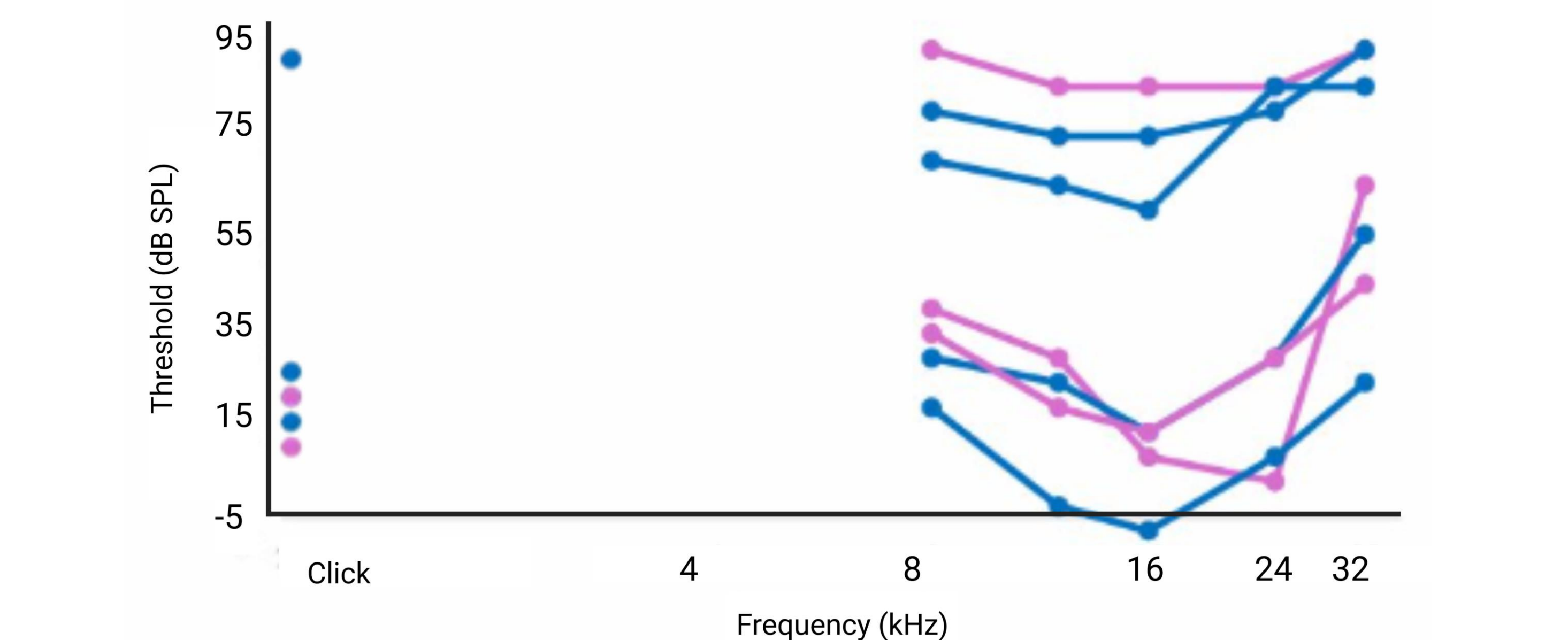


Audiograms for representative example mice utilizing ABR & AMFR prior to behavioral testing differentiated by sex (Figure 2. A), Mean and standard error of the mean for the audiograms differentiated by sex (Figure 2. B).



Overall training profile for representative example mouse at all frequencies presented at 70 dB and then at 60 dB SPL over 15 training sessions (Figure 3. A).

Frequency profile for representative example mouse in behavioral training at 60 dB SPL meeting training criteria (Figure 3. B).



Audiograms for representative example mice utilizing ABR & AMFR post sound exposure differentiated by sex (Figure 4 A).

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