# INVESTIGATING GENTAMICIN OTOTOXICITY IN GOLDFISH (*Carassius auratus*) USING LATERAL LINE-EVOKED POTENTIALS (LLEP)- A NOVEL TECHNIQUE

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OTOTOXICITY A NOVEL APPROACH

## Introduction

- Ototoxicity is defined as adverse reactions caused by pharmacological agents that lead to impairment of the inner ear and/or auditory nerve. This can consequently lead to cochlear and/or vestibular dysfunction.
- There are at least 700+ drugs that are known to be ototoxic (Bisht and Bist 2011). Although they may have ototoxic effects they are still very beneficial in treating potentially life-threatening conditions such as Tuberculosis (Kros and Steyger 2019)
- While hearing impairment is not a life-threatening condition it does impose negative impacts on the psychosocial and communication well-being of an individual (Wangchuck et al, 2021)

## Objective

- This research project examines the effect of a known ototoxic agent, gentamicin on the lateral line evoked potentials (LLEPs) generated by the neuromasts of adult goldfish (*Carassius auratus*).

## Methodology

Adult goldfish (*Carassius auratus*) were utilized in this investigation. The physiology of the lateral line in adult goldfish was studied using a novel method where a sound-proof rig around an aquatic tank recorded lateral line-evoked potentials (LLEPs). A reference electrode (2.0 mm exposed tip) was placed beneath the skin and between the eyes, while a recording electrode (1.5 mm exposed tip) was placed above the brainstem. The landmarks for electrode placement were predetermined by anatomical investigations. The lateral-line system was simulated using a mechanical vibrator producing stimuli at increasing voltages. Prior to LLEP acquisition, treated fish were subjected to a 0.002 or 0.003 percent gentamicin solution for four days.

## Results

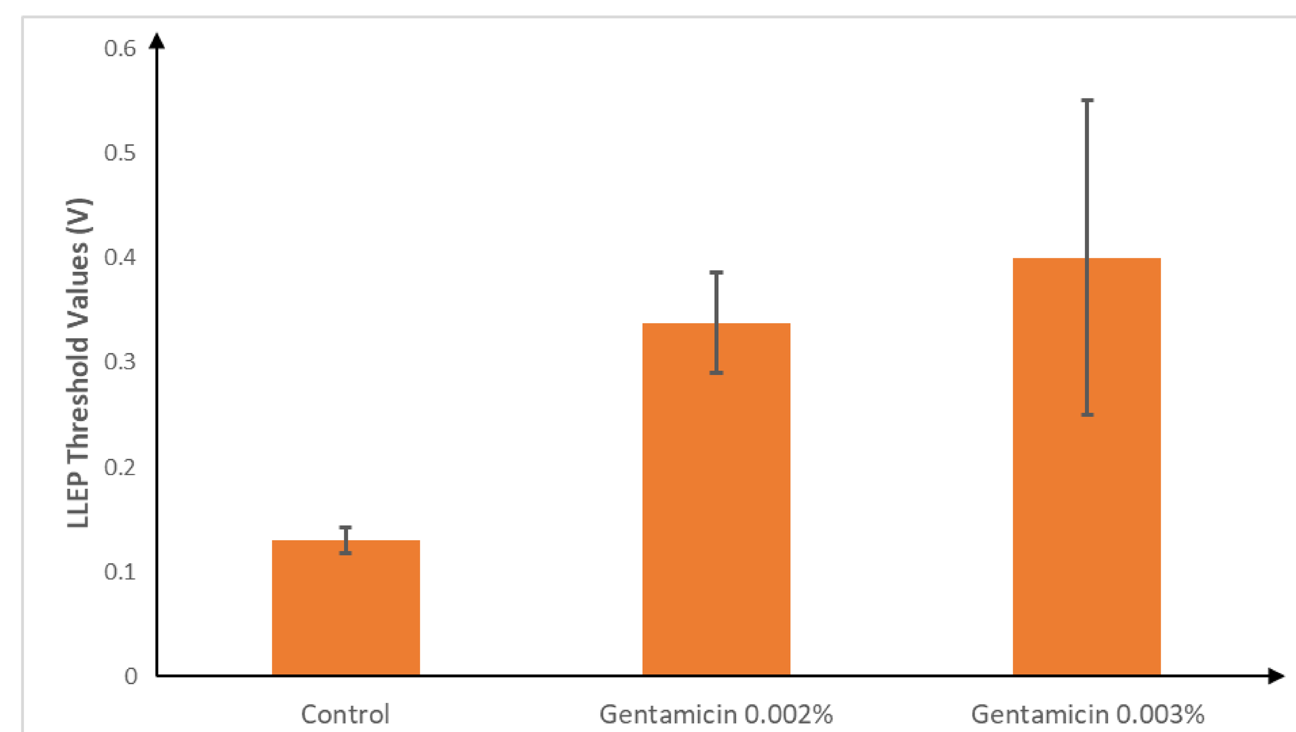


**Figure 1. Bar graph showing the average threshold and associated standard errors bars. Data are for control as well as treatment groups (gentamicin 0.002% and gentamicin 0.003%)**

- Goldfish treated with gentamicin 0.003% had a greater elevated average threshold value than those treated with gentamicin 0.002% as compared with the average threshold for control. (average threshold values: control= 0.13V, gentamicin 0.002% = 0.34V and gentamicin 0.003%= 0.4V)

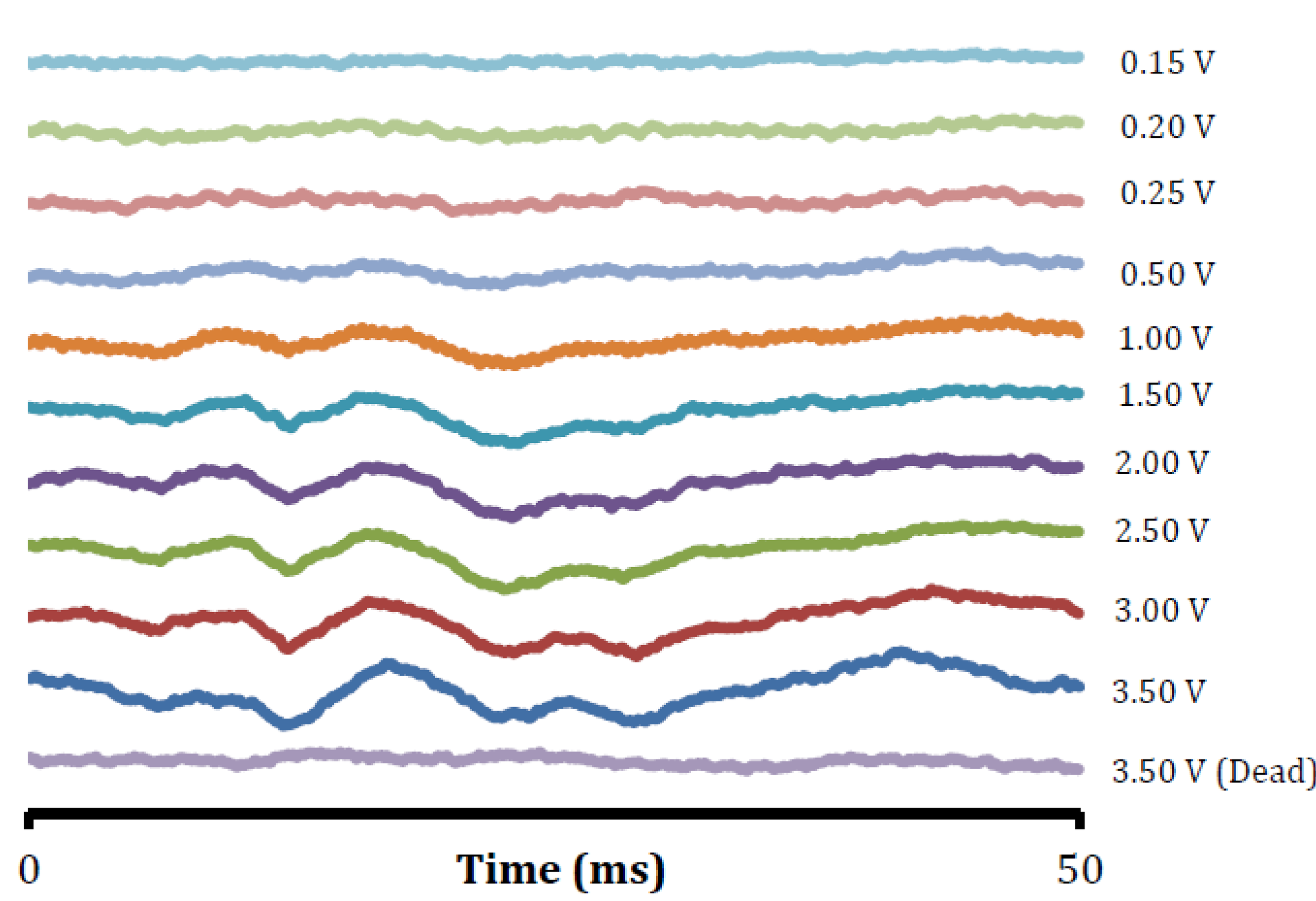


**Figure 2. showing sample suprathreshold LLEP traces**

## Discussion

- The main purpose of the project was to provide the proof of principle for a novel physiological technique for acquiring LLEPs. This was demonstrated successfully. The proof of principle was provided for the use of this tool in assessing ototoxicity as an ototoxic effect was observed in a physiologic way.
- This principle demonstrated how lateral line evoked potentials generated by the neuromasts were affected upon exposure to gentamicin.
- The general trend observed was that goldfish treated with 0.003% gentamicin required greater stimulation to produce a LLEP compared to those treated with 0.002% gentamicin. As such the LLEP threshold value was slightly more elevated in goldfish treated with 0.003% gentamicin than those treated with 0.002% gentamicin.
- This trend is seen as a result of greater neuromast destruction and reduced neuromast regeneration in goldfish treated with 0.003% gentamicin compared to those treated with 0.002% gentamicin.

## Conclusion

- The main purpose of the research project is to provide proof of principle for a novel physiologic technique that acquires lateral line evoked potentials. This project is used to assess and demonstrate the feasibility of a novel technique that explored the usefulness, and accuracy of the lateral line in the goldfish model in response to gentamicin treatment.
- The success demonstrated with this experimentation using the goldfish model suggests that using the more popular zebrafish model is quite feasible.

### References

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