Ototoxicity of a novel antimicrobial solution in a guinea pig model
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BACKGROUND

• Chronic otitis media (OM) is often treated with tympanostomy tube placement. But flares of OM may occur after tube placement—manifested by otorrhea—in up to 74% of patients.1
• Post-tube otitis media can be treated with antibiotic ear drops. However, quinolone ear drops have been associated with an increased risk of permanent tympanic membrane (TM) perforations.2,3
• Bacterial biofilms have also been shown to play a role in middle ear infections that are resistant to antibiotic treatment after ear tube placement.4
• Because of this resistance and the adverse impact of quinolones on TMs, other treatment options are needed.

OBJECTIVE

To examine the impact of a novel antimicrobial solution on hearing loss and vestibular function in guinea pigs, and to evaluate its potential use in the treatment of recalcitrant otitis media.

METHODS

• Institutional Animal Care and Use Committee approval was obtained (#201808827).
• All procedures conform to the National Institutes of Health Guidelines for the Care and Use of Laboratory Animals.
• Guinea pigs were housed at the Animal Care Facility at the University of Florida and had free access to water and commercial guinea pig diet supplemented with fresh fruit, vegetables and Timothy hay.

Study Design:

Hearing tests were conducted as previously described.5

Data Analysis: Hearing thresholds were the primary outcome measure. The hearing thresholds of MEW and control ears were compared using a two-tailed t-test (JMP™Pro 13, SAS Institute Inc., Cary, NC). Significance levels were determined at p<0.05.

RESULTS

Figure 1. Average threshold shifts in guinea pigs (A) 1-week and (B) 8-week after a single injection of 0.2mL of Next Science MEW or saline (control). Bars represent standard error. Negative values indicate that the mean post-injection hearing thresholds were better than the mean baseline thresholds.

Figure 2. Images of guinea pigs’ bulla 8-week after a single injection of 0.2mL of Next Science MEW or saline (control). Dark spots were seen in the MEW-injected ears (indicated by arrows).

• Hearing thresholds were not different between ears that received MEW and saline-treated control ears at 1 and 8 weeks after treatment (p>0.05).
• One animal showed a transient head tilt toward the MEW-injected ear only during anesthesia recovery.
• Middle ear pathology resolved at 8 weeks, but 4 of 8 guinea pigs had dark spots in the bulla (p=0.02).
• SEM revealed no differences in OHC loss in the cochleas of MEW and control ears.

CONCLUSION

A single dose exposure to Next Science™ Middle Ear Wash caused transient middle ear inflammation, but no evidence of inner ear toxicity. The ideal middle ear wash will be defined by its ability to disrupt pathogenic biofilms and the extent of collateral damage to the host tissues. The current formulation looks promising in this regard.

REFERENCES


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