

<b>SBIR 06.2 PHASE I - AWARD DETAILS</b>	
<b>ORGANIZATION</b>	MRMC
<b>TOPIC NUMBER</b>	A06-154
<b>CONTRACT NUMBER</b>	
<b>YEAR OF AWARD</b>	
<b>AWARD START DATE</b>	
<b>AWARD COMPLETION DATE</b>	
<b>PROPOSAL NUMBER</b>	A062-154-0708
<b>TITLE</b>	Pharmacological Strategies for Prevention and Treatment of Noise-Induced Hearing Loss
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<b>KEYWORDS</b>	Noise-induced hearing loss, ear, otoprotectant, physiologically based pharmacokinetics, computational fluid dynamics, drug delivery
<b>ABSTRACT</b>	Noise-induced hearing loss (NIHL) is a tremendous burden to the military. The sense of hearing is not only considered the most important survival sense for both the soldier, the monetary cost of NIHL amounts to approximately \$1 billion per year in disability payments. We propose a hybrid computer model integrating an anatomically accurate three-dimensional computational fluid dynamics model of the middle and inner ears and a whole-body physiologically-based pharmacokinetics (PBPK) model. The whole-body PBPK model consists of organ compartmental models interconnected by major blood vessels. Because our approach is physiologically-based, animal (chinchilla) data can be used for calibration and prediction of human pharmacokinetics (PK). As the drug is metabolized and excreted by the organ models, systemic circulation carrying the drug perfuses the middle and inner ears via the anatomically relevant blood vessels. The drug then diffuses throughout the cochlea as it partitions into the different cochlear tissue and lymph spaces, while simultaneously being cleared via metabolism and venous return routes. With this experimentally validated approach we can predict not only cochlear spatiotemporal drug distributions, but, with the same model, simulate systemic or local drug delivery methods.
<b>BENEFITS</b>	Military personnel will greatly benefit from a fast, safe and efficient therapy to protect and minimize hearing loss from noise exposure. Civilians are also susceptible to NIHL. Occupational and recreational noise exposure accounts for the third most prevalent health complaint in older adults following arthritis and stroke. Nearly 31 million of all non-institutionalized adults in the U.S. alone have trouble hearing. The potential outcome of this project will therefore also

	have a very large civilian market.
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