Column E Explanation

Registration Number: Certificate Number 93-F-008, Customer Number 1202

Number and Species of Animals: 70 Chinchillas

Explanation of Procedure Causing Possible Distress: Individual housing in an unfamiliar environment and exposure of chinchillas to 4kHz octave band noise at 105 dB sound pressure level for a duration of 6 hours or an impulse noise of 155 dB (75 repetitions at 1 impulse/sec.). This procedure is considered non-painful but may induce distress. This exposure induces cochlear hair cell loss and a significant hearing threshold shift. This model is utilized to test various means to protect against cochlear hair cell loss and to potentially reverse cochlear hair cell loss.

Scientific Justification for Unrelieved Potential Distress: The potential distress of individual housing in an unfamiliar environment is being relieved through a habituation procedure for our experimental animals. This leaves the actual noise exposure as our only unrelieved potential for distress as defined by the AWA. Alleviation of this potential distress through the use of anesthetics or analgesics is scientifically contraindicated for the following reasons.

General Considerations

a. Generalized anesthesia for a six-hour duration would be medically contraindicated and in itself leads to a painful and distressful recover period.

b. Animal models without anesthesia mimics human subjects under noise exposure better than the anesthetized animal.

c. Noise exposure should try to replicate the real world as much as possible; we typically are not exposed to noise in an anesthetized state. The administration of drugs to sound exposed animal's effects several important aspects of sound transduction in the inner ear and electrophysiological measurements of inner ear function. Because these confounded results from drugged animals cannot be extended to human models, these drugged models are not used in hearing research. In the course of the Medline literature review going back over 20 years some 5500 abstracts involving loud sound exposure, only about a dozen utilized anesthetized animals and in those cases the focus of the studies was to investigate the effects of those drugs on cochlear electrophysiological measurements.

d. Noise exposures in normal animals always result in significant variations in threshold shifts. These variations may result from a variety of factors such as, overactive middle ear muscles, efferent feedback, and state of the animal. Now there may be evidence that a drugged animal gives larger and more consistent threshold shifts because of the elimination of the aforementioned variables.[1]

Specific Considerations

a. Sodium pento-barbital has been shown to have a significant effect on total middle ear impedance and on the shape of the tympanograms.[2]

Column E Explanation cont.

b. The use of ketamine causes significant increases in distortion-product otoacoustic emissions. This result indicates that tonic activity levels in the cochlear efferents are reduced by the anesthetic effects, which could lead to greater damage due to loud sound exposure.[3,4]

c. Isoflurane significantly attenuates auditory steady state response (which is a response of the brain to auditory stimuli) in a dose dependant manner.[5]

References:

1) Popelar, J., et al. Effect of noise on auditory evoked responses in awake guinea pigs. Hearing Research. 26(3):239-47, 1987

2) Eames, B.L., et al. The role of the middle ear in acoustic trauma from impulses. Laryngoscope. 85(9): 1582-92, 1975

3) Harel, N., et al. The effects of anesthesia on otoacoustic emissions. Hearing Research. 110(12): 25-33

4) Puel, Jean-Luc, et al. Perspectives in inner ear pharmacology and clinical applications. In Cochlear pharmacology and noise trauma. Eds. D. Prasher and B. Canlon. NRN Publications. London; 1998

5) Plourde, G., et al. the effect of isoflurane on the steady state response and on consciousness in human volunteers. Anesthesiology. 89(4): 844-51, 1998

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