Auditory Nerve Response in Normal and Sound Exposed Chicken

[1] Mangilal Maida, [2] Dr. G. D. Sharma
[1]Ph.D Scholar, P.M.B. Gujarati Science College, Indore,
[2]Professor & Head Department of Zoology, P.M.B. Gujarati Science College, Indore.

Abstract

Intense sound exposed ears destroy the sensory hair cells and sensitivity of the auditory neurons. This temporary defect on the sensory neurons and particular frequency selectivity are unclear. The current study organizes the stimulated activity of the auditory neurons units to describe the normal and sound exposed neurons, this sensitivity is compared between normal and sound exposed chicken. Sensitivity curves, spikes discharge rate and coefficient variation were measured in both animals. The frequency tuning curves of sound exposed ears show slightly less frequency selectivity than the normal ears over all stimulus frequency. Finally, the results indicated that the high sound intensity harmful for frequency selectivity by auditory neurons and other sensory epithelium in cochlear duct.

Index Terms: Sensory Epithelium, Spikes Discharge, Auditory Neurons, Coefficient Variation, Frequency Selectivity

Introduction

There are different mechanism involve to particular frequency selectivity in all animals. The first is wave traveling along the cochlear duct; the properties of the sound wave have been observed in chicken and pigeon (Von Bekesy 1960; Gummar et al.1987; Richter 2001). The current study is driven by the observation of auditory nerve defect with accompanying morpho-physiological changes following acute sound exposure. The nature of the morph-physiological defects has been described elsewhere (Cotanche 1999; Smolders 1999).

Materials and Methods

Chicken were classified into control and sound exposed groups, after 5 days old. The sound exposed animals were over stimulated with a 32 to 80 kHz frequency at 60dB SPL for 12 hours per days, until 10 days. The experimental materials and methods used in the present study have been described by Henson and Pollak 1972. Each chicken was anesthetized from the effect of inhaled chloroform in anesthesia induction chamber (AIC), after some time 60 mg/kg ketamine was administered intramuscularly. Glass insulated microelectrode (12 - 18MΩ) filled with 2 M KCl was connected to driver and insert into neural units through scala tympani. Neural sensitivity detected by microelectrode were amplified by amplifier and sent to the signals analyzer oscilloscope (Oscilloscope Hantek 6022BE)

Results

We report comparative data from 5 control and 5 sound exposed neural units, whose threshold of characteristics frequency were no higher than around 18 dB. In order to plotting the FTCs over wide range of stimulus frequencies, it was necessary to the analysis on neural units with FTCs having the lowest thresholds of CFs. All neural units may contribute to the CFs with FTCs between 0.5 and 1.5 kHz.
Figure 1 shows FTCs plotted from neural units control animals, the vertical line in each FTCs indicate the selective frequency. Nerve sensitivity systematically decreases on higher to lower stimulus frequencies. In all FTCs, the selective frequency at the peak of neural discharge is dissimilar in both groups of animals.

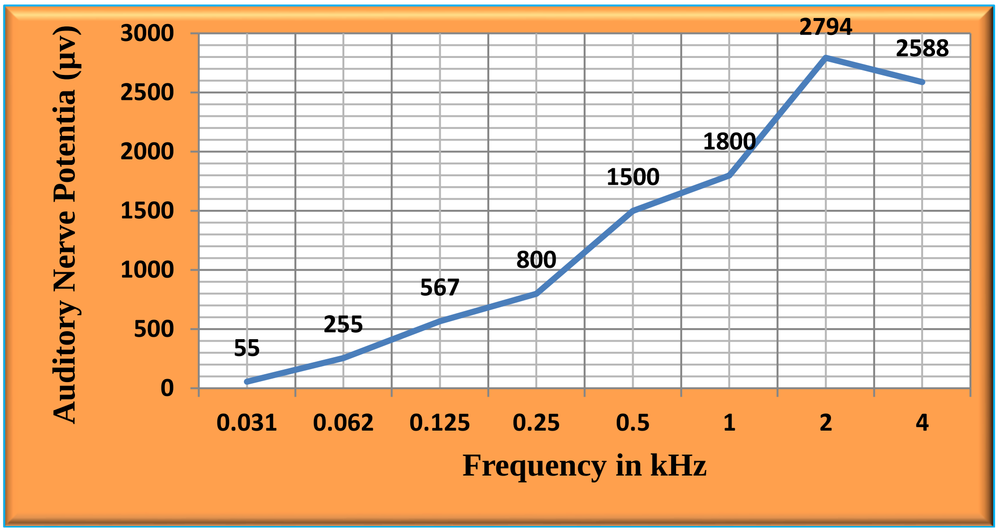

Figure-1 show the Auditory nerve potential in control chicken, response properties can be determined in this curve over any stimulus frequencies.

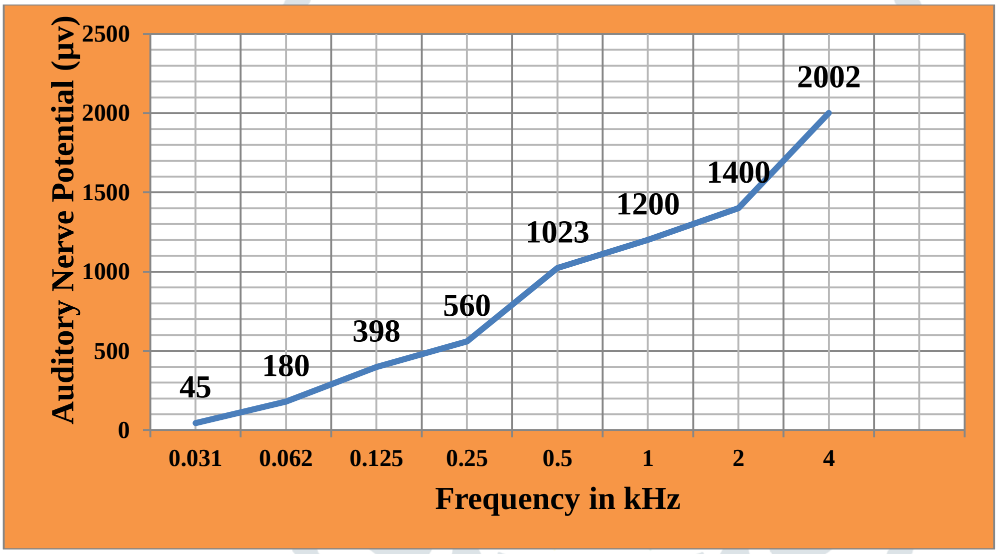

Figure-2 show the Auditory nerve potential in sound exposed chicken, response properties of this auditory nerve less than control animals

Discussion

All chickens examined in sound attenuation laboratory after intense sound exposure reveal same response lesion (Adler and Saunders 1995), but this response properties are not similar to the control chickens. The frequency distribution revealed common response properties in the chickens and starling.

Our results show that FTCs of the exposed and control animals followed orderly changes with the intensity of criterion frequency. These changes are related to stimulus frequency traveling along the cochlea. Other researchers described the patterns of frequency distribution along the length of corti (Kim and Molnar 1979). If we apply same interpretation to the current data, then the response patterns reported here are suggest of frequency selectivity along the organ of corti in both groups of animals.

Conclusion

The results of our current study show more difference in response properties between sound exposed and control chickens, also the width of FTCs becomes narrower on the characteristics frequency as stimulus frequency decrease in both animals, but more difference in nerve potentiality. Finally, the FTCs crystal clear in bandwidth as the stimulus frequency orderly increase, and decline in response activity over very low and high criterion frequency in both animals.

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