AD-A237 286

(2)

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

1a REPORT SECURITY CLASSIFICATION: Unclassified	1b. RESTRICTIVE MARKINGS: NA
2a SECURITY CLASSIFICATION AUTHORITY: NA	3 DISTRIBUTION / AVAILABILITY OF REPORT
2b. DECLASSIFICATION / DOWNGRADING SCHEDULE: NA	Unlimited
4. PERFORMING ORGANIZATION REPORT NUMBER(S): NA	5. MONITORING ORGANIZATION REPORT NUMBER(S): NA
6a. NAME OF PERFORMING ORGANIZATION: Washington University St. Louis	6b. OFFICE SYMBOL (If applicable): NA
6c. ADDRESS (City, State, and ZIP Code): Box 8115 Washington University School of Medicine 4566 Scott Ave St. Louis MO 63110	7a. NAME OF MONITORING ORGANIZATION: Office of Naval Research
	7b. ADDRESS (City, State, and ZIP Code): 800 N. QUINCY ST ARLINGTON VA 22217-5000
8a. NAME OF FUNDING / SPONSORING ORGANIZATION: ONR	8b. OFFICE SYMBOL (If applicable): ONR
	9 PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER: N00014-88K-0032
8c. ADDRESS (City, State, and ZIP Code): C.f. 75	10. SOURCE OF FUNDING NUMBERS

PROGRAM ELEMENT NO	PROJECT NO.	TASK NO	WORK UNIT ACCESSION NO.
		441m803	

11 TITLE (Include Security Classification): Unclassified

12. PERSONAL AUTHOR(S)

13a. TYPE OF REPORT	13b TIME COVERED FROM ____ TO ____	14. DATE OF REPORT (Year, Month, Day)	15 PAGE COUNT

16 SUPPLEMENTARY NOTATION: 6/12/91

17 COSATI CODES		
FIELD	GROUP	SUB-GROUP

18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number): Vestibular, Semicircular canal efferent,

19 ABSTRACT (Continue on reverse if necessary and identify by block number)

See attached

20 DISTRIBUTION / AVAILABILITY OF ABSTRACT ☐ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT ☐ DTIC USERS	21. ABSTRACT SECURITY CLASSIFICATION
22a NAME OF RESPONSIBLE INDIVIDUAL	22b TELEPHONE (Include Area Code) / 22c OFFICE SYMBOL

DD Form 1473, JUN 86 — Previous editions are obsolete. — SECURITY CLASSIFICATION OF THIS PAGE

S/N 0102-LF-014-6603

91-03028

ABSTRACT

All vertebrates are endowed with a vestibular efferent system (EVS) consisting of somata within the Central Nervous System with long axons exiting the brain to innervate the labyrinth. Behaviorally relevant stimuli related to feeding and/or aggressive behaviors and conditions leading to enhanced attentional states or alerting, activate the EVS. Increased EVS activity modifies the resting rate and response dynamics to motion of vestibular afferents. This modification is non-uniform across the fiber spectrum of the semicircular canals, for example, affecting the more sensitive, low spontaneous activity cells more profoundly than their less sensitive counterparts. The cellular bases for EVS effects are excitatory axo-axonic synapses upon primary afferents and axo-somatic inhibitory synapses upon hair cells.

FINAL REPORT ON CONTRACT NUMBER N00014-0032

PRINCIPLE INVESTIGATOR Stephen M. Highstein

CONTRACT TITLE: Vestibular Efferent Activity in Squirrel Monkeys

START DATE 1, October, 1987
END DATE 1, October, 1990

RESEARCH OBJECTIVE:

To investigate the structure and function of the mammalian efferent vestibular system in Squirrel monkeys in order to aid in the understanding of the purpose for, and the potential utilization of this system. Intracellular recording will be taken from efferent vestibular neurons in anesthetized animals. We will stimulate the VIIIth nerves bilaterally to antidromically identify these neurons. Subsequently, we will identify sources of synaptic input to these neurons by electrically stimulating sites in the central and peripheral nervous systems and recording the post-synaptic potentials thereby evoked. We will inject horseradish peroxidase into these cells and into the efferent nucleus to determine relevant morphological features of the system. We will record extracellularly in alert animals from the somata of antidromically identified efferent vestibular neurons to define the level of spontaneous activity, if any, and to determine the responses of these neurons to behavicrally applied stimuli. Immunohistochemistry will also be employed to determine which peptide transmitterr candidates are present within the system.

PROGRESS (Years 1-3)

We have purchased the Cambridge Electronic Design recording system and the Asyst language to program this interface. We have written the programs to use this equipment in the proposed experiments and have begun the alert animal series proposed. We have recorded from three monkeys and are continuing to this line of investigation. Part of these experiments included the training of a post-doctoral fellow and a student who were unfamiliar with this type of recording. We have also performed several intracellular experiments in anesthetized, paralyzed animals. To date we have collected six efferent vestibular neurons. These cells receive input from both VIIIth nerves and the spinal cord. These experiments were also performed with an M.D.-Ph.D. student and an Otolaryngology resident as a part of their training in my laboratory. We have published several papers and abstracts listed below.

PUBLICATIONS AND REPORTS (Year 3):

An oral presentation has been given at an ONR workshop in Pensacola this last winter. Several publications bearing on the efferent control of the labyrinth are listed below.

1) Tricas, T., and Highstein, S.M. The action of the efferent vestibular system upon the lateral line afferents in free swimming toadfish. Neurosci. abs., 1989.

2) Tricas, T., and Highstein, S.M. The action of the efferent vestibular system upon the lateral line afferents in free swimming toadfish. Biological Bulletin abs., 1989.

3) Boyle, R. and Highstein, S. M. Resting discharge and response dynamics of horizontal semicircular canal afferents of the toadfish, Opsanus tau. J. Neurosci., 10(5): 1557-1569, 1990.

4) Boyle, R. and Highstein, S. M. Efferent vestibular system in the toadfish: action upon horizontal semicircular canal afferents. J. Neurosci., 10(5): 1570-1582, 1990.

5) Carey, J. P., and Highstein, S. M., Physiology and brainstem morphology of single horizontal semicircular canal afferents in the toadfish, Opsanus tau: A biotin dye study. Neurosci. abs., 1990, in press.

6) Locke, R. E. and Highstein, S. M., Efferent modulation of synaptic noise in lagenar afferents of the toadfish. Neurosci. abs., 16:735, 1990.

7) Locke, R. E. and Highstein, S. M., Efferent modulation of synaptic noise and spike frequency in lagenar afferents of the toadfish. Association for Research in otolaryngology abs., 99, 1990.

8) Locke, R. E. and Highstein, S. M., Efferent modulation of synaptic noise and spike frequency in lagenar afferents of the toadfish. Biological Bulletin abs., 1989.

9) Tricas, T. and Highstein, S.M., Visual activation of the octavolateralis efferent system during predation in free swimming toadfish, Opsanus tau. Exp. Brain Res., 83:233-236, 1990.

10) Tricas, T. and Highstein, S.M. Action of the octavolateralis efferent system upon the lateral line of free-swimming toadfish, Opsanus tau. J. Comp. Physiol., in press.

11) Boyle, R., Carey, J.P., and Highstein, S.M. Morphological correlates of response dynamics and efferent stimulation in horizontal semicircular canal afferents of the toadfish, Opsanus tau. J. Neurophysiol. in press.

12) Schessel, D.A., Ginzberg, R., and Highstein, S.M. Morphophysiology of synaptic transmission between type I hair cells and vestibular

primary afferents. An intracellular study employing horseradish peroxidase in the lizard, Calotes versicolor.

TRAINING ACTIVITIES: I have trained an Otolaryngology fellow in aspects of the techniques used in the published studies.