SOCIETY FOR NEUROSCIENCE

ABSTRACTS

VOLUME 14, PART 1

18TH ANNUAL MEETING
TORONTO, ONTARIO
NOVEMBER 13-18, 1988

Made in the United States of America
International Standard Book Numbers
Part 1 ISBN 0-916110-29-X
Part 2 ISBN 0-916110-30-3
Both parts ISSN 0190-5295
Library of Congress Catalog Card Number 75-7761

Proper citation form for this volume:
Soc. Neurosci. Abstr., Vol. 14, Part 1, p. xxx, 1988.

Published by
Society for Neuroscience
11 Dupont Circle, N.W., Suite 500
Washington, D.C. 20036

38.3

POSSIBLE ACTIVE SPACE OPTIMIZATION BY THE MALE CRICKET FROG, ACRIS CREPITANS, THROUGH ADJUSTMENT OF NEIGHBOR SPACING. J. H. Fox. Psychology Dept., University of Texas, Austin, TX 78712.

Computer models of hypothetical anuran choruses (Fox, J.H. and Wilczynski, W., Soc. Neuroscience Abst. 12:84.10, 1986) demonstrate that a male may increase the active space (AS) of its mating call by joining a chorus and optimize AS by spacing itself at an appropriate distance from neighboring males. Optimal neighbor spacing depends on chorus geometry type, approximate chorus population, call duty cycle (DC), the randomization factor (RF) for neighbor spacing, and the threshold distance (TD), over which the solitary male's mating call attenuates to the female's multiunit midbrain auditory threshold.

Acris crepitans choruses in the Austin area are usually linear but often planar and typically have less than 50 members. DC = .029, RF = .63, and TD= 18.4 M. Conflicting spacing optima exist, based on the above values, for the two chorus types. AS is optimized when neighbor spacing is .79 M in linear choruses and 8.15 M in planar choruses. Actual neighbor spacing is 4.8 M and does not seem to differ between chorus types. Perhaps 4.8 M represents a compromise between the conflicting linear and planar optima.

(Supported by NSF grant BNS 8606289.)

38.4

BEHAVIORAL AND NEURAL THRESHOLDS TO ADVERTISEMENT CALLS IN A NEOTROPICAL FROG. W. Wilczynski. Dept. of Psychology, Univ. of Texas, Austin, TX 78712.

Male Hyla microcephala produce a short, high frequency, advertisement call with two spectral peaks: the dominant frequency at ca. 5.8 kHz and a lower amplitude peak at ca. 3 kHz. Different call amplitudes characterize different male behaviors. The mean (+SD) threshold for antiphonal calling is 62.2 ± 2.99 dB SPL (fast RMS). Males maintain an intermale distance marked by neighbor call amplitudes of 75 ± 5.95 dB. At ca. 81 dB males switch to an aggressive call (estimated from Wells & Schwartz, Copeia, 1985: 27-38). Midbrain multiunit recordings reveal one broad area of auditory sensitivity below 1.2 kHz and a second marked by a V-shaped frequency-threshold curve with a mean best frequency of 5.3 kHz. Both peaks in the call fall within this upper sensitivity band, which presumably represents basilar papilla (BP) activity. BP thresholds at best frequency average 62.7 ± 10.8 dB, which is not significantly different from the mean threshold for antiphonal calling ($t=0.51$, $p>0.25$), but is different from the mean neighbor amplitude ($t=10.0$, $p<0.001$). In collaboration with W. S. Geisler, a computer model of sensory filtering is being applied to these data to investigate the relationship between behaviorally relevant call amplitudes and the intensity-dependent activity of BP neurons.

Supported by a Smithsonian Short Term Visitor Grant and NSF grant BNS 8606289.

38.5

TESTOSTERONE-INDUCED CHANGES IN HORMONE ACCUMULATION IN THE SONG SYSTEM OF FEMALE CANARIES. E.A. Brenowitz and A.P. Arnold, Depts. of Psych & Zool, Univ. Washington, Seattle, WA 98195 and Dept. Psych & Brain Res. Inst., UCLA, LA, CA 90024. Adult female canaries (Serinus canarius) show extensive plasticity in the neural sytem that regulates song production. Normal females do not sing regularly, have smaller song control regions (SCRs) in their brains than do males (Nottebohm and Arnold 1976), and have smaller dendritic trees in one SCR than do males (DeVoogd and Nottebohm 1981). Treatment of females with testosterone (T) induces song and increases SCR volumes (Nottebohm 1980), neuron number (Bottjer and Dignan, submitted), and dendritic tree size (DeVoogd and Nottebohm 1981). In this study we asked whether such T-induced neural plasticity is accompanied by changes in the accumulation of T or its metabolites by SCR neurons.

Female canaries were implanted with silastic capsules containing either T (n = 5) or nothing (n = 3). Vocal behavior was monitored. One month later the pellets were removed, each bird was gonadectomized and then injected with tritiated testosterone for steroid autoradiography. In the caudal nucleus of the ventral hyperstriatum (HVc), we measured the proportion of cells that were labeled and the extent above background that cells were labeled (density ratio). Gross volume of HVc was also determined.

Song occurred in all T-treated but no control females. HVc volume was 75% greater in T birds. The proportion of HVc cells labeled by T or its metabolites did not differ between T-treated (X ± SD = 50.2 ± 7.8%) and control (50.3 ± 0.3%) groups. Density ratios of HVc cells, however, were greater for T females (6.5 ± 1.6) than for controls (5.5 ± 1.9; $P<.01$, t-test). The T-induced masculinization of vocal behavior is thus accompanied by an increase in the strength with which T/metabolites is accumulated by target cells but not in the frequency of such cells. Also, T target and non-target cells must be recruited at equal frequencies into HVc following T treatment.

38.6

NEUROCHEMICAL STUDIES OF THE NUCLEUS INTERCOLLICULARIS IN THE JAPANESE QUAIL. M. Gahr*, G.F. Ball, M. Schumacher*, & J. Balthazart (SPON: J. Cohen). Univ. Kaiserslautern, FRG; Rockefeller Univ., New York, NY 10021; Univ. Liège, Liège, Belgium.

In the Japanese quail crowing and copulatory behavior are both suppressed by castration, but different steroid treatments reinstate these behaviors. Little is known about the reason for this difference. N. intercollicularis (ICo) has been identified as an important area mediating vocal behavior in the quail. We have therefore investigated neurochemical factors influencing steroid effects in ICo. Approximately 50% of the cells in the medial portion of the nucleus contain estrogen receptors (determined immunohistochemically), however, levels of the steroid converting enzyme aromatase are undetectable. Levels of the 5α reductase enzyme are high in ICo but do not appear to be regulated by testosterone (T). Steroid effects on crowing are presumeably mediated by the modulation of neurochemical activity in ICo. We have therefore studied the localization and modulation by steroids of two neurotransmitter systems in ICo. Dense α-2 adrenergic receptor binding ([^{3}H] Para-aminoclonidine [PAC]) and muscarinic cholinergic binding ([^{3}H]N-methyl scopolamine [NMS]) as determined by autoradiography is present in the nucleus. However, there are differences between the two ligands. For example, PAC shows a distinct sub-region of binding in medial ICo which resembles the dorso-medial region of ICo described in songbirds. PAC binding is sexually dimorphic although the density of receptors in the male is not affected by T treatment. In contrast, NMS binding is not sexually dimorphic but castration of the male seems to decrease the density of binding, especially in rostral ICo. The actions of steroids in ICo are different in several ways from those described for copulatory behavior in the medial pre-optic nucleus.

38.7

AUTORADIOGRAPHIC LOCALIZATION OF BRAIN PROLACTIN RECEPTORS IN A PARENTAL AND NON-PARENTAL SONGBIRD SPECIES. G.F. Ball, A.M. Dufty*, A.R. Goldsmith*, and J.D. Buntin. Rockefeller University, New York, NY 10021; Univ. of Bristol, Bristol, U.K. and Univ. of Wisconsin, Milwaukee, WI 53211

In several species of birds, such as the European starling (*Sturnus vulgaris*) plasma levels of prolactin are positively correlated with the onset and maintenance of incubation behavior. Brood-parasites such as the brown-headed cowbird (*Molothrus ater*) lay their eggs in other bird's nests and do not engage in any parental care. However, seasonal changes in prolactin secretion in this species show a pattern similar to that of parental birds. It has been hypothesized that cowbirds have evolved a central insensitivity to the action of prolactin. In order to test this idea we compared prolactin binding sites in the brains of male and female starlings and cowbirds using *in vitro* quantitative autoradiography. Sites were labeled using [^{125}I] ovine prolactin (55pM [^{125}I] oPRL ± 85nM oPRL). Sections were exposed to X-ray film and the autoradiograms were analyzed with an image analysis sytem. Plasma levels of prolactin were measured in all subjects. Specific [^{125}I]oPRL binding sites were observed in both species throughout the pre-optic area (POA) and in hypothalamic regions including such nuclei as the paraventricular nucleus and the infundibular nucleus. Extra-hypothalamic binding sites in both species include the n. intercollicularis and the n. taeniae. A sex difference in receptor density was identified in both species in the POA. The density of binding was similar between the two species in all hypothalamic regions but in the POA levels were significantly higher in starlings. This difference may be related to inter-

38.8

CONNECTIONS AND FUNCTION OF AN "AROUSAL"-AREA OF THE CAUDAL FOREBRAIN OF ZEBRA FINCHES. H.-J. Bischof*, K. Herrmann*, J. Engelage*, J. Niemann*, E. Church* (SPON: European Brain and Behavior Society). University of Bielefeld, Dept. Ethology, POB 8640, D 4800 Bielefeld 1, FRG.

In previous studies (Bischof, H.-J., Herrmann, K.; Behav. Brain Res 21: 215, 1986; Behav. Neural Biol: in press), we demonstrated that four areas of the forebrain of zebra finch males are activated in situations which arouse the animal, e.g. if it is exposed to a female. We investigated the connections and responses to sensory stimuli of one of these areas, the archi/neostriatum caudale (ANC). In addition, we examined the effects of ANC lesions on courtship behaviour. Besides other afferents ANC receives input from the visual area pretectalis, locus coeruleus, and the reticular formation. Only one projection to the optic tectum could clearly be demonstrated. Evoked potentials within ANC occurred with visual and, very rarely, acoustical stimulation. The best responses were obtained with combined stimuli. Bilateral lesions to ANC reduce male song activity during courtship, but not courtship behavior in general. We propose that ANC may be involved in the regulation of song output according to the behavioral state of the animal. Supported by the