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BRIEF COMMUNICATION

Effects of Olfactory Bulb Removal on Brain Norepinephrine in Golden Hamsters[1]

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MURPHY, M. R. AND L. A. POHORECKY. *Effects of olfactory bulb removal on brain norepinephrine in golden hamsters.* PHARMAC. BIOCHEM. BEHAV. 1(2) 231–232, 1973. Changes in brain norepinephrine levels after olfactory bulb removal have been found in rats. Several investigators have suggested that the dramatic behavioral effects of bilateral olfactory bulb removal in hamsters might be due to a possible similar change rather than anosmia per se. The results of this study do not support this hypothesis since no significant differences in brain norepinephrine were found between sham operated and bilaterally bulbectomized male hamsters treated identically to those used in earlier behavioral studies on olfactory bulb removal. Also, since there were no changes in the norepinephrine levels in female hamsters which were treated identically to female rats used in earlier neurochemical studies, it is probable that there is a species difference in the effects of olfactory bulb removal on brain norepinephrine.

Olfactory bulb Hamster Norepinephrine

BILATERAL olfactory bulb removal eliminates mating behavior and initiated intermale aggression in male Syrian golden hamsters (*Mesocricetus auratus*) [3,4]. While these behavioral changes may be due to the loss of olfactory ability, they could be caused by some other effect of olfactory bulb removal. Pohorecky *et al.* [5] found that olfactory bulb removal in Sprague-Dawley rats caused levels of brain norepinephrine to significantly increase in the brain stem and significantly decrease in the telencephalon. Several investigators have recently suggested that the behavioral deficits which follow bilateral olfactory bulb removal in hamsters might be due to a similar neurochemical change rather than anosmia per se [2, 6, 7]. The first experiment described here used identical procedures to those which have produced behavioral deficits in hamsters in order to determine if changes in brain norepinephrine also occur. The second experiment used identical procedures to those which have produced neurochemical changes in rats in order to determine if there is a species difference in the effects of olfactory bulb removal on brain norepinephrine.

EXPERIMENT 1

Animals and Procedure

Animals were 18 male hamsters from the same breeder and of comparable age and experimental history as hamsters used in earlier work on the behavioral effects of olfactory bulb removal [4]. Surgical procedure was also identical to that used in the earlier investigation. Olfactory bulbs were removed bilaterally in 9 animals; the other 9 underwent a control sham-operative treatment which was like the experimental treatment except that the skull was not opened and no brain tissue was removed. Twenty-seven days after surgery the animals were killed by decapitation and completeness of the lesion was verified by gross examination of the brain. The brain was then divided into telencephalon and midbrain + brainstem. Tissues were rapidly frozen on dry ice and stored at −20°C until analyzed. Catecholamines were analyzed fluorimetrically [8] after separation by alumina column chromatography [9]. Analysis was done using the same techniques used in

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earlier work which found changes in the rat brain following olfactory bulb removal [5].

Results

There were no significant differences in norepinephrine levels between bilaterally bulbectomized hamsters and sham operated controls in either brain stem or telencephalon (Table 1).

TABLE 1

Region	Norepinephrine (μg/g)* Bulbectomized	Control
Brainstem	0.902 ± 0.08	0.917 ± 0.06
Telencephalon	0.422 ± 0.09	0.429 ± 0.02

*Data are presented as mean ± standard error of the mean.

EXPERIMENT 2

Animals and Procedure

The rats used in the original study on the effects of olfactory bulb removal on brain norepinephrine were female and were housed in groups of 3 to a cage; in addition, only unilateral olfactory bulb lesions were performed and comparisons were made between the levels of norepinephrine on the operated and unoperated sides of the brain. Thus, Experiment 1, using solitarily housed bilaterally bulbectomized male hamsters, was not a fair comparison of these species. For Experiment 2 one olfactory bulb was removed in 22 female hamsters and after the operation they were housed 3 to a cage until they were sacrificed 27 days later. The other procedures were the same as were employed in Experiment 1 and in earlier experiments [4,5].

Results

There were no significant differences in the levels of norepinephrine between the bulbectomized side and the unoperated side of the brain in either brain stem or telencephalon.

GENERAL DISCUSSION

The behavioral effects observed in male hamsters following bilateral removal of the olfactory bulbs cannot be attributed to the norepinephrine changes caused by bulbectomy in rats since similar changes do not occur in hamsters. Also, since there were no changes in brain norepinephrine levels in female hamsters which were treated identically to female rats used in earlier neurochemical studies, it is probable that there is a species difference in the effects of olfactory bulb removal on brain norepinephrine.

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