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Department of Animal Genetics and Organic Evolution, Jagiellonian University, Kraków 2, Krupnicza 50, Poland. *Received, January 4, 1967.*

Mieczysław LECYK

THE INFLUENCE OF CROWDED POPULATION STIMULI ON THE DEVELOPMENT OF REPRODUCTIVE ORGANS IN THE COMMON VOLE

WPŁYW BODŹCÓW ZAGĘSZCZONEJ POPULACJI NA ROZWÓJ ORGANÓW ROZRODCZYCH U NORNIKA ZWYCZAJNEGO

It was demonstrated that the presence of crowded sexually active voles somewhat inhibits the development of spermatogenesis in young individuals. The degree of gonadal development and function in experimental and control voles is given.

In our colony of common voles (*Microtus arvalis* Pallas, 1779) it was noted that young animals, placed in close proximity of cages with sexually active individuals usually start breeding slightly later than the young kept in separate quarters. These observations seemed to indicate that sexual maturation of voles may be somewhat influenced by a complex of stimuli provided by sexually active individuals.

In an attempt to explain this phenomenon the following experiment was done between 30 June and 10 August 1960. One hundred and twelve young (10 to 11 days old) voles from 19 litters were divided into two groups: experimental and control. Half of each litter was assigned to the experimental group (59 animals) and half to the control group (53 animals). The cages with the experimental voles were placed adjacent to cages with specially crowded sexually active voles. The control animals were placed in different building and serviced by another keeper. The size of the cages and the number of animals per cage were the same in both groups. The diet was identical and the animals were fed at the same time.

Some animals of both groups were sacrified after 10 days, others after 20 days and the remainder after 40 days (Tables 1 and 2). After sacrificing the animal the gonads were removed, weighed and fixed in Bouin's solution. Subsequently they were embedded in parafin, sectioned at 10 μ, and stained with Ehrlich hematoxylin and eosin.

In group 1 (10 days) no differences were observed in the degree of gonadal development between experimental and control animals. Similarly no differences were detected in group 2 (20 days). After 40 days (group 3) the degree of ovarian development was the same in the ex-

Table 1.
The degree of testicular development in experimental and control males.

Groups	No of animals	Age in days	Duration of experiment in days	Body weight in /g/	Testis weight in /mg/	Spermatogenesis			
						Spermatogonia	Primary and secondary spermatocytes	Spermatids	Spermatozoa
1 Experimental	8	20	10	11-13 /12/	80-160 /120/	+	+	-	-
1 Control	10	20	10	10-12 /11/	60-160 /120/	+	+	-	-
2 Experimental	9	30	20	13-16 /14.5/	200-340 /264.8/	+	+	+	single
2 Control	6	30	20	13-15 /14/	200-400 /304/	+	+	+	single
3 Experimental	12	50	40	16-20 /18.7/	240-400 /313.2/	+	+	+	single
3 Control	11	50	40	22-32 /27.3/	500-540 /520.4/	+	+	+	very numerous

Table 2.
The degree of ovarian development in experimental and control females.

Groups	No of animals	Age in days	Duration of experiment in days	Body weight in /g/	Weight of ovaries in /mg/	oogenesis			
						follicles			
						primary	growing	maturing	ripe
1 Experimental	11	20	10	10-11 /10.5/	8-10 /9/	+	+	+	-
1 Control	11	20	10	10-11 /10.7/	8-10 /9/	+	+	+	-
2 Experimental	10	30	20	14-15 /14.5/	8-12 /10/	+	+	+	+
2 Control	7	30	20	12-14 /13.2/	8-12 /10/	+	+	+	+
3 Experimental	9	50	40	17-22 /19.5/	8-12 /9.6/	+	+	+	+
3 Control	8	50	40	15-20 /18.3/	8-12 /10/	+	+	+	+

perimental and control females. The testicular development of the experimental males was comparable to that observed after 20 days (spermatogonia primary and secondary, spermatocytes and spermatides were present on the slides, while spermatozoa were very rare). However, in the testes of the control males of this group full and very intensive spermatogenesis was taking place (Table 1 and 2).

The age of the animals, the diet and housing were identical in control and in experimental groups, as indicated in the preceding discussion of methods. The results are most likely due to the olfactory-acoustic stimuli derived from crowded population. In the mouse, oestrous cycles of females are influenced by the olfactory stimuli from the male (Whitten, 1957). In fertilized mice the presence of an alien male usually causes pregnancy block and after a few days, recurrence of oestrus (Bruce, 1959, 1961; Bruce & Parrot, 1960; Bruce & Parkes, 1961). Experiments of same investigators involving the surgical removal of *bulbus olfactorius* demonstrated that pregnancy block in the presence of an alien male depends exclusively on olfactory stimuli. In voles, olfaction is very important in the selection of sexual partners (Moncrieff, 1962).

However in the present experiment the acoustic stimuli can not be disregarded (for example: the sounds of fighting in the crowded population). These stimuli were keeping the experimental animals constantly alert (in nervous tension). This is a specific »stress« and may influence the vital functions of an organism (Bashenina, 1963).

The above mentioned olfactory-acoustic stimuli of a crowded population can somewhat limit its fertility. During the peak of population density this, together with the factors described by Frank (1953; 1954), could lead to a crash of population numbers.

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Department of Comparative Anatomy, Wrocław University, Wrocław, Sienkiewicza 21. *Received, September 10, 1966.*