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Correlation between Ocular Stimulation and Spermatogenesis in the English Sparrow (*Passer domesticus*).*

A. R. RINGOEN AND A. KIRSCHBAUM. (Introduced by R. F. Blount.)

From the Departments of Zoology and Anatomy, University of Minnesota.

The importance of daily light ration in the sexual cycle of certain birds is well established. Male English sparrows may be brought to full spermatogenic activity within 6 to 8 weeks during the fall and early winter by daily exposures of 6 to 7 hours (4 P. M. to 11 P. M.) to the light afforded by either a 60 or 100 watt incandescent bulb.[1-4] No significant gonadal response, however, is observed in female birds during a comparable period of exposure. Female response is considered in a subsequent publication.

The question has been raised as to the manner in which light brings about testicular hypertrophy in the bird. Ivanova[5] placed caps over the eyes of male sparrows exposed to increased daily light ration to determine the rôle of the eyes in the response of the testes to light. According to her interpretation, light rays exert their stimulating effect on the testis largely through the general body surface as the breeding season approaches (February and March). Benoit[6, 7] performed similar experiments with ducks and concluded that light acts through the ocular region. The stimulating action of light was maintained even after the optic nerves were severed. Bissonnette[8] was unsuccessful in an attempt to ascertain whether added exposures of light affect capped starlings since the birds died as the result of handling.

Thirty-five juvenile male sparrows were used in the present study. Fifteen of these received 7 hours of additional light daily beginning November 5th. A second group of 9 birds was capped during the 7-hour light exposure. Nine caged birds and 2 specimens from nature

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3 Kirschbaum, A., and Ringoen, A. R., *Anat. Rec.*, 1936, **64**, 453.

4 Riley, G. M., PROC. SOC. EXP. BIOL. AND MED., 1936, **34**, 331.

5 Ivanova, S., *Arch. Exp. Path. u. Pharmakol.*, 1935, **179**, 349.

6 Benoit, J., *C. R. Soc. Rend.*, 1935, **118**, 669.

7 Benoit, J., *Anat. Rec.* (Suppl.), 1936, **67**, 81.

8 Bissonnette, T. H., *Quart. Rev. Biol.*, 1936, **2**, 371.

TABLE I.

Testis length, diameter, volume and degree of spermatogenic activity of four groups of juvenile sparrows. "0" is indicative of spermatogonia; "+" spermatocytes; "++" spermatids and occasionally sperms; "+++" complete spermatogenic activity.

No. of Bird	Killed Dec.	Days of Added Light	Bill Color	Body Weight gm.	Left Testis Length mm.	Left Testis Diam. mm.	Left Testis Volume mm.³	Germ Cells
				Cap Birds				
1	16	41	Black	28	5.0	4.0	42.0	+
2	16	41	Yellow	25	3.3	3.0	15.6	+
3	16	41	"	24	1.4	1.2	1.1	0
4	17	42	"	28	2.0	1.4	2.1	0
5	19	44	"	26	2.1	1.4	2.2	0
6	19	44	"	29.5	1.3	1.1	.8	0
7	19	44	"	27.5	1.4	1.1	.9	0
8	19	44	"	29	2.8	2.1	6.5	+
9	19	44	"	29	1.9	1.0	1.0	0
Aver.		42.8		27.5	2.4	1.8	8.0	
Temp.—57°-74°F.								
				Light Birds				
1	13	38	Black	26	7.0	7.0	180.1	+++
2	16	41	"	31	6.1	4.0	51.2	++
3	16	41	"	30.5	5.2	4.0	43.6	+++
4	17	42	"	30.5	10.0	7.2	272.1	+++
5	17	42	Yellow	30.5	2.0	1.5	2.4	0
6	19	44	Black	29	7.4	5.2	131.2	+++
7	19	44	"	31	7.0	4.5	74.0	+++
8	19	44	"	28	7.3	6.2	146.8	+++
9	19	44	Yellow	24.5	1.3	1.0	0.7	0
10	19	44	Black	27	7.6	6.8	184.0	+++
11	19	44	"	28	8.0	6.2	160.8	+++
12	21	46	Yellow	23	3.2	2.4	9.6	+
13	21	46	Gray	28	5.0	3.8	37.6	++
14	21	46	Yellow	22	4.6	3.2	24.8	+
15	22	47	Black	29	8.3	6.0	156.4	+++
Aver.		43.5		28.0	6.0	4.6	98.4	
Temp.—57°-74°F.								
				Caged Controls				
1	16	0	Yellow	34	1.5	1.2	1.1	0
2	16	0	"	25.5	1.2	1.1	.8	0
3	16	0	"	29	1.5	1.2	1.1	0
4	17	0	"	27	1.3	1.0	.7	0
5	21	0	"	25.5	1.4	1.0	.7	0
6	21	0	"	29.5	1.5	1.2	1.1	0
7	21	0	"	30	1.7	1.1	1.1	0
8	22	0	"	30	2.0	1.7	3.0	0
9	22	0	"	27.5	1.7	1.3	1.5	0
Aver.		0		28.5	1.5	1.2	1.2	
Temp.—56°-70°F.								
				Outside Controls				
1	21	0	Yellow	25	2.0	1.3	1.8	0
2	22	0	"	28	1.5	1.2	1.1	0
Aver.		0		26.5	1.8	1.3	1.5	

served as controls. All caged sparrows were allowed to feed 8 hours daily; the temperature was approximately the same for all these specimens. The experiment extended over a period of 6 weeks; results are shown in Table I.

Sections of the testes from the "light birds" revealed numerous spermatozoa in 9 of the 15 specimens. The gonads of 2 L and 13 L contained only occasional sperms. Slight spermatogenic activity was evident in 12 L and 14 L. Lack of response was noted in 5 L and 9 L. These results confirm those previously reported by the authors.[3]†

The outcome of the experimental studies on the capping of male sparrows is shown in the table. Failure of definite gonadal response is strikingly evident in 6 of the 9 capped birds subjected to additional light. The gonads of the other 3 contained spermatocytes. All control testes were spermatogenically inactive.

Our results indicate that testicular response to light in the sparrow (if experiments are begun in early November) depend largely on reception of the stimulus through the ocular region.‡

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Arachidonic and Linolic Acid of the Serum in Normal and Eczematous Human Subjects.*

WILLIAM R. BROWN AND ARILD E. HANSEN.

From the Departments of Botany and Pediatrics, University of Minnesota, Minneapolis, Minnesota.

Relatively little information is available concerning the content and nature of the various unsaturated fatty acids of the blood. The

† Although Riley recognizes the influence of light in promoting spermatogenic activity experimentally in the quiescent sparrow testis, he concludes that an "intrinsic sexual rhythm" independent of light influence is operative.

‡ According to Whetham, E. O., (*J. Agric. Sci.*, 1933, **23**, 383), "There would seem to be two possibilities concerning the action of light on the reproductive organs by way of the anterior pituitary. Firstly, it may be a quantitative effect on some precursor substance similar to that by which ultra-violet light forms vitamin D; or secondly it may cause stimulation of the anterior pituitary by acting on sensory nerves." Quoting further from Whetham's publication, "Although the rays at the red end of the spectrum have greater penetrating power on animal tissues and so might act on the tissues generally, it would seem more probable in view of the facts at present available that the stimulus acts by way of the nerves associated with color vision."

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