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Animals. p. 101

Treatment with androgens stimulates aggressive behavior in many vertebrates. These include: spayed and normal females of the swordtail fish, Xiphophorus helleri; both sexes of the lizard, Anolis carolinensis¹; the turtle, Chrysemys picta²; domestic hens³; male chicks of the domestic fowl⁴; immature male and female black-crowned night herons⁵; female canaries⁶; female ring doves⁷; female rats⁸; and young boys, in the sense of increased independency.¹⁰

Few morphological effects of sex hormones are so consistent in the vertebrate series as is this stimulation of aggressive behavior by androgens. The

increase in pugnacity was induced in both males and females, though not necessarily to the same extent.

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2. Noble, G.K., and Greenberg, B. 1941a. Induction of female behavior in male Anolis carolinensis with testosterone propionate. Proc. Soc. Exper. Biol. and Med., 47: 32-37. 1941b. Effects of seasons, castration and crystalline sex hormones upon the urogenital system and sexual behavior of the lizard Anolis carolinensis. I. The adult female. Jour. Exper. Zool. 88: 451-74.
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4. Alice, W.C. Collias, N.E.; and Lutherman, C. 1939. Ascertainment of the social order in flocks

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- of hens by the injection of testosterone propionate Physiol. Zool., 12: 412-40.
5. Noble, G.K. and Zitrin, A. 1942. Induction of mating behavior in male and female chicks following injection of sex hormones. Endocrinology; 30: 327-34.
6. Noble, G.K. and Wurm, M. 1940. The effect of testosterone propionate on the black-crowned night heron. Endocrinology, 26: 839-50.
7. Shoemaker, H.H. 1939b. Effect of testosterone propionate on behavior of the female canary. Proc. Soc. Exper. Biol. and Med., 41: 299-302.
8. Bennett, M.A. 1940. The social hierarchy in ring doves. II. The effects of treatment with testosterone propionate. Ecology, 21: 148-65.
9. Ball, J. 1939. Male and female mating behavior in prepubertally castrated male rats receiving estrogens. Jour. Comp. Psychol., 28: 273-83.
10. Bize, P.R., and Moricard, R. 1937. Modifications psychiques provoquées par l'injection de testostérone chez les jeunes garçons. Bull. Soc. Pediat. d. Paris 35:³⁸⁻⁴⁹

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But genetic differences have also been demonstrated. J.P. Scott¹ and Ginsburg and Allee² found differences in aggressiveness of three different laboratory strains of mice. By selective breeding (for another goal) it has been found possible to separate from the original common stock two different strains of rats, in one of which the individuals are very aggressive in encounters with other rats while in the other the reverse holds true. Individual differences in aggressiveness appeared to be fairly stable and consistent.^{3. 4.}

1. Scott J.P. 1942. Genetic differences in the

social behavior of inbred strains of mice. *Jour. Heredity*, 33: 11-15.

2. Ginsburg, B., and Allee, W.C. 1942. Some effects of conditioning on social dominance and subordination in inbred strains of mice. *Physiol. Zool.*, 15: 485-506.
3. Hall, C.S., and Klein, S.J. 1942. Individual differences in aggressiveness in rats. *Jour. Comp. Psychol.*, 33: 371-84.
4. Keeler^a has presented evidence that the black (nonagouti) gene in the Norway rat is associated with lesser aggressiveness, in the sense of tameness. However, the term "aggressiveness" is used in a different sense in this paper.
 - a. Keeler, C.E. 1942. The association of the black (non-agouti) gene with behavior in the Norway rat. *Jour. Heredity*, 33: 371-84.



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