

twins is the dislocation of the germ cells. Especially in the females one finds practically all the germ cells outside of the gonads in the mesovarium in the direction of the kidney as well as towards the fat body. In the males the extra regional germ cells concentrate rather in the hilum region of the gonad. The germ cells outside the gonads are more or less reduced in size but show the characteristic multilobate nucleus. The failure of the germ cells to reach their final position is not due to the general conditions of parabiosis as evidenced by the unisexual twins in which extragonadal germ cells may only exceptionally be found. It evidently is caused by an antagonistic reaction between the sexes, resulting in a mutual inhibition of the processes leading to the differentiation of the primordial gonads. Therefore in this experiment we deal with a so far unique case of manifestation of sex-antagonism prior to the morphological formation and differentiation of the gonads.

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Effect of Oestrus Upon Achilles Reflex Time.*

R. YORKE HERREN AND H. O. HATERIUS.

(Introduced by Lee Edward Travis.)

From the Psychopathic Hospital and the Zoölogical Laboratory, State University of Iowa.

Several authors have remarked upon the relationship, in mammals, between the functional sex glands and behavior—general¹ and specific.² No work has been done on the relationship between the normal functional sex glands and the central nervous system. This report gives the influence of oestrus on the electromyographically determined Achilles reflex time. Eight normal female rats with known sex histories were followed through 18 consecutive cycles, varying from 1 to 4 cycles per individual, and reflex time determinations were taken during the active phase of the sex cycle—oestrus, and during the quiescent phase—dioestrus. Vaginal smears were made daily according to the technique of Long and Evans (1922) to determine the phase of the cycle. Our determination of

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¹ Richter, C. P., *Quart. Rev. Biol.*, 1927, ii, 307.

² Macht, D. I., and Seago, D. W., *J. Comp. Psychol.*, 1924, iv, 151.

the reflex time for either period was taken as the average of 5 to 7 consecutive jerks. The recording apparatus and technique has been fully described elsewhere³ and need not be discussed here.

The average reflex time during the dioestrus interval was .0059 sec.; that for oestrus was .0079 sec., with an average difference between the 2 periods of .0019 sec. The average difference, though not large, is, we feel, significant, especially since it is between one-third to one-fourth of the longest reflex times, and, in all instances, nearly 4 times as great as the jerk to jerk variation of one testing. Two typical readings are included:

RAT HR₁

Date	Period	Times				Average Time
3- 8	Oestrus	.0090	.0095	.0095	.0095	.0094
3-11	Dioestrus	.0075	.0075	.0075	.0075	.0075

There are several possible explanations of the decreased rate of reflex responses. One is that the sex gland during oestrus directly or indirectly causes the liberation of a substance which inhibits the passage of the nerve impulse somewhere along the arc. Another is that the impulse set up by the stimulus has greater radiation during oestrus and hence its appearance in the muscle is delayed. A third is that the functioning of the sex gland disproportionately increases higher nerve center activity which in turn depresses lower nerve center activity. The depressed lower center activity expresses itself in the longer reflex times. This explanation is based upon the findings and interpretations of Travis and Dorsey^{4, 5} who found that whatever increases higher correlation center activity lengthens the reflex time and whatever depresses the higher center activity shortens the time due to an increasing and decreasing respectively of the inhibitory action of the higher on the lower motor centers.

That the functioning of the sex gland does facilitate higher centers has been demonstrated by its relation to spontaneous activity, maze running, etc. (Cf. Richter.¹)

Our work so far has been limited to females because of the ease with which cyclic sexuality fits into the plan of research. So far work on castrates is too inconclusive to report.

³ Travis, L. E., *J. Exp. Psychol.*, 1928, ii, 342.

⁴ Travis, L. E., and Dorsey, J. M., *Arch. Neurol. and Psychiatry*, 1929, **xxi**, 613.

⁵ Travis, L. E., and Dorsey, J. M., 1929 (MS. to be published in *Arch. Neurol. and Psychiatry*).