

assumption in such individuals of a growth-rate order of feather areas typical of gonadectomized males^{6,11,12} and females.¹² The feath-

er areas of athyroidic hens following thyroxin administration reveal the characteristic threshold differences.

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Relaxation of the Pubic Symphysis in Guinea Pigs Following Injections of Desoxycorticosterone Acetate.*

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The recent reports¹ on the concentration and purification of relaxin have led to a renewal of interest in the relaxation of the pelvic symphysis of guinea pigs. It seems progesterone acts on the uterus to release relaxin, which acts on the pelvis and relaxes the symphysis pubis. Since progesterone and desoxycorticosterone induce similar responses, such as prolongation of life and growth in adrenalectomized animals,²⁻⁴ progestational changes in the uterus⁵ and growth of the lobules of the mammary glands,⁶ it seems likely that desoxycorticosterone could also induce relaxation of the pelvic symphysis of guinea pigs. This report contains data supporting this view.

Methods. Forty-eight virgin oophorectomized guinea pigs were used in this study. They were injected as outlined below, and after a recovery period of at least 2 weeks, they were sometimes used again for these ex-

periments. The estrogens[†] in the form of theelin, and stilbestrol, were given in olive and peanut oils, and injected subcutaneously daily, for 2 days. The site of injection was on the shoulder and back, as this area⁷ gives less oil cysts than any other area commonly used for injecting oils. Four days after the estrogens were started, progesterone and desoxycorticosterone acetate in olive oil were given, either intramuscularly or intraperitoneally.

Pelvic examination was gently carried out while the guinea pig rested quietly on one's lap or knee. The state of pelvic relaxation was determined by manual manipulation of the tuber ischi; these were held between the middle finger and thumb of each hand, while one of the fingers was pressed against the symphysis to determine the extent of movement present. By this method, there was almost no danger of mechanically forcing the pelvic ligaments to yield. The degree of movement was recorded from one to 4+, and those cases of 2+ or more, were considered to be positive for pelvic relaxation. Since the chief interest was to know whether the pubic symphysis was or was not relaxed, it seemed unnecessary to arrange the response into further gradations.

Fluoroscopic examination was also carried

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¹ Hisaw, F. L., Zarrow, M. X., Money, W. L., Talmage, R. V. N., and Abramowitz, A. A., *Endocrinology*, 1944, **34**, 122.

² Emery, F. E., and Schwabe, E. L., *Endocrinology*, 1936, **20**, 550.

³ Gaunt, R., and Hays, H. W., *Am. J. Physiol.*, 1938, **124**, 767.

⁴ Schwabe, E. L., and Emery, F. E., *Proc. Soc. Exp. Biol. and Med.*, 1939, **40**, 383.

⁵ Van Heuverswyn, J., Collins, V. J., Williams, W. L., and Gardner, W. U., *Proc. Soc. Exp. Biol. and Med.*, 1939, **41**, 552.

⁶ Mixner, J. P., and Turner, C. W., *Endocrinology*, 1942, **30**, 706.

[†] Appreciation for supplies is recognized as follows: Theelin, Dr. Oliver Kamm, Parke, Davis and Company; progesterone and desoxycorticosterone acetate, Dr. Erwin Schwenk, Schering Corporation.

⁷ Emery, F. E., Matthews, C. S., and Schwabe, E. L., *J. Lab. and Clin. Med.*, 1942, **27**, 622.

TABLE I.

No. of tests	Estrogens, mg	Progesterone, mg	% positive	No. of tests	Estrogens, mg	Desoxycortico- sterone acetate, mg	% positive
10	2 th	1½	70	10	2 th	1½	50
5	5 th	1½	75	5	5 th	1½	75
7	2 S	1½	29	7	2 S	1½	43
10	5 S	1½	40	10	5 S	1½	50
5	5 S	5	100	5	5 S	5	75
Summary							
37			58	37			57

Under estrogens in Column 2, th—theelin, S—stilbestrol. The per cent of guinea pigs showing a positive relaxation of the pubic symphysis is shown in the last column. Body weight range—300 to 580 g.

out, and this helped to confirm the amount of separation that occurred between the bones at the pubic symphysis.

Results. The dosages of estrogens employed were probably above the threshold necessary to prepare the uterus and pubic symphysis for the action of progesterone and desoxycorticosterone acetate. This is shown in Table I by the fact that the per cent of guinea pigs showing relaxation of the symphysis pubis, induced by 1.5 mg of either progesterone or desoxycorticosterone acetate, was about the same in animals primed with either 2 or 5 mg of estrogens.

It will also be noted in Table I that there is no noticeable difference between progesterone and desoxycorticosterone in bringing about relaxation of the pubic ligaments of guinea pigs.

When the total dose of progesterone, or desoxycorticosterone is 5 mg, the relaxation response is obtained in almost all animals, but the degree of relaxation was not always maximal. Likewise, much smaller doses sometimes produced what may be called a maximal response. The degree of relaxation of the pubic symphysis in some of these guinea pigs was equal to that found in advanced pregnancy, as shown by both manual and fluoroscopic examinations of the pelvis.

Both progesterone and desoxycorticosterone induced changes in the mammary glands, sufficient for lactation, and in some cases, large milk drops were pressed from them. Sometimes this was observed as early as 24 hours following the injection, but it usually occurred later, and as long as 4 days in one case. Although these time intervals also fit the time necessary for relaxation of the pubic symphysis,

the 2 phenomena seem unrelated and occur independently of each other.

Discussion. Previously⁸ it was found that progesterone could substitute for desoxycorticosterone acetate on an equal weight basis when tested on the growth curve of adrenalectomized rats. But as previously discussed, various investigations have found the dose of progesterone necessary to maintain life in immature adrenalectomized rats, varied from 1 to 4 mg.

In fact in the same volume of *Endocrinology* as the above citation, it was shown⁹ that in cats the progestational action of progesterone was about 10 times that of desoxycorticosterone acetate. Changes in blood, sugar, and serum electrolytes also require larger doses than needed to maintain life in adrenalectomized animals.^{10,11} In the present study it was sometimes found that in identically treated guinea pigs some were well relaxed while others gave no response. Thus, it is apparent that on a weight basis these 2 compounds vary greatly in their different actions, and therefore, a conservative view of the data, (Table I), seems to be that desoxycorticosterone acetate can substitute for progesterone in the reaction involved in the loosening of the pelvic symphysis of the guinea pig, but that the exact dosages have yet to be determined.

⁸ Emery, F. E., and Greco, P. A., *Endocrinology*, 1940, **27**, 473.

⁹ Leatham, J. H., and Crafts, R. C., *Endocrinology*, 1940, **27**, 283.

¹⁰ Harrison, H. E., and Harrison, H. C., *Proc. Soc. Exp. Biol. and Med.*, 1939, **42**, 506.

¹¹ Thorn, G. W., Howard, R. P., and Emerson, K., Jr., *J. Clin. Invest.*, 1939, **18**, 449.

The palpatory method for determining the extent of relaxation of the pelvic symphysis is not very precise, although in experienced hands, the movement in the pelvic symphysis is readily felt. Fluoroscopic examination helps in determining a positive response, but it is doubtful if this method is as reliable as palpation. The X-ray has given additional data and, as judged from a recent report,¹²

¹² Hall, K., and Newton, W. H., *J. Physiol.*, 1946, **104**, 346.

it is quite reliable in detecting changes in the pelvis of mice.

Summary. In oophorectomized guinea pigs primed with estrogens, desoxycorticosterone acetate can substitute for progesterone in bringing about relaxation of the pubic symphysis. Only a few animals showed a degree of relaxation comparable to that obtained in advanced pregnancy. Milk secretion was obtained in many of these guinea pigs.

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Roentgenographic Studies of the Normal Human Gallbladder.

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This preliminary study was made to ascertain how the diminution in size of the gallbladder shadow is accomplished following a fatty meal.

Method. Twelve healthy individuals were chosen, 6 males and 6 females, aged 20 to 27 years. Following a fat-free evening meal, 3 g of Priodax (beta-(4-hydroxy-3,5-diiodophenyl)-alpha-phenyl-propionic acid) was given orally.¹ Only fruit juice, tea, black coffee, and water were allowed until 14 hours later. Then after a cleansing enema the first film (A) was taken. Following this a meal consisting of 8 ounces of cream with yolks of 2 eggs was given. A second film (B) was taken one hour later, and a third (C) 4 hours after the first. All exposures were made in the upright position, in neutral respiratory phase, after the gallbladder had been located by fluoroscopic examination.

Roentgenographic Data. In all instances the gallbladder was clearly visualized on the first films (A). The size of the gallbladder varied in different individuals. The shadow appeared to have a greater density at its most dependent, fundic, portion, decreasing in density toward the uppermost, collic, portion,

which was usually indistinctly outlined (Fig. 1-4).

On the second films (B), taken one hour after ingestion of the fatty meal, the gallbladder shadow was invariably present, although in 2 instances it was faintly outlined. In 3 instances the decrease in size of the shadow was negligible. In the remaining 9 instances, the shadow was decreased in size about 10 to 50%. The density of the shadow was usually increased and was more uniform, with clearer outline of the neck (Fig. 1-4).

On the third films (C) taken 4 hours after the fatty meal and 3 hours after the second exposure, the shadow of the gallbladder was present in all instances except one. In 6 instances the shadows decreased in size about 50 to 75% as compared to the first films. In 5 instances there was only slight diminution in size of the shadow, and there was a distinct difference in the density between the fundic and collic portions of the gallbladder, the fundic portion being more dense and more sharply outlined (Fig. 3 and 4). In 3 of these the shadows closely resembled in size and shape those on the first films (Fig. 2 and 4).

Interpretation. The ingestion of the Priodax, according to present knowledge, is followed by the appearance of the radio-

¹ Einsel, I. H., and Einsel, T. H., *Am. J. Digest. Dis.*, 1943, **10**, 206.