SYNERGISTIC ACTION OF PROLACTIN WITH HCG ON RAT VENTRAL PROSTATE

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The increase in the weights of the ventral prostate and other accessory sex organs of the immature rat has been employed as an end point for estimating the biological potency of preparations of LH and HCG (Greep *et al.*, 1941, 1942; Diczfalusy & Loraine, 1955). Several investigators have claimed that prolactin alone or synergistically with androgens has a role in the growth of the male accessory sex organs (Segaloff *et al.*, 1956; Chase *et al.*, 1957; Antliff *et al.*, 1960; Bengmark & Hesselsjo, 1963, 1964; Okamoto *et al.*, 1967; Dorfman, 1972; Negro-Vilar *et al.*, 1973). In these studies, large amounts of prolactin were used, and the possible presence of small amounts of contaminating LH could not be ruled out. It was therefore of interest to re-examine the effects of prolactin alone or with HCG on the growth of the male accessory sex glands of the rat.

Biological and bioimmunological experiments were carried out (see Table 1) with 20- to 23-day-old immature male rats of the Holtzman strain. The HCG (Ayerst Laboratories, U.S.A.) and ovine prolactin (NIH-P-S10) were administered subcutaneously to rats once a day on 3 consecutive days, at approximately 24-hr intervals while control animals received saline or normal rabbit serum. In the bioimmunological experiments, one group of animals received a mixture of ovine prolactin and the antiserum to ovine prolactin, which was incubated at 37°C for 1½ hr. The preparation and specificity of this antiserum has been described elsewhere (Purandare *et al.*, 1975; Thakur *et al.*, 1975). On the 4th day of the experiment the rats were weighed and killed. Statistical evaluation of the results was carried out using Student's *t* test.

The results indicated in Table 1 show that administration of 20 µg ovine prolactin + 1.0 i.u. HCG caused a significantly greater increase ($0.001 < P < 0.01$) in the weight of the ventral prostate than did HCG alone, but no significant increases occurred in the weights of the testes, dorsolateral prostate and seminal vesicles. When 20 µg ovine prolactin were administered alone, there were no changes in the organ weights. There was no further increase in the weight of the ventral prostate when 20 µg ovine prolactin + 2.0 i.u. HCG were given. When the antiserum to ovine prolactin was administered with ovine prolactin, the stimulation of the ventral prostate brought about by prolactin + HCG was suppressed (Table 1). These results confirm that the effect of prolactin in potentiating the action of HCG on the ventral prostate is not due to its contamination with LH.

Table 1. The effect of ovine prolactin alone or with HCG on the weights (mg/100 g body wt) of the testes and accessory sex glands of immature male rats

<i>Treatment</i>	<i>Testes</i>	<i>Ventral prostate</i>	<i>Dorso-lateral prostate</i>	<i>Seminal vesicles</i>
Saline (controls)	610.55 ± 23.41 ^a (9)	47.40 ± 3.81 ^a (9)	62.79 ± 3.75 ^a (9)	21.34 ± 2.36 ^a (9)
HCG (1.0 i.u.)	674.08 ± 30.70 (10)	79.96 ± 4.13 ^b (10)	85.13 ± 3.32 ^b (10)	33.19 ± 3.48 ^b (10)
HCG (1.0 i.u.) + ovine prolactin (20 µg)	707.15 ± 30.22 (7)	102.63 ± 4.61 ^c (7)	91.32 ± 5.97 ^b (7)	32.83 ± 2.51 ^b (7)
HCG (2.0 i.u.)	725.92 ± 28.76 ^b (10)	96.90 ± 5.72 ^d (10)	93.99 ± 4.05 ^b (10)	42.25 ± 3.41 ^c (10)
HCG (2.0 i.u.) + ovine prolactin (20 µg)	714.11 ± 22.48 (11)	94.53 ± 4.77 ^d (11)	93.97 ± 4.97 ^b (10)	42.87 ± 3.67 ^c (10)
Saline + NRS (controls)	605.27 ± 17.50 (9)	50.32 ± 1.44 ^a (9)	64.79 ± 3.10 ^a (8)	20.96 ± 0.72 ^a (9)
Ovine prolactin (20 µg) + NRS	554.90 ± 20.72 (10)	45.13 ± 2.23 ^a (10)	64.92 ± 2.55 ^a (10)	18.63 ± 0.65 ^a (10)
HCG (0.75 i.u.) + NRS	666.17 ± 35.01 (9)	74.07 ± 1.28 ^b (10)	83.04 ± 3.64 ^c (9)	33.43 ± 1.05 ^b (9)
HCG (0.75 i.u.) + ovine prolactin (20 µg) + NRS	695.79 ± 19.87 (10)	84.56 ± 2.72 ^c (10)	83.31 ± 2.69 ^c (10)	36.1 ± 2.2 ^b (10)
HCG (0.75 i.u.) + ovine prolactin (20 µg) + anti-serum to ovine prolactin (0.6 ml)	727.25 ± 16.74 (8)	75.99 ± 2.82 ^b (8)	79.14 ± 1.68 ^c (8)	28.67 ± 1.25 ^b (8)

Values are Means ± S.E.M. Figures in parentheses indicate the number of animals. NRS = normal rabbit serum. Within each column, values with different superscripts are significantly different, $P < 0.05$.

The synergistic role of prolactin in the hormonal control of a number of target organs is becoming increasingly evident. Earlier studies have indicated that prolactin stimulates prostatic growth (Okamoto *et al.*, 1967; Negro-Vilar *et al.*, 1973) and increases the weight of the seminal vesicles (Chase *et al.*, 1957; Antliff *et al.*, 1960; Bengmark & Hesselsjo, 1963, 1964; Dorfman, 1972; Negro-Vilar *et al.*, 1973). These effects, however, were manifest only when prolactin was used with androgens. The results presented in this study indicate that ovine prolactin alone has no effect on any of the male accessory sex glands, but potentiates the action of HCG on the growth of the ventral prostate. We did not, however, notice a significant increase in the weights of the seminal vesicles. This corroborates the experimental findings of Okamoto *et al.* (1967), who demonstrated the lack of prolactin-androgen synergism on the growth of the seminal vesicles. Our results do not agree with those of Segaloff *et al.* (1956) who found a significant increase in the weights of the ventral prostate of hypophysectomized rats treated with 10.0 i.u. (350 µg) ovine prolactin, a dose at which there was synergism with ovine LH. The response given by 10.0 i.u. ovine prolactin was smaller to that induced by 120 µg ovine LH, but the degree of contamination of the prolactin with small amounts of LH was not determined. In the present study, the results of the bioimmunological experiments showed that antiserum to ovine prolactin suppressed the effects of ovine pro-

lactin on the ventral prostate, and thus confirm the synergistic action of prolactin with HCG.

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REFERENCES

- ANTLIFF, H.R., PRASAD, M.R.N. & MEYER, R.K. (1960) Action of prolactin on seminal vesicles of guinea pig. *Proc. Soc. exp. Biol. Med.* **103**, 77–80.
- BENGMARK, S.B. & HESSELSJO, R.H. (1963) The combined effect of prolactin and androsterone on the growth of rat seminal vesicles *in vitro*. *Urol. int.* **16**, 387–390.
- BENGMARK, S. B. & HESSELSJO R.H. (1964) Endocrine dependence of rat seminal vesicle tissue in tissue culture. *Urol. int.* **17**, 84–90.
- CHASE, M.D., GESCHWIND, I.I. & BERN, H.A. (1957) Synergistic role of prolactin in response of male rat sex accessories to androgen. *Proc. Soc. exp. Biol. Med.* **94**, 680–683.
- DICZFALUSY, E. & LORAIN, J.A. (1955) Sources of error in clinical bioassays of serum chorionic gonadotropin. *J. clin. Endocr. Metab.* **15**, 424–434.
- DORFMAN, R.I. (1972) Mechanism of action of gonadotropins and prolactin. In *Biochemical Actions of Hormones*, pp. 295–316. Ed. G. Litwack. Academic Press, New York.
- GREEP, R.O., VANDYKE, H.B. & CHOW, B.F. (1941) Use of the anterior lobe of pituitary gland in the assay of Metakentrin. *Proc. Soc. exp. Biol. Med.* **64**, 644–649.
- GREEP, R.O., VANDYKE, H.B. & CHOW, B.F. (1942) Gonadotropins of the swine pituitary. *Endocrinology* **30**, 635–649.
- NEGRO-VILAR, A., KRULICH, L. & McCANN, S.M. (1973) Changes in serum prolactin and gonadotropins during sexual development of the male rat. *Endocrinology* **93**, 660–664.
- OKAMOTO, R., KAWASHIMA, K. & FUJII, K. (1967) Action of prolactin on the male sexual organs of the rat. *Bull. Tokyo med. dent. Univ.* **14**, 37. Cited by Dorfman (1972).
- PURANDARE, T.V., DATTATREYMURTY, B., MUNSHI, S.R. & RAO, S.S. (1975) Immunobiological actions of antiserum to ovine prolactin in mice. *J. Reprod. Fert.* **44**, 411–419.
- SEGALOFF, A., STEELMAN, S.L. & FLORES, A. (1956) Prolactin as a factor in the ventral prostate assay for luteinizing hormone. *Endocrinology* **59**, 233–240.
- THAKUR, A.N., SHETH, A.R., PURANDARE, T.V., MUNSHI, S.R. & RAO, S.S. (1975) Antisera to gonadotropins and placental function in mice. I. Effect on polyamine content. *J. Reprod. Fert.* **43**, 221–224.