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EFFECT OF UNILATERAL OVARIECTOMY ON FOLLICULAR GROWTH IN HYPOPHYSECTOMIZED RATS TREATED WITH PREGNANT MARE SERUM GONADOTROPHIN

R. WELSCHEN

Medical Faculty, Department of Anatomy, Rotterdam, The Netherlands

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Unilateral ovariectomy results in compensatory follicular growth and doubling of the number of ovulations in the remaining ovary. It has been suggested that this is (at least partly) due to the increased availability of circulating gonadotrophins to the remaining ovary (McLaren, 1966). If this view is correct, it could be expected that in hypophysectomized rats treated with fixed regimens of pregnant mare serum gonadotrophin (PMS), follicular development in one ovary would be stimulated by removal of the other ovary.

Wistar rats (180–200 g) which had had at least three consecutive 5-day cycles were used. In a first experiment (Table 1) the effect of unilateral ovariectomy on follicular growth in rats with an intact hypophysis was determined. The animals were unilaterally ovariectomized during oestrus or 2 days later (dioestrus 2). They were killed 1, 2, 3 or 4 days thereafter. In these rats a significant increase of follicular growth in the remaining ovary was seen on the 2nd postoperative day after removal of one ovary during oestrus and on the 1st postoperative day after removal of one ovary during dioestrus 2. In a second experiment rats were hypophysectomized transauricularly, unilaterally ovariectomized or sham operated and injected with 0·5, 1 or 2 times a dose of PMS known to maintain normal follicular growth (Welschen, 1972). Again all manipulations were performed either during oestrus or during dioestrus 2. The rats were killed 24 h later. The results (Table 2) show that in these hypophysectomized rats no significant compensatory follicular growth occurred after unilateral ovariectomy. This is in agreement with results of Greenwald (1968), who found no compensatory ovulation in unilaterally ovariectomized hypophysectomized prepuberal rats after treatment with PMS and human chorionic gonadotrophin.

The results indicate that changes in the gonadotrophin levels are required for compensatory follicular growth after unilateral ovariectomy. Moreover, changes in gonadotrophin levels have been demonstrated after unilateral ovariectomy (Benson, Sorrentino & Evans, 1969; Peppler, 1969). Therefore, as was suggested previously (Welschen, 1970) the compensatory phenomena after unilateral ovariectomy seem to be due exclusively to the secretion of additional gonadotrophins.

Table 1. *Effect of unilateral ovariectomy on follicular growth in rats with an intact hypophysis (means ± S.E.M.)*

State of animal	Follicular volume $\times 10^5$ (μm^3)†	Number of follicles in each volume range in the right ovary at* Oestrus	Dioestrus 1	Dioestrus 2	Dioestrus 3	Pro-oestrus
Left ovary in situ	⩾ 1000	—	—	—	3·7 ± 0·7	4·3 ± 1·3
	500–999	—	1·0 ± 0·6	5·7 ± 0·9	2·8 ± 0·8	1·6 ± 0·8
	200–499	9·7 ± 0·7	13·3 ± 1·2	10·7 ± 0·6	7·0 ± 0·6	2·6 ± 1·5
		(5)	(5)	(5)	(5)	(4)
Left ovary removed during oestrus*	⩾ 1000	—	—	0·8 ± 0·8	2·3 ± 0·9	8·6 ± 2·0‡
	500–999	—	1·0 ± 0·6	11·0 ± 0·7‡	7·3 ± 0·6‡	3·7 ± 2·2
	200–499	—	12·7 ± 0·3	8·0 ± 1·6	8·0 ± 0·5	3·7 ± 1·3
		—	(5)	(5)	(5)	(5)
Left ovary removed during dioestrus 2*	⩾ 1000	—	—	—	4·8 ± 0·9	6·6 ± 1·1
	500–999	—	—	—	5·2 ± 1·2‡	7·0 ± 2·1‡
	200–499	—	—	—	8·4 ± 1·6	7·6 ± 2·3
					(8)	(5)

The number of rats is indicated in parentheses.
* Operations and autopsies were always performed between 12.00 and 13.00 h.
† Follicular volumes were determined as described elsewhere (Welschen, 1972).
‡ Values significantly different from corresponding values in non-ovariectomized rats ($P < 0·02$).

Table 2. *Effect of unilateral ovariectomy on follicular growth in hypophysectomized rats treated with pregnant mare serum gonadotrophin (PMS) (means + S.E.M.)*

State of animal	Follicular volume $\times 10^5$ (μm^3)	Number of follicles in each volume range in the right ovary: Treatment from oestrus to dioestrus 1 with PMS 4 i.u.	8 i.u.	16 i.u.	Treatment from dioestrus 2 to dioestrus 3 with PMS 4 i.u.	8 i.u.	16 i.u.
(*a*) Left ovary in situ	⩾ 1000	—	1·0 ± 0·7	—	2·0 ± 0·3	3·3 ± 1·5	4·4 ± 1·0
	500–999	—	1·6 ± 0·6	4·6 ± 1·0	3·3 ± 0·6	3·3 ± 0·9	6·0 ± 0·7
	200–499	9·0 ± 0·8	13·8 ± 1·2	16·4 ± 2·0	6·0 ± 1·3	7·0 ± 3·1	12·8 ± 1·4
		(5)	(5)	(4)	(5)	(5)	(5)
(*b*) Left ovary removed	⩾ 1000	—	—	—	2·4 ± 0·6	3·2 ± 0·1	4·7 ± 0·7
	500–999	—	2·0 ± 1·1	4·7 ± 1·3	2·7 ± 0·7	4·0 ± 2·1	6·9 ± 0·5
	200–499	8·5 ± 1·5	12·3 ± 0·9	14·0 ± 2·3	6·9 ± 1·9	7·8 ± 1·2	11·9 ± 0·5
		(5)	(5)	(5)	(5)	(5)	(7)
Significance of difference between (*a*) and (*b*)		NS	NS	NS	NS	NS	NS

PMS, (Gestyl, Organon) dissolved in 0·1 ml saline, was injected intramuscularly, a first dose of 4, 8 or 16 i.u. immediately after hypophysectomy and a second dose of, respectively, 1, 2 or 4 i.u. 13 h later. Operations and autopsies were always performed between 12.00 and 14.00 h. The number of rats is indicated in parentheses. NS = not significant.

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