COMPARISON OF LUTEAL FUNCTION IN PSEUDOPREGNANT AND PREGNANT HAMSTERS

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The functional status of corpora lutea (CL), as inferred by their weight and progesterone content, was evaluated in pregnant and pseudopregnant golden hamsters. In addition, the duration of pseudopregnancy was determined in intact hamsters and in animals made pseudopregnant by separating the uterus from the ovary. Pseudopregnancy was induced in (1) intact hamsters by mating them to vasectomized males, (2) hamsters in which utero-tubal connections were interrupted either bilaterally or unilaterally, (3) animals which were hysterectomized at least 8 days before mating. In all cases, the day spermatozoa were found in the vaginal smear was designated Day 1 of pregnancy or pseudopregnancy. CL were dissected from the ovaries and weighed; progesterone was determined by the competitive binding method (Neill, Johansson, Datta & Knobil, 1967). The end-point for the termination of pseudopregnancy was the reappearance of the conspicuous postovulatory vaginal discharge.

The data in Table 1 show that on Day 7, the mean weight per CL of Group 1 hamsters was significantly lower than the other groups according to the honestly significant difference procedure (Steel & Torrie, 1960). Similarly, on

TABLE 1
COMPARISON OF CL IN THE PSEUDOPREGNANT AND PREGNANT HAMSTER

<i>Treatment group</i>	<i>Mean wt/CL (mg ± S.E.)</i>			<i>Mean progesterone content/CL (ng ± S.E.)</i>		
	<i>No. of hamsters</i>	<i>Day 7</i>	<i>Day 11</i>	<i>No. of hamsters</i>	<i>Day 7</i>	<i>Day 11</i>
1. Pseudopregnant (mated to vasectomized male)	12	0.52* ± 0.02	—	6	11.5* ± 1.01	—
2. Pseudopregnant (tract cut at utero-tubal junction)	11	0.62 ± 0.01	—	6	12.5 ± 0.66	—
3. Pseudopregnant (hysterectomized)	9	0.63 ± 0.02	0.73* ± 0.02	6	11.2* ± 0.92	11.9* ± 0.51
4. Pregnant	7	0.65 ± 0.03	1.07 ± 0.04	6	14.6 ± 0.26	17.1 ± 1.25

* $P < 0.05$ in comparison with Group 4.

Day 7, the average progesterone content in Groups 1 and 3 differed significantly from pregnant animals. There was a trend towards reduced progesterone content in Group 2 but the values were not significantly different from the CL

of pregnancy. On Day 11, the CL in animals from Group 3 were significantly smaller and contained less progesterone than in pregnant animals.

From the data presented in Table 2, it can be seen that the CL from the ovary adjacent to a pregnant uterine horn were significantly heavier than their counterparts in the contralateral ovary (Group 1a and b). The average CL

TABLE 2
COMPARISON OF CL FROM OVARIES ADJACENT TO A GRAVID OR A STERILE HORN

Group	Day 8		Day 10	
	No. of hamsters	Mean wt/CL (mg $\pm$ S.E.)	No. of hamsters	Mean wt/CL (mg $\pm$ S.E.)
1. Unilaterally pregnant				
a. ovary adjacent to a pregnant horn	6	0.79 $\pm$ 0.05	8	0.95 $\pm$ 0.07
b. ovary adjacent to a sterile horn	6	0.64* $\pm$ 0.03	7	0.74* $\pm$ 0.05
2. Bilaterally pregnant	8	0.74 $\pm$ 0.03	11	0.98 $\pm$ 0.03
3. Bilaterally pseudopregnant	6	0.61* $\pm$ 0.03	—	—

* $P < 0.05$ in comparison with group 2.

weight from the ovary next to a sterile horn in unilaterally pregnant animals did not differ from the value in bilaterally pseudopregnant hamsters (Groups 1b and 3). However, the CL from the former group continued to grow between Days 8 and 10, whereas the pseudopregnant animals reverted to oestrus by Day 10 and the CL regressed.

Table 3 presents a comparison of the lengths of pseudopregnancy for intact females mated to vasectomized males (Pseudopregnant 1); for animals in which the utero-tubal junctions were cut and ligated without disrupting the blood

TABLE 3
COMPARISON OF DURATION OF PSEUDOPREGNANCY

Group	No. of hamsters	Mean duration of pseudopregnancy (days $\pm$ S.E.)
Pseudopregnant I	10	8.9 $\pm$ 0.10
Pseudopregnant II	10	10.0 $\pm$ 0.15
Pseudopregnant III	10	10.9 $\pm$ 0.41

supply (Pseudopregnant II); and for animals in which both the utero-tubal junctions were cut and the blood supply was interrupted between the uterus and ovary (Pseudopregnant III).

Significant differences existed between all groups in the duration of pseudopregnancy, according to the honestly significant difference test ($P < 0.05$). The intact hamsters (Pseudopregnant I) had the shortest pseudopregnancy, i.e. the fastest cessation of luteal function.

Collectively, the present experiments indicate that the CL of pregnancy are larger and produce more progesterone than the CL of pseudopregnancy. Luteal function in pseudopregnant hamsters parallels that of pregnant animals for a few days and thereafter uterine influence and/or lack of placental development suppresses growth and progesterone synthesis in intact pseudopregnant animals.

The separation of uterus and ovaries prolongs luteal activity by one day; this agrees with Orsini's findings (1969). Further dissociation by interrupting the blood supply between uterus and ovary, extends luteal function beyond 10 days.

CL of pseudopregnant, hysterectomized animals are the same size on Day 7 as CL of pregnancy but their progesterone content is lower. A possible explanation is that there are reduced pituitary levels of FSH in pseudopregnant, hysterectomized hamsters compared to pregnant animals (Greenwald, unpublished) and FSH is an important component of the luteotrophic complex in this species (Greenwald & Rothchild, 1968).

On Day 11, CL of pseudopregnant, hysterectomized hamsters are smaller and contain less progesterone than CL of pregnancy. Based on ovarian histology, the diameter of CL in pseudopregnant, hysterectomized hamsters is smaller than in comparable pregnant animals (Orsini, 1969). The size and progesterone production by hamster CL during the second half of pregnancy depends on both hypophysial and placental gonadotrophins and it is noteworthy that hysterectomy during the second half of pregnancy results in prompt regression of the CL (Greenwald & Rothchild, 1968).

In the unilaterally pregnant hamster, the CL in the ovary adjacent to the sterile horn continue to grow but they never reach the size of the CL on the pregnant side. The sterile uterine horn possesses either limited luteolytic activity or the levels of circulating luteotrophins in the pregnant animal are sufficiently high to counteract a luteolytic factor. Another possibility is that a placental factor locally stimulates CL growth in the adjacent ovary.

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