TERMINATION OF PREGNANCY AFTER ACCELERATED LACTATION IN THE RAT

MARILYN J. VEOMETT AND J. C. DANIEL, JR

Department of Molecular, Cellular and Developmental Biology,
College of Arts and Sciences, University of Colorado,
Boulder, Colorado 80302, U.S.A.

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The gestation period in rats that have bred during a post-partum oestrus is known to be lengthened if the female is suckling a moderately large litter. Presumably, this lengthening is due to a prolongation of the progestational period and the embryos may remain dormant in the blastocyst stage for up to 14 days (Weichert, 1940; Psychoyos, 1970).

We wanted to determine whether heavy lactation might also induce dormancy in postimplantation embryos or if other effects might take precedence, for example, if the mother would continue to suckle the large litter or if the pregnancy would be terminated.

Holtzman strain rats were used throughout the experiment. Pregnant females were caged with experienced males at least 8 days before parturition. Post-partum mating was checked by vaginal smears and the males removed from the cages thereafter. The day on which spermatozoa were found in the smear was designated Day 0. At parturition, the litters were reduced to two or three young; normally, this number will not delay implantation, but will maintain milk secretion (King, 1913; Weichert, 1940). Females were permitted to nurse these few young until Day 9, when laparotomies under semi-sterile conditions, using ether anaesthesia and mid-ventral incisions, were performed to confirm implantation. The animals with implanted embryos were then given from eleven to fourteen young to nurse. (Of thirteen animals studied, seven had conceptus sites on Day 9.) A second laparotomy was performed on Day 13 if no implantations were observed on Day 9. Three experimental animals that showed no implantation sites on Day 9 were found to have implantations on Day 13 when the number of suckling young was reduced from three to one. Delayed implantation was presumed to have occurred in these animals. The second (or third) laparotomy was performed on Day 17, 21 or 24, if parturition had not occurred by that time.

The same procedures were used for another group of control rats except that they were left to nurse only two young after the laparotomy on Day 9.

The results are summarized in Table 1.

Experimental animals E1 to E7 all had implanted embryos on Day 9. Of the eleven to fourteen young they were then given to nurse, between seven and thirteen were maintained until the time of the second laparotomy. All the experimental animals had flaccid uteri with no evidence of decidual sites at the time of the second laparotomy. From the results for E4, the presence of as few
### Table 1

**EFFECT OF ACCELERATED LACTATION ON PREGNANCY IN THE RAT**

<table>
<thead>
<tr>
<th>Animal no.</th>
<th>No. of sites on Day 9</th>
<th>No. of sites on Day 13</th>
<th>No. of young given after implantation</th>
<th>No. of young maintained to last laparotomy</th>
<th>Day of last laparotomy</th>
<th>No. of sites at last laparotomy</th>
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<tr>
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</tbody>
</table>

* It was frequently difficult to distinguish whether a site contained two very close implantations or only one. Hence, a lower limit of implantations was determined.

† NA = Not applicable.

‡ These results are significant at $P < 0.001$. 

Uterus flaccid and empty

Presumably were in delayed implantation at first laparotomy

Implantation sites on one side only
as seven nursing young may be associated with the termination of a post-implantation pregnancy within 8 days.

Presumably, delayed implantation occurred in the other three experimental animals, E8 to E10, so that no sites were apparent on Day 9. These animals were therefore given only one young to nurse on Day 9 and implantation was then confirmed on Day 13 at a second laparotomy. They were then given twelve young to nurse, of which they maintained nine or ten. When a third laparotomy was performed on Day 21, all three of these animals also had flaccid uteri.

The control animals, C1 to C10, provided a test of the possible detrimental effects of the laparotomy or any other handling (e.g. see Runner, 1959). They nursed two young throughout the experiment and all but one had foetal-stage embryos on Day 17. In both the experimental and the control rats, the size of the implantation sites on Day 9 varied slightly, but all appeared to be developing normally. The variation could reflect a short delay in implantation resulting from nursing only a few young, as noted by Weichert (1940).

We conclude that heavy lactation after implantation causes termination of pregnancy in rats. These results are consistent with earlier findings concerning the effect of lactation on pituitary hormone levels (e.g. Minaguchi & Meites, 1967; Tucker & Thatcher, 1968).

The precise timing of embryo resorption/abortion caused by lactation and the possible relationships of this occurrence to levels of hormones and/or uterine proteins are being examined.

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REFERENCES