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ESTIMATIONS OF NUMBER OF YOUNG BORN ON THE BASIS OF PLACENTAL SCARS COUNT IN THE LABORATORY MOUSE **

OCENA LICZBY URODZONYCH MŁODYCH WEDŁUG BLIZN ŁOŻYSKOWYCH U MYSZY LABORATORYJNEJ

Comparison was made between the number of placental scars and the number of young born, in 96 females which previously had produced one, two or three litters. Placental scars were counted at autopsy on uteri in fresh state as well as after fixation and bleaching. Bleaching of uteri does not improve the legibility of scars. Scars remain visible on uterus for at least 9 months. In females breeding once or twice the number of scars exceeds the actual number of young born; in females breeding three times the cumulative number of young exeeds scars count thus resulting secondarily in approximation of the mean number of scars and young born. Up to the 10th day of pregnancy it is possible to determine if the female bred previously. Value of the correlation coefficient between the number of scars and young born decreases as the number of young born increases. In general counting the placental scars provides a reliable method of estimating the number of young born.

The present investigations were undertaken in order to define the approximate error in estimating the number of young born to a female, on the basis of the placental scars count. Placental scars represent climps of hemosiderine derived from desintegration of red blood cells. They are situated between the longitudinal and the circular muscles of the uterus, as well as in the deeper layers of endometrium in places where placentae were situated.

96 females from the inbred strains A, CBA, CBA-p, CBA-T6T6 were examined. The whole material was divided into four series: females which gave one litter (I), two litters (II), three litters (III), one or two litters and autopsied during a succesive pregnancy (IV).

Females belonging to I series were dissected between the first and ninth months after giving birth. Females belonging to series II and III were autopsied two to five month after last breeding, and the interval

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between successive pregnancies amounted to several weeks. The size of litters was estimated on the first day after birth, before noon. These data are probably somewhat »underrated« because in some cases females could have eaten part of their litter before its number was recorded.

Uteri were excised from the body, rinsed, stretched out on paraffin plates, and examined in 0.9% NaCl. Stretched out uteri were then submerged in 10% formaldehyde for 24 hours. After rinsing they were bleached out according to the method of Strauss (Romeis, 1953) using 5% KOH in 6% H_2O_2. Placental scars were examined and counted under 6.3 magnification of a dissecting microscope by transmitted and reflected light. The comparison was made between the number and position of scars on fresh and bleached out material.

RESULTS

The analysis of the first series has shown that placental scars remain visible on uterus for at least 9 months after pregnancy. This observation confirms the results obtained by Deno (1941) and Davis' and Emlen's (1948) with *Mus musculus* and *Rattus norvegicus* respectively. According to these authors placental scars are visible on uterus at least one year after pregnancy. As the distinctness of the scars does not depend on lenght of time that passed from the time of littering it is possible to treat females of I series as a homogenous material. However it has often been observed that the scars placed in close neighbourhood of each other were different in size and intensity of colouring. This makes it impossible to distinguish between scars originating from different litters. The same observation was made by Corthum (1967) on *Microtus*.

Data concerning the number of young born and the number of scars in all series of females are given in Table 1. Among females which littered once in 44% of cases the number of young was equal to the highest number of scars determined either during dissection, or after bleaching or after both these methods simultaneously. In the remaining series this percent appears to be much lower. This indicates that a large number of young born decreases the accuracy of estimation. It seems probable that in many cases the number of scars coincides closely with the actual number of embryos, some of which could have been resorbed (Conoway, 1955), and with the number of new-born, when part of the litter was destroyed immediately after birth by the mother.

In individual females the coincidence between the number of scars determined before and after fixation, appears frequently in I series (23/36). In other series the number of scars estimated before fixation is as often higher, equal or lower as the number of scars found in fixed material.

In I and II series the scars count exceeds the number of young born (as noted also by Davis & Emlen, 1948; Conoway, 1955). In III series where the number of young born is large, the estimation based on the scars count may be in individual cases »overestimated« as well as »underestimated«.

As a result the mean number of scars secondarily approximates the

mean number of young, this permitting of obtaining a correct estimation of the total number of young born. In order to obtain the actual error of estimation per female absolute differences between the scar number and the number of young were calculated (see table 1, the differences in minus and in plus were taken into account, when calculating means per female). Absolute difference in I series amounts to 0.84, in II series — 2.85, and in III series — 3.58. Larger gap in values between the I and II series than between II and III series may probably be explained by the fact that scars from the consecutive litters overlap, this rendering impossible to distinguish some of them.

Table 1.

Data concerning the number of young and number of placental scars in investigated females.

No. of series		I	II	III	IV
Number of females (total)		36	14	24	17
Number of young:	n	219	190	463	148
	$\bar{x}$/♀	6.08	13.57	19.29	8.71
Number of placental scars fresh material (pf):	n	242	229	457	129
	$\bar{x}$/♀	6.72	16.36	19.94	7.05
after bleaching (pb):	n	212	218	443	132
	$\bar{x}$/♀	5.89	15.57	18.46	7.76
Number of females in which:					
$y = p_{max}$	n	16	2	2	4
	%	44.4	14.3	8.7	23.6
$y > p_{max}$		1	1	10	9
$y < p_{max}$		19	11	12	4
pf = pb		23	4	9	9
pf > pb		8	6	8	3
pf < pb		5	4	7	5

Meaning of series number is given in the text, p. 263.
y — number of young; p_{max} — maximal number of scars.

A pronounced predominance of the number of young over the number of scars, was observed in females pregnant at the moment of autopsy. 22 [1]) pregnant females were examined starting from 5th to the 13th day of pregnancy. The size of the embryos and the degree of vascularisation of the uterus on the 13th day of pregnancy, absolutely does not allow for distinction of placental scars from previous pregnancies. The situation is similar on the 12th day of pregnancy, although in one case 4 scars were found on a female which gave birth to 6 young. Up to, and including the 10th day of pregnancy it is possible to reveale scars, but

[1]) The difference between the number of examined females cited in the text and in table 1 results from the fact that on 5 uteri from females killed on the 12th and 13th day of pregnancy scars were not found at all.

the accuracy of estimation is very low. Two cases of strict coincidence between the number of young and the number of scars were observed on the 5th and 6th day of pregnancy (only on fresh material).

Fig. 1 illustrates the correlation between the number of placental scars and the number of young born in all four series. According to expectations the highest correlation is observed in I series ($r = 0.902$). The correlation coefficient for II series amounts to 0.861, and for III series to 0.855. The level of significance is somewhat higher in III series than in II series, on account of larger size of this sample. IVth series has the lowest correlation coefficient value ($r = 0.640$) but also significant at the 0.05 level. In this series dispersion of data is heighest.

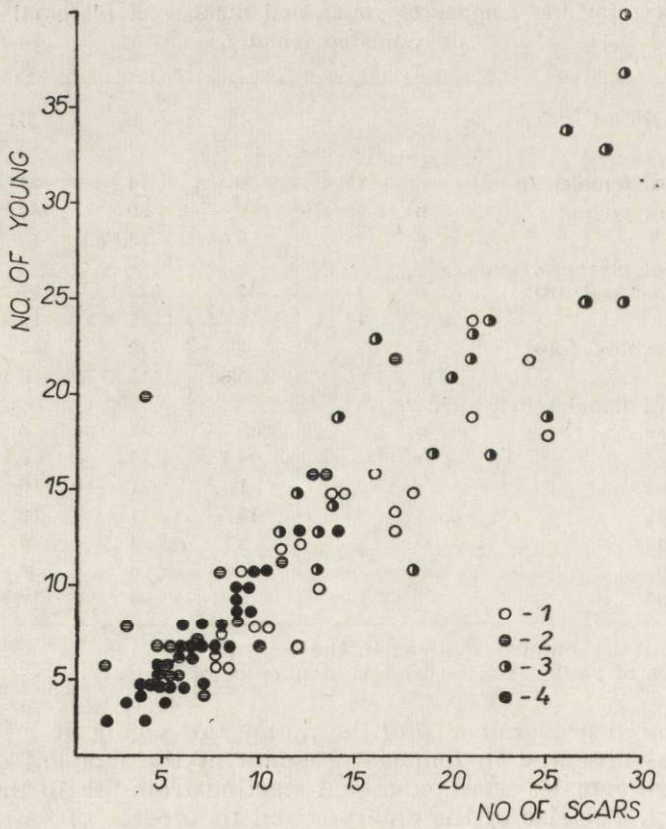

Fig. 1. Correlation between the number of placental scars and the number of young born by females which gave one litter (1), two litters (2), three litter (3), and one or two litters and being during successive pregnancy (4).

Examination of the correlation table (Fig. 1) reveals that when the number of scars does not exceed fifteen the correlation with the number of young is very close. In the nonpregnant females deviations do not exceed ±3 young with a tendency in the direction »in plus«; in the case of pregnant females maximal deviation is —4. Starting with the

second litter the accuracy of estimation depends to higher degree on the total number of young born to female than on the number of litters. In general however the coincidence between the number of young and the numbers of placental scars is of high order and the method may prove helpful in studies concerned with reproduction of wild mouse and, possibly other closely related species.

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THE EFFECT OF PRE-BAITING ON CAPTURES OF RODENTS*

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Four series of catches were made at two localities in Poland, on previously pre-baited and on unbaited study areas. Numbers of rodents caught were estimated from linear regression equation and compared using the Student's test. It was stated that pre-baiting does affect the results of catches.

I. INTRODUCTION

The investigations were aimed at ascertaining the effect of pre-baiting on the rate of removal of rodents when the Standard Minimum method is used (Grodziński, Pucek & Ryszkowski, 1966), and in particular whether more rodents are caught in a pre-baited than in an unbaited area, whether numbers assessed on the basis of captures are greater in a pre-baited than in an unbaited area.

The experiments were carried out in connection with the opinion expressed by Dr. Pelikán at the IBP symposium held at Jabłonna (1966), during which he stated that if mice are pre-baited in a certain area there may be more of them there in comparison with an area which had not been pre-baited (Pelikán, 1968). This may be due to greater immigration than emigration in the pre-baited area. The rodents may therefore tend to be more settled in a pre-baited area.

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