that natural radiation caused natural mutations, since their data on beta and gamma rays of radium, like the independent work on X-rays reported above, showed a proportionate relationship between dosage and mutation frequency. Stadler[4] on the basis of preliminary experiments on barley has tentatively reported an apparently similar relation between X-ray dosage and mutational effect. Still more recently Babcock and Collins[5] have reported preliminary results that point in the same direction, in that they find a difference in mutation frequency between two series of flies subjected to differing amounts of natural radiation which is 2.5 times its own probable error. The chance of occurrence of such an outcome if there were no real effect is 1 to 10. In their work, owing to the small numbers of mutations necessarily obtained with such dilute radiation, there can as yet be no question of showing a proportionality between mutation frequency and radiation. However, the concurrence of the evidence from all the above sources is noteworthy.

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OVARIAN CHANGES DURING PREGNANCY IN THE RAT

IN an earlier issue of SCIENCE, Nelson[1] reports the recurrence of oestrus cycles four days in length with copulation taking place at three of the oestrus periods in a pregnant white rat. Two instances of copulation during pregnancy had been reported by Long and Evans,[2] though no evidences of the normal oestrus cycle were noted. In the later report no attempt was made to determine the occurrence of ovulation.

In a preliminary communication[3] we have noted the occurrence of ovogenesis during adult life in the mammalia as a rhythmical production which coincides with the rhythm of the oestrus cycle. In each oestrus cycle a new crop of follicles is formed and a few grow to maturity. At each oestrus period ovulation takes place, and all the other follicles degenerate within a short time thereafter. We have found that this cycle of ovogenesis in the rat is not interrupted by pregnancy, but continues throughout with the usual four or five-day periods. At the end of each period ripe follicles are present with many smaller follicles showing all stages of degeneration. With the beginning of the new cycle at the fifth, the tenth, the fourteenth and the eighteenth days, or thereabouts, newly formed corpora are found, some of which contain a segmenting ovum. These corpora are seldom more than a third of the size of the corpora of pregnancy, and are often much less than that. The number of large follicles produced at each cycle varied from two to twelve in the seventy-six rats that were examined at all stages of pregnancy from the third day to full term. The number of small corpora showed about the same range of variation though occasionally small follicles were luteinized.

No changes in the uterus corresponding to those of the non-pregnant oestrus cycle were observed. The living animals were not examined by means of the vaginal smear method. This has been done in hundreds of pregnant rats in our laboratory, however, without detecting the typical oestrus changes, though it has been noted for many years that at day five the smear loses its typical appearance, resembling a prooestrus smear, especially in the reduction in leucocytes, though it is not followed by cornified cells. In their studies of the uterus of pregnant rats, Long and Evans[2] found no evidence of cyclical changes. No eggs were found in the tubes, though comparatively few of the corpora showed a retained egg.

Twenty-three of these rats were tested for oestrus behavior by being placed in a cage with an active male on the fifth day. No evidences of oestrus were observed and copulation did not take place in a single instance, as shown by the absence of plug and sperm when examined on the following day.

There is no evidence in these animals that the corpora lutea of pregnancy have any effect on the production of a normal number of follicles and their maturation. The evidence also shows that the cervical stimulation of copulation at the beginning of pregnancy did not result in the delayed production of mature follicles, as these were present at the fifth day in eight rats. It also indicates that the presence of fairly large follicles in the ovary is not sufficient to produce oestrus changes in the uterus or oestrus behavior in the animal, although corpora lutea are actually developed from such follicles. Cyclical changes thus occur in the ovary during pregnancy, a condition which has hitherto been supposed to suspend those changes.

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