

**Local Inhibition by Lactation of chemically induced Breast Tumours in Mice of the IF Strain**

THE IF strain of mice, established by Bonser<sup>1</sup>, does not develop spontaneous breast tumours. However, it is very susceptible to the action of certain chemical carcinogens<sup>2,3</sup>, developing a high incidence of tumours of the skin or breast when the chemicals are administered in an appropriate way. Dmochowski and Orr<sup>4</sup> showed that breast tumours so induced lacked the virus-like mammary tumour agent.

In previous studies of IF mice given methylcholanthrene it was found that, while the incidence of palpable breast tumours induced in virgin and forced-bred (unsuckled) mice was of the order of 70 per cent, no breast tumours were obtained in breeding mice which were allowed to suckle their young, provided the first lactation had begun before the mice received their first treatment with the carcinogen<sup>5,6</sup>.

The experiment to be described here was performed in order to discover whether the inhibitory effect on induction of breast tumour of suckling the young was a direct local effect of lactation on the breasts concerned, or a result of the hormonal status of the lactating animals. The experiment was designed to provide breeding animals in which half the number of breasts would be suckled by young and the other half would not be suckled, though all would be subjected to the same hormonal influences. This was achieved by excising the nipples from the five breasts on one side only of 20 young adult IF female mice. The mice were then mated and allowed to breed freely, but the number of babies suckled was reduced to four if there were more than this number in a litter. After the first litter was born, eight fortnightly paintings of the mothers with 0.5 per cent methylcholanthrene in olive oil were begun, about 0.2 ml. being distributed over dorsal and ventral surfaces at each treatment. The mice were inspected once weekly for palpable tumours, and when these were large the animals were killed. At autopsy most of the palpable tumours were fixed and the pelts were removed and examined for non-palpable tumours. All suspicious lesions were removed for histological examination.

The mean survival of the 20 mice used from the first painting with methylcholanthrene was 28 weeks (range 19-45 weeks). The mean number of litters born after carcinogen treatment began was 3.15. Palpable breast tumours arose as subcutaneous lumps from the seventeenth week after the first painting with methylcholanthrene, many mice developing more than one. Some mice developed papillomas of the skin, and a few of these became malignant.

Table 1 shows the incidence of breast tumours in the mice. It will be seen that this was far greater in the non-lactating breasts. Only two palpable tumours were obtained on the lactating sides, whereas 31 palpable tumours were obtained on the non-lactating sides in 13 of the 20 mice. Almost all the tumours induced in this group of animals showed a very marked degree of squamous metaplasia. The two which arose on the lactating sides were entirely squamous, but it is considered that they may have arisen in breast tissue since they first appeared as subcutaneous lumps. The tumours with a marked squamous component grew more slowly than the typical adenocarcinomas with secretion which were

Table 1. THE INCIDENCE OF TUMOURS INDUCED BY METHYLCHOLANTHRENE IN BREAST TISSUE OF 20 IF MICE SUCKLED ON ONE SIDE ONLY

Breast tumours	Number of mice with tumours on suckled side	Number of mice with tumours on non-suckled side
Multiple palpable	0	10
Single palpable	2	3
Non-palpable	1	2
None	17	5
Total mice	20	20
Incidence of mice with palpable tumours	2/20 = 10 per cent	13/20 = 65 per cent

previously induced with methylcholanthrene in virgin or forced-breeding mice of this strain. From histological study of the non-palpable nodules found in these mice, it is considered that many of the tumours probably arose from foci of squamous epitheliosis in the breast tissue, similar to those described by Pullinger<sup>7</sup>.

The experiment described above indicates that the hormonal status of lactating animals is not responsible for inhibiting the chemical induction of breast tumours. The inhibition must, therefore, be a direct local effect of suckling on the breasts concerned. Further experiments are in progress to attempt to discover whether, or not, the inhibition by lactation results from excretion of the effective carcinogen in the milk.

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<sup>1</sup> Bonser, G. M., *J. Path. Bact.*, **46**, 581 (1938).

<sup>2</sup> Orr, J. W., *Acta Un. Internat. contre Cancr.*, **12**, 682 (1956).

<sup>3</sup> Jull, J. W., *Second Internat. Symp. Mammary Cancer, Perugia, 1957*, ed. by Severi, L., 423 (1958).

<sup>4</sup> Dmochowski, L., and Orr, J. W., *Brit. J. Cancer*, **3**, 520 (1949).

<sup>5</sup> Marchant, J., *J. Path. Bact.*, **70**, 415 (1955).

<sup>6</sup> Marchant, J., *Brit. J. Cancer*, **12**, 55 (1958).

<sup>7</sup> Pullinger, B. D., *Brit. J. Cancer*, **3**, 494 (1949).

**Increase of Viral Hæmagglutinability of Red Cells of the Mouse after Treatment with Formalin**

Clark and Nagler<sup>1</sup> found that the red cells of the mouse did not react very well with viral hæmagglutinin. Flick<sup>2,3</sup>, and later on Cox and Pirtle<sup>4</sup>, introduced the use of human red cells treated with formalin in the study of hæmagglutination by influenza virus. We found, while using formalin to stabilize the red cells of fowl and mouse for viral hæmagglutination, that the hæmagglutinability of those of the latter was considerably enhanced, particularly for certain types of influenza virus.

A slight modification of the method described by Cox and Pirtle<sup>4</sup> was used for preparing the preserved fowl cells and preserved mouse cells with a little modification. Mouse cells were obtained from pooled blood of a Swiss strain of mice. 100 ml. of citrated blood (with 1 per cent sodium citrate) was diluted with an