Education and science are not being neglected. In 1940 65,000 children in organized groups visited the Zoo and 45,000 visited the Aquarium. In 1941, for the first time, there will be a regular docent service available in the Zoo. Education can not be forced down the public's throat, and the pill will be sugar-coated. We thank the society and other forward-looking groups at the World's Fair for this lesson.

Research continues undiminished, with Dr. Breder's exploration of La Cueva Chica in Mexico, Dr. Beebe's 41st field expedition in Bermuda and the mass of routine research going on all the time behind the scenes which is never of public knowledge, but of tremendous public value.

To education, science and research it is gratifying to add art. There has been tremendous public interest in the few special exhibits held at the Zoo. Starting in October with amateur photography, in a contest in which nearly 800 enlarged prints were submitted for judgment, and continuing with one-man shows by two able young free-lance artists, the revitalized Museum of Heads and Horns attracted 20,000 interested visitors up to the end of the year.

I close with an expression of gratitude to the officers of the society for having provided me with the opportunity of continuing my public service along such thoroughly worthwhile lines, and hope that a year from now I may report on all manner of new things to bring us all definitely nearer to our objective of making the Zoo and Aquarium the finest in the world.

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SPECIAL ARTICLES

THE EFFECT OF AN EXTRA-CHROMOSOMAL INFLUENCE UPON TRANSPLANTED SPONTANEOUS TUMORS IN MICE

FOR several years we have had two strains of mice in our laboratory which were descended from animals that developed from fertilized ova transferred to the uteri of females of another stock. This work was done by Elizabeth Fekete, who made the transfers and developed the two strains of mice. Fertilized ova taken from JAX–dba mice were implanted into the uteri of pregnant JAX–C57 black females, and *vice versa*.[1] Unfortunately, the mice which themselves developed directly from the transferred ova are not at present available for tumor transplantation studies. However, the first to the tenth generations of inbred descendants from these mice have been employed in this study.

In order to determine what extra-chromosomal influence, if any, was exerted on the ova during their development in the uteri of females from unrelated strains, the descendants of the mice that developed from transferred ova received implants of transplantable tumors from each of the two stocks of mice employed. Two different transplantable tumors were used. One was originally an osteogenic sarcoma (L946A) which appeared spontaneously on the tail of a virgin JAX–C57 black female in 1936.[2] It now grows as a fibrosarcoma called L946AII. The other tumor (S91) is a malignant melanoma that originated spontaneously in 1937, in a JAX–dba female at the base of the tail. Both tumors show a high frequency of pulmonary metastases.

Since the work was preliminary, and the mice descended from transferred ova animals were available only in limited numbers for any one generation, the generations and ages were lumped together. However, the results are suggestive, as shown in Table 1. As is usually observed with pure strains of mice, samples of these stocks gave 100 per cent. of positive takes when inoculated with a tumor that arose spontaneously in a member of the stock inoculated. A sample of 300 JAX–C57 black mice all developed tumors when inoculated with L946AII, and similarly 200 JAX–dba animals were all positive to S91, the dba tumor. On the other hand, only 6 out of 52 black mice grew the dba tumor (S91) and 13 of the 52 dba mice were positive when inoculated with the black strain tumor (L946AII). When a pure strain mouse was descended from an ovum that had developed

TABLE 1

PURE STOCKS AND DESCENDANTS FROM TRANSFERRED OVA MICE INOCULATED WITH TWO TRANSPLANTABLE TUMORS

Tumors	JAX stocks inoculated			
	C57 black stock	dba stock	Descendants from black ova grown in dba	Descendants from dba ova grown in blk
L946AII from C57 black	300 = 300 + : 0 –	52 = 13 + :39 –	36 = 36 + : 0 –	107 = 55 + :52 –
S91 from dba	52 = 6 + :46 –	200 = 200 + : 0 –	71 = 26 + :45 –	46 = 46 + : 0 –

[1] G. Woolley, Elizabeth Fekete and C. C. Little, *Proc. Soc. Exp. Biol. and Med.*, 45: 796–798, 1940.

[2] A. M. Cloudman, *Proc. Soc. Exp. Biol. and Med.*, 37: 492–496, 1937.

within the uterus of another strain female the strain susceptibility, as shown by descendants of this mouse, was not altered toward a transplantable tumor from the mouse strain that developed the ovum. There was, however, a definite indication of an increased susceptibility for the tumor that came from the same mouse strain as was employed to protect and nourish the transferred ovum in its development.

The negative mice were kept for one year before they were discarded. Unfortunately, no negative mice were reinoculated. The reason was that the ultimate outcome of a single transplant of a tumor from an unrelated strain was difficult to determine in the pure stocks until considerable time had elapsed. Both of the tumors employed develop sizable masses in four to five weeks when implanted into the strain that originated them. However, many of the positive blacks with S91 implants showed no masses for several months following inoculation but had well established melanotic tumors at the end of one year. The descendants of transferred ova mice grew the tumors of unrelated strains at a faster rate than did the regular pure stock dba and C57 black mice.

Since the same female was used to foster each developing transferred ova mouse before and after birth, experiments are now under way to test the effect of foster nursing when taken alone. A considerable number of mice are being fostered, but finished data are available on only small numbers of mice as shown in Table 2. Here the JAX–A stock mice were

TABLE 2

TRANSPLANTATION OF TUMORS INTO FOSTERED MICE

Tumors	A stock	A stock young fostered by dba females	dba young fostered by black females
L946AII ..	0	0	5 = 5 + :0 – inoc. at 30 days
S91	6 = 0 + :6 –	4 = 4 + :0 – inoc. at 30 days 7 = 2 + :5 – inoc. at 60 days	5 = 5 + :0 –

fostered on JAX–dba females and JAX–dba young were fostered on JAX–C57 black females.

The six unfostered A stock mice inoculated with S91 first received implants at 30 days and were reinoculated at about 5 months. They were killed at the end of one year without any signs of tumor growth. The fostered A mice inoculated at 30 days all developed large masses and had extensive lung metastases. Where the mice were kept for 2 months before inoculation only two out of seven developed the transplanted tumors and these were delayed for a long time before developing. Unpublished data by Law show a similar result when he used older fostered mice to receive implants of tumors. This would indicate a lessening of the influence in older fostered mice.

In the above data where mixed ages were used for the descendants of transferred ova mice, a similar age influence may have been in operation. The non-transferred pure stock mice were all about 30 days of age when inoculated.

There appears to be an extra-chromosomal influence exerted by the foster female upon the ova of other stock females implanted into the uterus of such a female. One method of testing this influence by the use of transplantable tumors is described. The testing of the effects of foster nursing alone on transplantable tumors is under investigation.

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THE EFFECT OF FOSTER NURSING ON THE GROWTH OF A TRANSMISSIBLE LEUKEMIA IN MICE[1]

THE most extensive reports concerning the factors involved in susceptibility to transmissible leukemia[2,3] show that inoculated leukemic cells grow in practically 100 per cent. of mice of the susceptible inbred strain and in the first hybrid generation involving this strain. Leukemic cells fail completely to grow in mice of other unrelated or resistant strains. From the work that has been done the conclusion has been reached that susceptibility or non-susceptibility to leukemic tissue is dependent upon the relationship existing between the genetic constitution of both the host and the tumor cell. Only a very few exceptional inoculations, that is, negative inoculation in expected susceptible mice or positive inoculation in expected non-susceptible mice, have been recorded for the various types of transmissible neoplastic growths. These, however, have been adequately explained.[4]

The purpose of the present report is to record the behavior in transplantation of a lymphoid leukemia, line $\overline{LL}$ 449. This tumor was induced in ♀D2001, of the Jax dilute brown strain (D), subline 212 following painting with a 0.3 per cent. solution of 9:10 dimethyl-1:2 benzanthracene in benzene.[5] The carcinogen was applied to the back of the animal from occiput to mid-sacral region twice a week until tumor appearance. At 143 days following initial painting there appeared extreme bilateral axillary, cervical and inguinal lymphadenopathy. The animal appeared dyspneic and was killed *in extremis* a week

[1] The author is recipient of a Finney-Howell Foundation Medical Research Fellowship.

[2] E. C. MacDowell and M. N. Richter, *Jour. Cancer Research*, 14: 434, 1930.

[3] M. D. Schweitzer and J. Furth, *Am. Jour. Cancer*, 37: 224, 1939.

[4] John J. Bittner, *Jour. Genetics*, 31: 471, 1935.

[5] L. W. Law and Marjorie Lewisohn, *Proc. Soc. Exp. Biol. and Med.*, 43: 143, 1940.