M. Swartz and C. A. Bonine, of the Pennsylvania State College; Dr. C. R. Fettke, of the Carnegie Institute of Technology; R. F. Myers, of Muhlenberg College, and Dr. Parke A. Dickey, of the Pennsylvania Survey. E. A. Munyan, of Charleston, W. Va., showed lantern slides of the ninth conference, which was held in West Virginia in 1939.

On Saturday the group was led by R. M. Foose and M. N. Shaffner through the gorge of the Conemaugh River which cuts across the axis of the Laurel Hill anticline exposing all the rocks of the Allegheny, Pottsville and Mississippian series, and the Upper Devonian strata. Of particular interest was the almost continuous section of rocks from the base of the Pottsville series to the Catskill red beds of the Devonian at the northwest end of the gorge. The group was entertained at supper that evening at the home of Mr. and Mrs. Crichton at Westmont.

The trip on Sunday morning was led by Dr. F. M. Swartz. The party drove eastward over the Allegheny Plateau, crossing rocks of the Coal Measures, and descended the Front east of Portage seeing sections of the Mississippian, Devonian, Silurian and Upper Ordovician Systems. The party disbanded near Altoona.

M. N. SHAFFNER,
Secretary

SPECIAL ARTICLES

PREVENTION OF TUMOR GROWTH (CARCINOMA 2163) BY INTRAVENOUS INJECTIONS OF YEAST AND VITAMINS

IN 1937 Kinosita,[1] using dimethylaminoazobenzene (butter yellow), produced liver cancer in rats. Ando[2] reported that the addition of yeast to a butter yellow-rice diet reduced the incidence of liver cancer.

In 1939 Nakahara and his co-workers[3] reported that Vitamins (B_1, B_6, nicotinic acid) and their combinations as well as liver eluate and liver-filtrate had no effect on the development of liver cancer.

In 1941 Sugiura and Rhoads[4] showed that they could prevent liver cancers in rats which had been fed butter yellow when a diet of unpolished rice was mixed with 15 per cent. of brewer's yeast.

Recently Rhoads and his co-workers[5] have demonstrated that riboflavin mixed with casein substantially protects the rats against liver cancers. When either riboflavin or casein alone was added to the diet, the incidence of liver cancer was reduced from 100 per cent. to 70–80 per cent. When both substances were added simultaneously to the diet, the incidence of malignancy was reduced to 3 per cent.

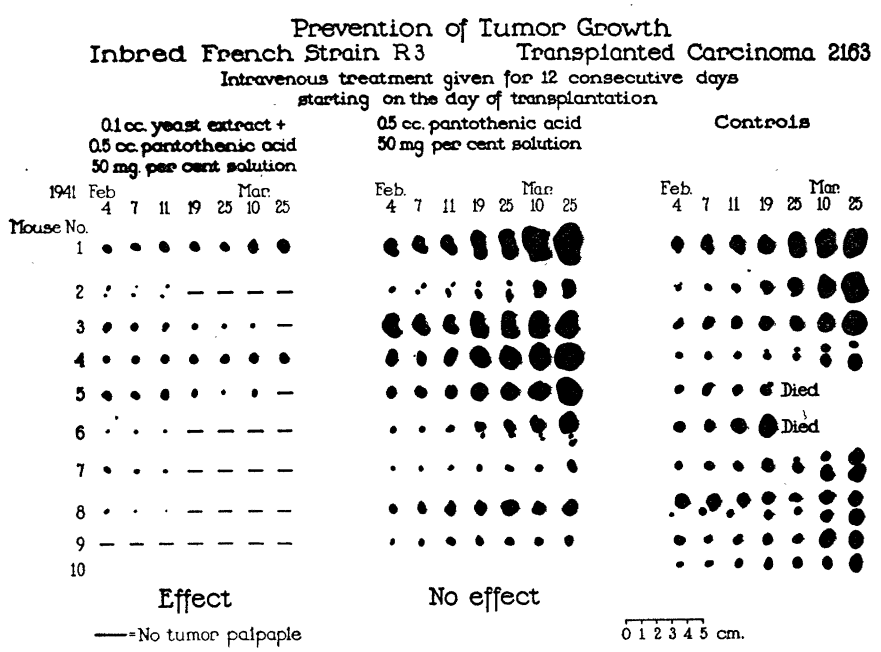

FIG. 1

[1] R. Kinosita, *Trans. Soc. Path. Jap.*, 27: 665, 1937.
[2] T. Ando, *Gann*, 32: 252, 1938.
[3] W. Nakahara, T. Fujiwara and K. Mori, *Gann*, 33: 406–427, 1938.
[4] K. Sugiura and C. P. Rhoads, *Cancer Research*, 1: 3–16, 1941.
[5] C. I. Kensler, K. Sugiura, N. F. Young, C. R. Halter and C. P. Rhoads, SCIENCE, 93: 308–310, 1941.

In 1938 Maisin and Pourboix[6] had shown that by feeding of yeast they could reduce the percentage of tumors produced by carcinogenic substances.

Since then two papers[7, 8] have been published from this laboratory demonstrating the complete disappearance of spontaneous mammary carcinomas in 30 per cent. of the treated mice following intravenous injections of a watery yeast extract.

In a set of experiments which are the basis of this brief report we tried to influence the takes of a transplanted Carcinoma 2163 in the R III strain. This tumor is a mammary adenocarcinoma which in this laboratory was found to be transplantable in 95 to 100 per cent. of animals of this strain, the strain in which it arose. In our experience this carcinoma has proved very resistant to treatment.

TABLE I

PREVENTION OF TUMOR GROWTH. INBRED FRENCH STRAIN R III. TRANSPLANTED CARCINOMA 2163*

	No. of animals	Non-takes	Takes
Yeast and pantothenic acid	40	19 (47.5 per cent.)	21
Yeast	30	6 (20 per cent.)	24
Pantothenic acid	40	1 (2.5 per cent.)	39
Controls	40	2 (5 per cent.)	38

* In the first two experiments (20 animals) the intravenous treatment was started on the day of the transplantation and continued for 10 consecutive days. Since then in these prevention-experiments the intravenous treatment was given on 10 consecutive days and stopped on the day of transplantation.

The yeast extract for the prevention experiments was prepared as described originally[7] and was given intravenously in doses of 0.1 ccm (containing 4 mg of dry matter). 0.5 ccm pantothenic acid (calcium panthothenate dextrorotary) of a 50 mgm per cent. solution was administered intravenously. 0.5 ccm thiamin of a 50 mgm per cent. solution was used for intravenous application. We obtained these substances through the courtesy of Messrs. Merck and Company.

TABLE 2

PREVENTION OF TUMOR GROWTH. INBRED FRENCH STRAIN R III. TRANSPLANTED CARCINOMA 2163*

	No. of animals	Non-takes	Takes
Yeast + Riboflavin	29	18 (62 per cent.)	11
Yeast	28	6 (4 per cent.)	22
Riboflavin	29	4 (14 per cent.)	25
Yeast + Thiamin	28	5 (20 per cent.)	23
Thiamin	29	1 (4 per cent.)	28
Controls	29	.....	29

* [illegible] for 10 consecutive days be- [illegible] were stopped on the day of [illegible]

[6] J. Maisin and Y. Pourboix, *Comptes rend, Soc. biol.*, 127: 1477, 1938.

[7] R. Lewisohn, C. Leuchtenberger, R. Leuchtenberger and D. Laszlo, *Proc. Soc. Exp. Biol. and Med.*, 43: 558–561, 1940.

[8] R. Lewisohn, C. Leuchtenberger, R. Leuchtenberger and D. Laszlo, *Am. Jour. Path.*, 17: 251–260, 1941.

The accompanying charts demonstrate the effects of yeast, different vitamins and combinations of these substances on the prevention of tumor-growth. It is evident that the vitamins (pantothenic acid, riboflavin and thiamin) alone have none or very little effect on tumor growth. Yeast alone prevents tumor growth in about 20 per cent. only. This tumor-preventing effect of yeast was markedly improved by adding pantothenic acid (non-takes 47 per cent.) or riboflavin (non-takes 62 per cent.) to the yeast extract. Addition of thiamin to the yeast extract did not improve the tumor-preventing action.

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EFFECTS OF VITAMIN B_1 ON WOODY EROSION-CONTROL PLANTS[1]

RECENTLY there has been considerable interest in the use of vitamin B_1 for stimulating plant growth. The results reported here are concerned with the relation of added vitamin B_1 (thiamin chloride) to the survival and growth rate of young woody erosion-control plants in the field. By a woody erosion-control plant is meant one that possesses to a high degree the ability to withstand indifferent handling, drought, adverse soil conditions and vigorous competition. For deciduous erosion-control plants, these requirements are best realized by planting seedlings with strong taproots that are large in proportion to the size of the tops and that contain much stored food.

Plantings were made at two locations: (1) On recent sandy alluvial soil in an intermontane valley in the Santa Rosa Mountains, in Riverside County, California. The Santa Rosa planting is in a mountainous mediterranean climate. (2) On primary heavy grassland soil near Capistrano, Orange County, California. The Capistrano planting is in a coastal mediterranean climate, with moderately cool summers. Precipitation during the experimental period was at or above normal.

Seedlings were planted in natural soil in holes dug by shovels to a depth just sufficient to accommodate roots without bending. Soil was filled back into holes and tamped by shovel and by hand. Around each plant a ring of soil was thrown up to form a basin; subsequent waterings were made in these basins from tank wagons. At Capistrano domestic tap water was used; at Santa Rosa water from a surface reservoir was used. Where vitamin B_1 was used in the experi-

[1] Field and clerical assistance was furnished by the Works Projects Administration.