wheat germ (Table II, 15 and 18). Thus far, extracts were prepared only from pearled barley and malted barley. Intravenous injections of pearled barley of 0.1 cc corresponding to 1.2 mg solids showed an inhibitory effect similar to 5.25 mg of the standard when groups of animals were kept on normal diets. Extracts from malted barley were ineffective (Table III). At present no conclusions can be drawn as to the quantities of tumor growth inhibitors in the different grains. Experiments for the quantitative determination and chemical characterization of these factors are in progress.

Summary. Tumor growth-inhibiting substances are demonstrated in various grains with the aid of a rapid test on Sarcoma 180. They are effective by feeding in combination with injections of a standard solution of yeast extracts. Extracts of these grains are effective upon intravenous injection.

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Treatment of Spontaneous Breast Cancers in Mice with Pearled Barley.*

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We have presented in previous papers[1,2,3,4] our results with intravenous injections of yeast extract in the treatment of spontaneous breast adenocarcinomas in mice. We reported complete disappearance of these tumors in 30% of the animals, if the tumors were not of excessive size. In our last publication[4] we reported that by combining the injections of yeast extract with the feeding of polished rice we were able to double the percentage of complete regressions and to get these results not only in small tumors, but in tumors of considerable size.

We mentioned in this paper that since the preparation of beer had been changed, due to the exigencies of the war, successful results could be obtained only with a yeast extract prepared from bock beer, as bock beer was still prepared according to the old technic. Bock beer is prepared only once a year.

We were planning to prepare a large quantity of this extract when we were informed that the breweries had decided to discontinue the manufacture of bock beer for the duration of the war. Thus we were forced to abandon the use of yeast extract and to search for other sources of tumor growth-inhibiting substances.

In the preceding paper[5] we demonstrated on the growth-rate of a transplanted tumor (Sarcoma 180) an increased inhibitory effect, resulting from the combination of a polished rice diet and intravenous injections of yeast extract. From observations with other diets it was evident that this effect is not due to a deficiency in the diet. Furthermore it was possible to extract a factor from the rice which inhibited tumor growth when injected intravenously. As feeding experiments and injections of extract of pearled barley gave a similar inhibition of tumor growth in the rapid test, we tested the influence of pearled barley on spontaneous tumors.

In this preliminary report we shall present results obtained by treating mice with intravenous injections of pearled barley extract and a diet of pearled barley or polished rice.

The pearled barley extract is prepared in

1 Lewisohn, R., Leuchtenberger, C., Leuchtenberger, R., and Laszlo, D., PROC. SOC. EXP. BIOL. AND MED., 1940, **43**, 558.

2 Lewisohn, R., Leuchtenberger, C., Leuchtenberger, R., and Laszlo, D., *Am. J. Path.*, 1941, **17**, 251.

3 Lewisohn, R., Leuchtenberger, C., Leuchtenberger, R., Laszlo, D., and Bloch, K., *Cancer Research*, 1941, **1**, 799.

4 Lewisohn, R., Leuchtenberger, C., Leuchtenberger, R., Laszlo, D., and Dische, Z., *Cancer Research*, 1942, **2**, 218.

5 Lewisohn, R., Laszlo, D., Leuchtenberger, C., Leuchtenberger, R., and Dische, Z., PROC. SOC. EXP. BIOL. AND MED., 1943, **52**, 269.

the following manner:

To 100 g barley ("Albers Pearled Barley") 1500 cc distilled water plus 0.15 cc glacial acetic acid are added. The mixture is stirred, heated rapidly to 100° and boiled for 7 minutes. The supernatant fluid is separated by decantation from the barley, is cooled to room temperature and precipitated without concentration at 50% ethanol. It is kept in an ice-box overnight and filtered off. The filtrate is freed from ethanol in vacuum and concentrated to 30 cc. The turbid concentrate is filtered through a sterile Seitz-filter and poured into sterile ampoules. About 2.5% of the barley solids are extracted.

0.1 cc is injected intravenously every day, and injections must be continued until the tumors have disappeared completely.

The animals are fed pearl barley and carrots. After the tumors have disappeared, the mice are put back on the ordinary diet of pellets from the Rockland Farms and carrots.

We use in our work 3 different types of mice, the strain A and the Swiss strain from the Jackson Memorial Laboratory, and tumor mice obtained from the Rockland Farms.

Before the treatment is started the diagnosis of malignancy is established by a biopsy.

During the course of the treatment the average loss of weight of the animals was 5 g. However, the beneficial effect of this diet on tumor growth should not be ascribed to a deficiency in the diet.[5] Evidently the diet contains substances which inhibit tumor growth. Only the combination of the pearled barley diet with intravenous injections of barley extract effects a rapid disappearance even of large tumors in about one-half of the animals.

That diet alone is not sufficient to cause complete regression of tumor growth has been reported in a previous paper. Fifty controls received polished rice and carrots as a diet, but were not treated intravenously. In none of these animals did the tumors disappear. On the contrary, most of the animals showed a very rapid tumor growth.

The changes which occur in these tumors following this combined treatment are striking. After a few treatments hemorrhagic tumors show a whitish color. Hard tumors change to a soft consistency. In many cases the whole tumor is expelled, leaving a flat cavity which heals completely after a few days.

Detailed macroscopic and microscopic descriptions of these changes will be presented in a subsequent publication.

Among 46 spontaneous breast adenocarcinomas 19 tumors regressed completely.

At present we have a set of animals under observation in which pearled barley is replaced by brown barley, both in the diet and in the extracts for the intravenous therapy.