

# THE EFFECT OF IRRADIATED ERGOSTEROL AND INCREASED CALCIUM ON GROWTH OF TUMOR TISSUE

ALFRED GOERNER

*(From the Department of Bio-chemistry, The Long Island College Hospital)*

In the preceding paper (1) the interest displayed by various workers in the rôle played by calcium in tumor growth was briefly discussed. It was also shown that injections of a potent parathyroid extract would increase the blood calcium fifty per cent above the normal, with a subsequent increase of calcium in the ash of Flexner rat carcinoma. However, this increased calcium in the circulating blood did not inhibit the growth of the tumor but rather enhanced it, and a number of multiple metastatic tumors were observed.

It occurred to the author that inasmuch as irradiated ergosterol produces a deposition of calcium in certain tissues, it would be of interest to study the effect of this vitamin on the growth and calcium content of tumor tissue. Kreitmair and Moll (2) have described the pathological changes produced by "enormous doses" of irradiated ergosterol. Collazo, Rubino and Varela (3) have observed the fatal results of overdosage, as have also Harris and Moore (4) and Light, Miller and Frey (5). These facts led to the adoption of a dosage which would be many times the ordinary amount given but not so great as to be fatal.

## EXPERIMENTAL

Purified ergosterol was irradiated by means of an ultra-violet lamp of the mercury arc type using the technic of Bills, Honeywell and Cox (6) in order to secure the maximum activity of the product. The properties of the compound conformed with those described by Bills and Honeywell (7). This method of irradiation is superior to that of cathode ray exposure as outlined by Knudson and Moore (8).

The tumor selected for study was the Flexner rat carcinoma inasmuch as this showed the most marked effect with parathyroid hormone. A series of twelve rats of the Douredoure strain weighing from 120 to 130 grams were inoculated with small fragments of tumor tissue. When the tumors had reached the size of about one centimeter in diameter the animals were divided into two groups. One group received daily subcutaneous injections of ten milligrams of irradiated ergosterol dissolved in one cubic centimeter of olive oil. The second group were injected daily with the same amount of the pure oil. The weights of the animals, the size of the tumors, and finally the analysis of the tumor ash were recorded. The tumors were removed for analysis at the end of three weeks of treatment with the vitamin.

The weights of the animals receiving the irradiated ergosterol decreased steadily for the first week and after that remained fairly constant. There was no noticeable difference in the rate of tumor growth in the two groups of animals.

On removal of the tumors the ash and calcium content were determined by methods described in a preceding paper (1). The results of these analyses are tabulated below.

*Analysis of Tumors (Flexner Rat Carcinoma) from Animals Receiving Irradiated Ergosterol*

Weight of tumor in grams	Ash, grams	Ash per 100 gm. of tumor	Calcium, mg.	% Calcium in ash
9.10	.0826	.91	5.5	6.6
10.51	.1019	.97	6.0	5.9
8.62	.0724	.84	5.9	8.1
19.01	.1977	1.04	14.4	7.3
13.03	.1277	.98	4.9	3.8
7.95	.0716	.90	3.7	5.1

*Analysis of Tumors from Animals Receiving Pure Olive Oil (Control)*

Weight of tumor in grams	Ash, grams	Ash per 100 gm. of tumor	Calcium, mg.	% Calcium in ash
3.50	.0345	.99	2.6	7.5
8.76	.0771	.88	2.4	3.1
11.95	.1231	1.03	7.0	5.7
4.67	.0388	.83	2.5	6.4
7.83	.0619	.79	2.8	4.5
12.04	.1216	1.01	8.9	7.3

Averages	Gms. Ash per 100 Gms. Tumor	% Calcium in Tumor Ash
Vitamin D treated . . . . .	.94	6.1
Control tumors . . . . .	.92	5.7

It is evident that the two series of animals showed no appreciable difference in the amount of calcium in the tumor ash nor in the amount of ash in the tumor, when these are averaged and compared on a percentage basis.

#### SUMMARY

1. The effect of irradiated ergosterol has been studied on the rate of growth of Flexner rat carcinoma and on the deposition of calcium in the tumor.

2. No difference in rate of tumor growth was observed in the treated and untreated groups of animals.

3. There was no appreciable difference in the deposition of calcium in the tumors of the treated and untreated animals, nor a difference in the ash content of tumors of the two series.

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