

## SELENIUM AND LUNG TUMORS<sup>1</sup>

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Four of six male rats, that had been receiving a seleniferous diet for fifteen months, showed evidences of lung neoplasms. Pathological livers characteristic of selenosis, were also observed in these animals whereas the control animals were free of tissue damage.

The objective of this project was to repeat the above work with a greater number of animals and to determine if naturally-occurring, orally-ingested selenium might be a causative agent for lung tumors.

### EXPERIMENTAL

Thirty-five male rats weighing approximately 150 grams each were placed on a diet containing nineteen parts per million (p.p.m.) of selenium. The control groups consisted of fifteen male rats.

The control diet had the following composition:

Control wheat	84.25 per cent
Casein <sup>2</sup>	10.00
Salt mix (1)	1.00
Yeast <sup>3</sup>	1.00
Lard	3.00
A and D feeding oil <sup>4</sup>	0.75

The toxic diet differed from the control only in that seleniferous wheat (containing 23 p.p.m. of selenium) was substituted for the control wheat. Food and water were given *ad libitum*. The animals were kept on screen bottoms and were weighed twice a week.

After sixteen months the animals were killed and examined macroscopically, and histologically (when found necessary) for lung tumors. Animals that died during the experiment were examined in like manner.

### RESULTS

Figure 1 shows the average weight record of each group. Not only the greater number of deaths but also the inhibited growth of the selenium-fed group showed that selenium was at a sufficient concentration (19 p.p.m.) to produce the typical signs of selenosis (2). Au-

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<sup>2</sup>B-3-F Casein (not vitamin free) prepared by Casein Company of America, New York, N. Y.

<sup>3</sup>Type 50-B produced by Standard Brands Incorporated, New York, N. Y.

<sup>4</sup>Three thousand I. U. of vitamin A and 400 I. U. of vitamin D per gram.

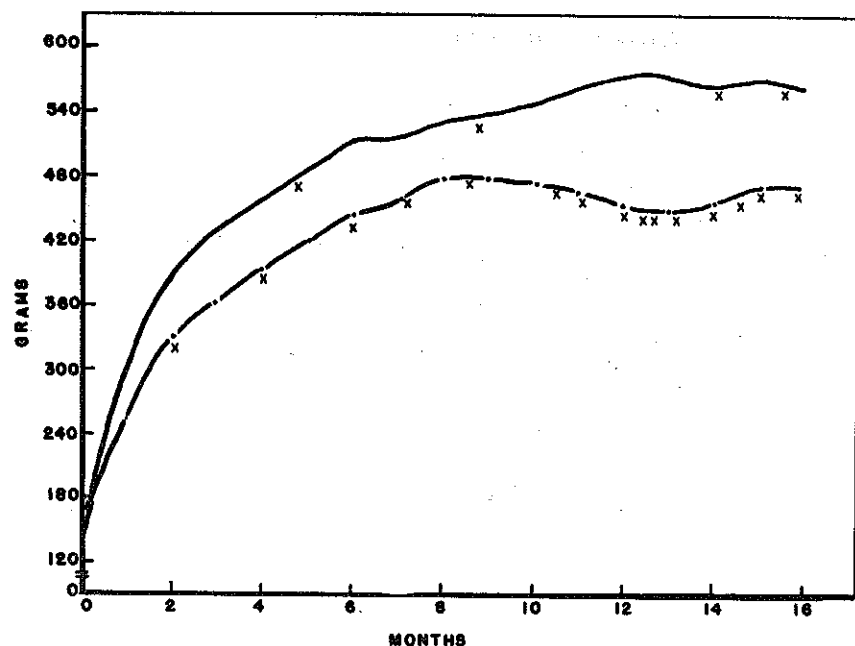


Figure 1. Average weight record of control group (upper graph) and of the selenium-fed group (lower graph). The symbol "x" marks the approximate time of the death of an animal during the experiment.

topsies showed severely damaged livers, that is, atrophy, cirrhosis, and large necrotic areas. However, no lung tumors were found. Indications of pneumonia were observed in both groups.

Five animals showed the condition in which one lung, usually the left, was about half as large as a normal lung. Examination of these atrophied lungs histologically by Dr. G. S. Harshfield of this college showed evidences of jaagsieke (3).

#### DISCUSSION

Apparently the small glistening-white nodules found in the lungs of the first series of rats were not neoplasms. They were likely results of bronchitis or pneumonia.

Selenium has been shown to be carcinogenic in rats but the liver was the organ involved. Nelson et al., (4), feeding seleniferous corn or wheat or a mixed inorganic selenide at 10 p.p.m. of Se for 18 to 24 months, reported adenomas or low grade carcinomas in cirrhotic livers. Aside from noting the severely damaged livers, no microscopic examination was made of the livers from the animals in this experiment.

Concurrent studies were made concerning the nature of the volatile selenium compounds exhaled by the selenium-fed animals and the results will be published separately. Apparently these materials, if they are carcinogenic, require a longer period of time than 16 months to produce tumors.

#### CONCLUSIONS

Rats receiving orally a diet containing 19 p.p.m. of naturally-occurring selenium for 16 months did not show lung tumors.

Evidence of a condition similar to a sheep disease-jaagsieke was noted in several of the animals.

It is concluded that selenium does not produce lung tumors under the conditions of this experiment.

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