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Effect of Thiouracil on Growing Swine.*

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Hypothyroidism, a condition associated with a decrease in the metabolic rate and with obesity, would conceivably be desirable in animals that were being fitted for market. Andrews and Bullard¹ reported rapid fattening and gain in weight following partial thyroidectomy of steers. In this case the rapid gains may have been partly due to compensation for the loss of weight immediately following the operation as well as to the decreased metabolic rate. The goitrogenic effect of a large number of substances related to thiourea has been demonstrated by Richter and Clisby² and also by Kennedy.³ Astwood⁴ found that thiouracil is also very effective in lowering the metabolic rate. These earlier workers were not concerned with economy of gains in their experimental animals but Kempster and Turner⁵ reported that the feeding of thiouracil to broiler chicks for 36 days reduced the rate of growth and increased the amount of feed required to produce a pound of gain. The purpose of this investigation was to study the effect of thiouracil upon the economy of gain in swine.

Experimental. The animals were Chester White and Poland China crossbred pigs, paired according to weight, sex, age, and type. Whenever the pairs were of unequal weight the heavier pigs were placed in the control pen.

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¹ Andrews, F. N., and Bullard, J. F., *Proc. Am. Soc. An. Prod.*, 1940, p. 112.

² Richter, C. P., and Clisby, K. H., *Arch. Path.*, 1942, **33**, 46.

³ Kennedy, T. H., *Nature*, 1942, **150**, 233.

⁴ Astwood, E. B., *J. A. M. A.*, 1943, **122**, 78.

⁵ Kempster, H. L., and Turner, C. W., *Poultry Science*, 1945, **24**, 94.

The control ration was made up of: 60 parts corn, 13 parts wheat, 10 parts tankage, 10 parts soybean oil meal, 5 parts alfalfa meal, and 2 parts mineral, by weight. The test ration was the same except for the addition of 0.2% of thiouracil. The animals were hand-fed twice daily and the control and test animals were given the same amount of feed per pig per day. This was less than the control group would have voluntarily eaten but was approximately *ad lib.* feeding for the test animals. The amount of feed consumed and the gains in weight are shown in Table I.

Analysis of variance by the method described by Snedecor⁶ shows that the differences were highly significant. The uneconomical gains in Group I (Table I) are partially due to the poor quality of the corn that it was necessary to use at the time. The very rapid and economical gains reported in Group II were due to the fact that these animals had been somewhat underfed during the month before the experimental period started. All of the animals in Group III had previously been on another experiment and they had received some thiourea before being placed in the trials referred to in Table I. The previous management of the animals in Group IV had been in accord with recommended practices.

Discussion. Table I summarizes some of the effects of thiouracil on the utilization of food by swine. When the consumption of food and of energy was the same, the animals which received thiouracil gained more rapidly in weight than did the controls. In other words, they required less food per unit of gain.

The controls had a much better appetite than did the test animals and they would have consumed a much larger quantity of food if it had been available. A higher feed intake

⁶ Snedecor, G. W., *Calculation and Interpretation of Analysis of Variance and Covariance*, Collegiate Press, Inc., Ames, Iowa, 1934.

TABLE I.
Effects of Thiouracil upon the Economy of Gain of Swine.

Groups	Treatment	No. of animals	Initial wt (lbs)	Wt after 28 days (lbs)	Gain (lbs)	Avg daily gain (lbs)	Feed consumed (lbs)	Lbs feed/100 lbs gain
I	Control	3	152	188	36	1.3	231	642
	Treated*	2	151	210	59	2.1	231	392
II	Control	3	149	203	54	1.9	198	367
	Treated*	3	120	196	76	2.7	198	261
III	Control	4	143	178	35	1.3	143	409
	Treated*	4	137	191	54	1.9	143	265
IV	Control	7	71	99	28	1.0	112	400
	Treated*	4	70	120	50	1.8	112	224
Combined I, II, III and IV	Control	17	129	167	38	1.4	183	482
	Treated*	13	120	179	59	2.1	183	310

*.2% of ration was thiouracil, kindly furnished by Lederle Laboratories.

would have increased the rate of gain but it is highly improbable that the rate of gain, or the gain per unit of feed consumed, would ever have been higher than that of the thiouracil-fed pigs. A daily gain of 2.03 lb on an unrestricted diet was observed by Hogan *et al.*⁷ which is as high as has ever been reported in the literature that has come to our attention, and is of the same order as the gains made by the thiouracil-fed pigs. However, the pigs on the unrestricted diet required 3.39 lb of feed per pound gained, which is less than was required by our controls, but was more than was required by the pigs which received thiouracil.

Although the animals which received thiouracil gained more than the controls the increased gain was not true growth. The heavier thiouracil-fed pigs were wider, shorter, and not as tall as the controls. They were apparently an example of retarded growth with rapid gains in weight due to deposition of an excessive amount of fat. The low cost of gains by the treated swine is probably due to the lower metabolic rate observed by Astwood.⁴ It was also noted that the controls

were much more active than the test animals. The treated animals seemed to sleep a greater portion of the time while the controls were active, which would also be a factor in the difference in cost of gain. This is in agreement with the observations of Andrews and Bullard¹ on steers, but the results on the swine are independent of an immediate loss in weight from surgical shock.

Our results are not concordant with those of Kempster and Turner⁵ who observed that thiouracil increased the feed intake and decreased the gain in weight of growing chickens. The different effects produced by this drug on different species and under varying conditions within a species make additional investigations in this field desirable. These should include the length of time thiouracil is retained in the tissues and the possibility that if thiouracil-fed animals were slaughtered too soon their flesh would be unsuitable for human food.

Summary. 1. Four groups of swine were pair-fed on rations which were identical except for the addition of 0.2% thiouracil to the ration of the test animals. 2. The test animals were less active, and after 28 days they were shorter and fatter than the controls. They gained weight more rapidly and more economically than did the controls.

⁷ Hogan, A. G., Weaver, L. A., Edinger, A. T., and Trowbridge, E. A., *Missouri Experiment Station Research Bulletin* 73.