was found to stimulate the growth of this culture *in vitro*. Again it should be pointed out that an equilibrium between growth and destruction rates of the test organisms was evident in the tissue even when large numbers of cells were injected. An attempt was made to study the effect of severity of the trauma on rate of growth of the test culture. However, the results revealed that differences in growth pattern of *E. coli* in the traumatized tissue as related to force applied to inflict the bruises (severe, medium or superficial) were slight.

The studies reported here demonstrate the persistence of *E. coli* in small numbers in traumatized tissue for 18 days, but the epidemiological significance of this observation is yet to be determined. It is also possible that the survival of bacteria in tissue could give rise to clinical disease as pointed out by Payne and Derbyshire(11).

Summary. A known number of *E. coli* K-12 cells was injected in bruised and normal poultry tissues and examined daily thereafter. Normal tissues completely eliminated 48×10^4 *E. coli* cells within 5 days but were unable to eliminate 12×10^8 cells within 8 days. However, the number of cells recovered decreased with time and very few cells were recovered on the 8th day. Regardless of the number of cells injected, the majority of bruised tissue stimulated and supported *E. coli* growth for one week. At the end of 18 days post-injection, a small percentage of bruised tissues still harbored the test culture. Although extrastromal hemoglobin stimulated *E. coli* growth, increasing the severity of the bruise (and therefore the amount of blood in this tissue) did not affect *E. coli* growth significantly.

1. McCarthy, P. A., Brown, W., Hamdy, M. K., J. Food Sci., 1963, v28, 245.

2. Hamdy, M. K., Barton, N. D., Brown, W. E., Appl. Microbiol., 1964, v12, 464.

3. Hamdy, M. K., Barton, N. D., ibid., 1965, v13, 15.

4. Hamdy, M. K., May, K. N., Powers, J. J., Poultry Sci., 1961, v40, 790.

5. Shinowara, G. Y., Am. J. Clin. Pathol., 1954, v24, 696.

6. Price, K. E., Zolli, E., Jr., Hardie, W. B., Gallian, M. J., Poultry Sci., 1957, v36, 219.

7. Smibert, R. M., Faber, J. E., DeVolt, H. M., ibid., 1960, v39, 417.

8. Hirsch, J. G., Bacteriol. Rev., 1960, v24, 133.

9. Skarnes, R. C., Watson, D. W., ibid., 1957, v21, 273.

10. Gross, W. B., Am. J. Vet. Res., 1958, v71, 448.

11. Payne, J. M., Derbyshire, J. B., J. Path., Bacteriol., 1963, v85, 171.

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Effect of Triton* Ingestion on Fat Retention, Blood Lipids and Growth in Rats.† (31220)

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In an earlier study it was reported that absorption of fat was delayed when fat was fed with orally administered Triton(1). Serum lipid levels were found not to be elevated when a fat-Triton mixture was fed(2), and the lower serum lipid levels were explained by a decreased fat absorption as a result of a marked inhibition of lipolysis by pancreatic lipase in the presence of Triton.

If the Triton itself is not absorbed and it decreases the absorption of dietary fat, the intake of Triton along with a meal might serve as a means of reducing one's caloric intake by lowering fat absorption. Following fat retention during a definite period would provide important data as to whether and to

* Triton WR-1339 (oxyethylated tertiary octyl phenol formaldehyde polymer), Winthrop Laboratories, is a detergent which has been used as an aid in studying fat metabolism.

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TABLE I. Effect of Triton on Fat Retention Initially.

Diet	No. of rats	Total fat intake* (g)	Total fat excreted (g)	Total fat retained (g)	% Fat retention
		1st week			
Corn oil and 2% Triton†	10	21.0 ± 2.9‡	5.1 ± .1	14.8 ± .3	76.0 ± 6.2
Corn oil only	10	23.7 ± 3.9	2.1 ± .1	21.6 ± .4	91.2 ± 3.6
		At the end (12th week)			
Corn oil and 2% Triton†	5	31.4 ± 6.2	8.0 ± .1	23.4 ± .4	74.6 ± 3.2
Corn oil and 5% Triton	5	30.8 ± 5.6	8.9 ± .1	21.9 ± .7	71.1 ± 3.3
Corn oil only	10	28.5 ± 3.4	2.8 ± .1	25.7 ± .3	90.3 ± 3.0

* All values are averages. † Drinking water also contained 2% Triton. ‡ S.E.M. values.

what extent Triton might decrease fat retention.

However, it must be well established that Triton itself is not absorbed because it has been reported that the presence of Triton has an undesirable elevating effect on blood lipids when given intravenously(3-5). Determining the blood lipid levels and growth rate over an extended period might serve as a more precise method for deciding whether Triton is absorbed from the intestinal tract or affects the well-being of the rats. Hence in this investigation an attempt has been made to obtain further evidence regarding the effect of Triton on fat retention by determining the amount of fat retained in the body after its ingestion, also the effect of ingested Triton on growth as a measure of any toxic effect which might be produced.

Experimental. Twenty-five male albino rats (70-125 g) used in the present study were maintained for one week on commercial rat pellets§ prior to initiation of the experiment. The rats were divided into different groups and were fed the following diets. (I), Similar rat pellets throughout the experiment (5 rats) served as a control for other diets. The ground rat pellets were mixed with (II), 20% corn oil and 2% Triton in food and in drinking water (10 rats). After one month 5 rats on this diet were fed a diet containing the fat and 5% Triton. (No Triton was added to the rats' drinking water during this period.) Finally (III), 20% corn oil only (10 rats) which served as a control for the study of the effect of Triton on fat retention, blood levels and growth. At the end of 4 weeks the fat added to the diets was reduced to 10% so as to give a caloric intake of 30% fat since pellets contained 5% fat initially.

The amount of fat retained by the rats fed diets II and III was determined for a period of 7 days by feeding a known amount of diet and collecting the feces. The feces for the 7-day period were dried under a reduced pressure to constant weight, ground and extracted by a slight modification of the method of Augur *et al*(6) in which neutral fat was first extracted with Bloor's mixture and the residue was again dried, acidified with minimal amount of 50% H_2SO_4 and the fatty acids extracted with ether. Blood was collected from the rat's tail and used for the estimation of total esterified fatty acids (EFA) according to the method of Stern and Shapiro(7).

During the 12th week the regime of the first week was repeated in order that fat retention and EFA levels at that time could be determined. At this time rats on the diet containing 2% Triton (5 rats) were again provided water with 2% Triton.

Results and discussion. The effect of Triton on fat retention is shown in Table I. During the first week of the study the per cent fat retained was 76.0 and 91.2 in the rats on diets of corn oil with 2% Triton and with corn oil only. At the end of the study the per cent fat retention was 74.6, 71.0 and 90.3, respectively, in the rats on the diets: corn oil with 2% Triton, corn oil with 5% Triton, and corn oil only. Thus the ingestion of Triton with fat decreased the fat retention. The increase in Triton concentration in the food showed little, if any, change in fat retention. The Triton effect on blood lipids is summarized in Table II. The EFA levels

§ Uncle Johnny's BSD Laboratory Animal Diet contains not less than 26.00% protein 5% fat prepared by Uncle Johnny Mills, Houston, Texas.

TABLE II. Effect of Triton on Blood Lipids.

Diet	No. of rats	Initial EFA level*	Final EFA level
1. Rat pellets	5	9.97 ± .30†	9.95 ± .13
2. Corn oil and 2% Triton	5	9.71 ± .10	7.83 ± .10
3. Corn oil only	10	9.90 ± .10	8.40 ± .10
4. Corn oil and 5% Triton	5	10.05 ± .10	7.99 ± .11

* All values are averages, expressed as μEq per ml. † S.E.M. values.

TABLE III. Effect of Triton on Growth.

Diet	No. of rats	Initial wt (g)*	Final wt (g)	Growth per wk (g)
Rat pellets	5	71	391	26.7 ± 3.7†
Corn oil and 2% Triton	5	71	372	25.1 ± 1.3
Corn oil only	10	97	395	24.7 ± 3.9
Corn oil and 5% Triton	5	119	396	23.1 ± 3.2

* All values are averages. † S.E.M. values.

decreased from initial values of 9.71, 10.05, 9.90 and 9.97 to 7.83, 7.99, 8.40 and 9.95, respectively, in the rats on diets: corn oil with 2% Triton, corn oil 5% Triton, corn oil only and rat pellets. It appeared that the Triton was not absorbed from the intestinal tract since there was no increase in serum EFA levels. The feeding of polyunsaturated fatty acids appeared to decrease the level of the blood lipids in all cases.

The effect of Triton on growth of the experimental rats is shown in Table III. It is apparent that all the rats on various diets grew at almost the same rate. Average growth per week was 25.1, 23.1, 24.7 and 26.7 g, respectively, for the rats on the diets: corn oil with 2% Triton, corn oil with 5% Triton, corn oil only and rat pellets. The slightly smaller average gain of 23.1 and 24.7 g may be accounted for in that the initial weights were greater and a slightly decreased growth rate was to be expected (Table III). There appeared to be no toxic effect on the rats. Slightly more growth in the rats fed only the rat pellets might be due to the more balanced diet when the fat content was reduced.

No evidence was obtained to indicate that Triton was toxic or had any effect on the well-being of rats. Triton apparently was not absorbed from the intestinal tract and it did decrease fat retention about 15 to 20%.

Summary. The effect of Triton on fat retention, blood lipids and growth in rats was studied by determining the amount of fed fat retained in the body, EFA levels of blood and increase in body weight, respectively, after its ingestion along with fat over a 12-week period. It was observed that rats retained less fat in the body when they were fed a diet containing fat and Triton as against the rats which were fed a diet with fat but no added Triton. It appears that Triton does decrease fat retention. An increase in Triton concentration showed little, if any, change in per cent fat retention. EFA levels were decreased at the end of 12 weeks indicating that Triton itself was not absorbed from the intestinal tract but the feeding of polyunsaturated fatty acids did decrease the level of the blood lipids. Average growth per week in all the rats on the different diets was almost the same, which suggests that Triton has no toxic effect as indicated by normal growth and well-being of the rats.

1. Moore, W. T., Tidwell, H. C., McPherson, J. C., Am. J. Clin. Nutrition, 1965, v16, 135.
2. Tidwell, H. C., Moore, W. T., McPherson, J. C., J. Exp. Med., 1965, v118, 986.
3. Cornforth, J. W., Hart, P. D., Rees, R. J. W., Stock, J. A., Nature, 1951, v168, 150.
4. Friedman, M., Byers, S. O., J. Exp. Med., 1953, v97, 117.
5. Kellner, A., Correll, J. W., Ladd, A. T., ibid., 1951, v93, 373.
6. Augur, V., Rollman, H. S., Deuel, H. J., Jr., J. Nutrition, 1947, v33, 177.
7. Stern, I., Shapiro, B., J. Clin. Path., 1953, v6, 158.

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