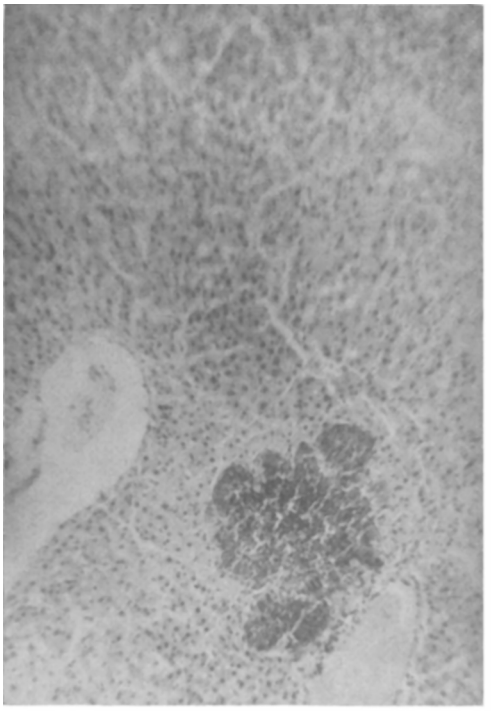

FIG. 1.
Rat liver: Typical focal necrosis and fatty degeneration following the administration of selenium in doses of 5 mg/kg for 10 days.

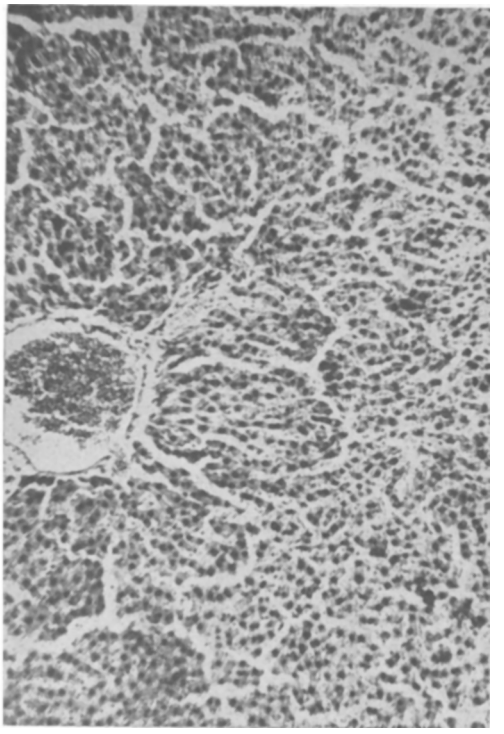

FIG. 2.
Rat liver: No abnormalities, following simultaneous administration of BAL 15 mg/kg and SS 5 mg/kg for 10 days.

of completely detoxifying the actions of SS.

It is now evident that BAL diminishes the toxicity of selenium for certain vital tissues and enhances the toxicity of the metal for the kidney. This corresponds to the findings of Gilman *et al.*,[3] who showed that cadmium becomes nephrotoxic with BAL. There are now evidently two such metals that have this property.

Our thanks are due Doctor R. L. Ferguson, Professor of Pathology, for reporting the microscopic findings in this paper.

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A Limited Feeding Regime for Rats.* (17377)

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For the past 5 years, a rat feeding regime has been in use by this laboratory which has proved so helpful under varied circumstances as to warrant this brief presentation. In carrying out metabolic research, some baseline of activity is needed. The definition of the "post-absorptive condition" has met this need in the human and dog, essentially daytime animals. However, the nocturnal feeding habits of the laboratory rat have led to the

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establishment of a 24-hour fast as the standard procedure, in which food is removed from the cage in the morning and the animals used the next morning. Considerable data have been accumulated on this preparation, and it will continue to be a very useful acute one. However, one great disadvantage of such a procedure is that it should not be repeated within a week if the animals are to be maintained in good condition. This restriction makes it impossible to study in each animal the time-curve of response to an experimental procedure and when used chronically over a period of weeks may seriously debilitate a high proportion of the rats.

Since rats learn readily, it was considered feasible to attempt to train them to consume their food from 5 to 10 P.M., so that they would be post-absorptive 15 hours later, 1 P.M. on the following day. Oxygen consumption or other metabolism studies could then be made from 1 to 5 p.m. without in any way interfering with the 5 to 10 feeding period for that day. The findings fulfulled the expectations.

Experimental. For most work in this laboratory, 4 adult rats are kept in a metal cage 20″ x 16″ x 12″. The food, in checkers about 1″ x 1″ x ½″ (Purina Dog Chow, Purina Laboratory Chow, Rockland Rat Diet), is fed from metal containers with the front and bottom out of ¼″ mesh hardware cloth. The animals have no trouble biting off pieces of about ⅛″ to ⅜″ in diameter, which they immediately eat from their own forepaws. These food checkers have also been ground to pass a 16 mesh screen and this fed from two open-top, cup-type containers per cage with equally satisfactory results. After removing the food containers, one should search the sawdust, paper strips, or other litter used on the floor of the cage for any stray pieces of food which could be consumed by the rats after the 10 P.M. deadline.

Oxygen consumption measurements were made in a modified Benedict[1] 4-unit closed-circuit apparatus.

Results and discussion. Twelve male and 12 female rats were placed on the feeding routine outlined when 120 days of age, while an equal number of littermate controls were kept on *ad lib* feeding. Fig. 1 reveals that these young adult animals were able to maintain their body weights after a preliminary period of about 2 weeks for adjustment to the schedule. Body weight measurements are

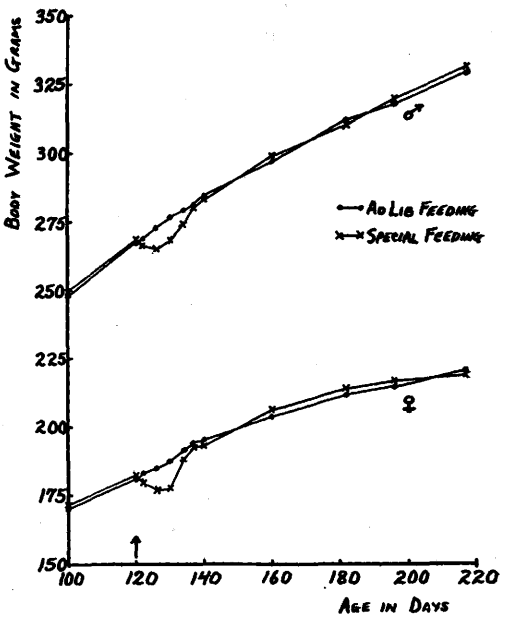

FIG. 1.
Body weight changes in rats placed on 5-hour feeding regime at 120 days of age.

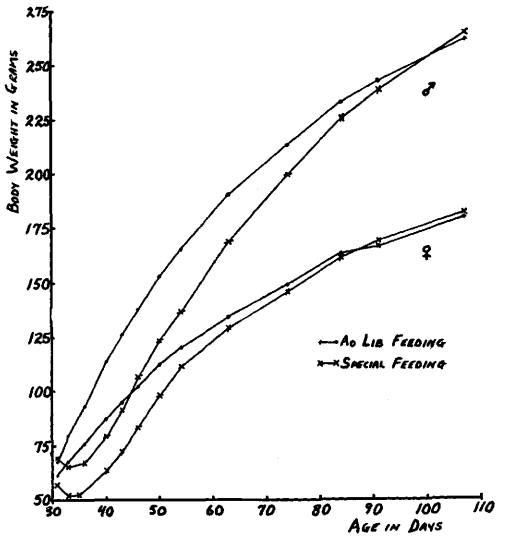

FIG. 2.
Growth curves of rats placed on 5-hour feeding regime upon weaning at 31 days of age.

[1] Benedict, F. G., *J. Nutrition*, 1930, **3**, 161.

TABLE I.
Metabolic Rates of Rats Fasted 24 Hours and of Rats on Special Feeding Regime.

	cc O_2/100 g/hr	
	24-hr fast	special regime
28 ♂	100.9	101.3
20 ♀	102.8	102.7
Avg of all 48	101.7 ± 4.66*	101.9 ± 4.82*

* Standard deviation.

probably more accurate when taken in the afternoon on this regime than on *ad lib* feeding, since occasional animals in the latter group eat during the daytime.

Even weanlings placed on the 5-hour feeding can eventually match the growth curves of littermates fed *ad lib*, as is shown in Fig. 2. In this experiment, groups of eight rats were weaned at 31 days of age from their mothers to ground rat food, available either *ad lib* or between 5 and 10 P.M. In these instances, the considerably longer time of nearly 2 months was required for complete readjustment, probably because of the increased requirements imposed by growth. Similar data are available for weanlings given their food in checker form.

Metabolic rates were compared in 48 adult rats, first after the conventional 24-hour fast, and then 3 to 6 weeks after being transferred to the limited feeding period regime. Table I shows that the two sets of oxygen consumption data were essentially identical. No apparatus was available for determining CO_2 production, so no R.Q.'s have been obtained for comparison. One would anticipate lower values after the extra 9 hours without food.

Although not shown because the results were not significantly different from those already discussed, 24 adult rats were trained to eat from noon to 5 P.M. so as to be ready for metabolism determinations at 8 A.M. on the next day. Even this remarkable alteration of habits, which essentially made daytime animals out of nocturnal ones, was successfully met.

Tepperman *et al.*[2] and Dickerson *et al.*[3] have shown that shortening the daily feeding time of rats to one hour resulted in such a distorted appetite in relation to caloric needs that the animals became obese. No such alteration in eating pattern has ever been observed in our animals. One may conclude from this that 5 hours' feeding time places no strain on the rat's ability to satisfy its appetite. No attempt was made to determine whether any of the alterations in carbohydrate metabolism noted by these authors could be shown to exist in our animals.

Summary. It has been found possible to train rats to eat their usual amounts of food in a 5-hour period, between 5 and 10 P.M. Fifteen hours later, at 1 P.M. on the following day, the animals are in a post-absorptive condition, prepared for a variety of metabolism studies.

The animals can be maintained indefinitely on this regime and the debilitating results of repeated periods of fasting for 24 hours can be avoided.

[2] Tepperman, J., Brobeck, J. R., and Long, C. N. H., *Yale J. Biol. Med.*, 1943, **15**, 855.

[3] Dickerson, V. C., Tepperman, J., and Long, C. N. H., *Yale J. Biol. Med.*, 1943, **15**, 875.

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