or no proliferative change, but the epithelium of the Bowman's capsule was often seen to be thickened; the capsular spaces contained much albuminous material and red blood cells. The tubular lumina were filled with an albuminous exudate, but the tubules themselves, as well as the interstitial tissues and blood vessels, were normal. The right kidney showed similar but somewhat less marked changes.

Summary. In a series of 9 dogs, an attempt was made to produce an experimental glomerulo-nephritis by the injection of horse serum into the left renal artery of previously sensitized animals. Functional studies failed to reveal any impairment as a result of the procedure, and pathologically no animal showed a real glomerulo-nephritis. In the kidneys of 2 dogs lesions were found which were the result of traumatization and infection respectively; in 2, minor changes were noted, as just described, whose relation to the procedure of the experiment is uncertain; in 5 no pathological changes were observed. It is concluded that the procedure described by Masugi as productive of glomerulo-nephritis in rabbits failed to produce the disease in dogs.

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Effects of Increased Metabolism on the Ketone Body Excretion of Depancreatized Dogs.*

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Since fat is a source of ketone bodies, increasing the amounts of this foodstuff oxidized by completely diabetic organisms should produce an increase in the ketone body excretion. According to Shaffer's quantitative expression, every mol of fatty acid oxidized without the simultaneous combustion of antiketogenic material yields one mol of acetoacetic acid. The evidence from a variety of sources indicates that the depancreatized animal depends largely upon fat to furnish its bodily energy, both at rest and during activity,[1] and, furthermore, that it is not able to oxidize significant amounts of

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[1] Chambers, W. H., Kennard, M. A., Pollack, H., and Dann, M., *J. Biol. Chem.*, 1932, **97**, 525.

TABLE I.
Summary of Changes in Metabolism of Depancreatized Dogs Produced by Exercise and by Dinitrophenol.

		Basal		R.Q.		Total Increased					
Exp. (1)	Dog No. (2)	Calories /hour (3)	Total acetone, mg./hr. (4)	Basal (5)	Exp. (6)	Cal. (7)	Acetone, mg. (8)	Expected acetone,* mg. (9)	% Obtained (10)	Expected acetone,† mg. (11)	% Obtained (12)
Exercise	B-3	22.7	200	.73	.72	10.1	—39	490	‡	89	‡
	5	24.3	66	.72	.72	19.0	44	921	5	52	85
	11	28.9	47	.71	.70	14.2	46	688	7	23	200
	13	31.4	118	.70	.69	6.4	237	310	76	24	988
	14	28.4	266	.73	.71	27.4	—202	1327	‡	256	‡
	18	28.1	48	.70	.71	41.8	25	2015	1	71	35
D.N.P.	6	28.4	315	.71	.73	134.8	—174	6520	‡	1494	‡
	11	15.3	36	.71	.71	4.9	0	237	0	12	0
	15	13.5	118	.71	.71	45.2	—62	2188	‡	396	‡
	16	22.7	45	.72	.71	68.9	35	3337	1	137	26
	17	18.3	23	.74	.71	82.1	—36	3978	‡	103	‡
	18	37.3	29	.72	.72	301.0	—23	14580	‡	234	‡

*Calculated from increased fat oxidized. See text.
†Calculated from basal metabolism and ketosis. See text.
‡Acetone excretion decreased.

antiketogenic material.[2] The general purpose of this research was to investigate acetone body formation in the depancreatized dog by increasing the burning of fat.

The methods used to stimulate oxygen consumption were exercise, injection of dinitrophenol (D.N.P.), and administration of desiccated thyroid gland.† An open-circuit respiration set-up was employed for the metabolism determinations, using a Carpenter-Haldane apparatus for the gas analyses. For the assay of urinary constituents, standard techniques were used, and in addition the amount of expired air acetone was determined.[3] All parts of the work were rigidly controlled.

Exercise. Eighteen experiments, including basal, exercise, and recovery periods, were performed on 6 depancreatized dogs. The respiratory quotients of exercise plus recovery (column 6, Table I) show no significant changes from the basal quotients (column 5), indicating that fat furnished the fuel for the increased metabolism. As a basis for comparisons, the total increases in ketosis and in caloric output during each experiment are calculated for the exercise plus the recovery periods. The amounts of additional ketone substances to be expected are computed in two different manners, the first from the increased amounts of fat oxidized (column 9), and the second from the basal proportions of acetone excretion and heat production (column 11). Using a heat value of 7.44 calories and an acetone yield of 0.36 gm. per gm. of fat oxidized, one should expect 0.36/7.44 gm. of extra ketones for each additional calorie of heat produced. Compared with the theoretical values, the amounts obtained were all less than 35% of the quantity expected, with one exception of 76%.

The second method of calculation is outlined as follows:

$$\frac{\text{Total increased calories}}{\text{Basal calories}} \times \text{Basal acetone} = \text{Expected increase in acetone}$$

When these values are used as standards, the amounts of extra acetone to be expected are considerably lowered, as can be seen from the table. Of the 18 sets of results, 4 showed decreased excretion of acetone bodies, while in 14 the amounts were increased over the respective basals. Five of these 14 were grouped about 30% of the theoretical, while the remainder were spread out quite evenly

2 Cori, C. F., *Physiol. Rev.*, 1931, **11**, 143.

† We wish to express our thanks for the thyroid preparation supplied by the Burroughs, Wellcome Company.

3 Barker, S. B., *Am. J. Physiol.*, 1936, **116**, 5.

up to 200%, with one high value of 988%. There were only 2 figures between 80 and 120%, the range which one would consider "quantitative". The wide distribution of the percentages obtained by this second method of calculation does not indicate any quantitative relationship between the increased fat oxidation and changes in the excretion of acetone bodies.

Dinitrophenol. The acetone changes following D.N.P. stimulation of metabolism proved to be even more startling, as in no instance did the excretion of the four-carbon compounds increase significantly. In 9 of 12 experiments the ketosis did not increase at all, or fell, in spite of increases of metabolism in these cases from 5 to 300 calories. When the expected additional ketones are computed from the extra fat burned following D.N.P. stimulation of heat output, the percentages obtained are all less than 1%. Recalculated from the basal metabolism and ketosis, the highest amount then obtained is 26%, with the other values being 20% and 2%, respectively. The amounts to be expected from the fat burned range from 200 to 14,000 mg., while those by the second method of calculation are much lower, being 5 to 1490 mg.

Thyroid. The administration of desiccated thyroid substance produced a much more prolonged elevation of metabolism than could be obtained with either of the other 2 methods. Four dogs were the subjects for 5 experiments, each consisting of a series of basal metabolism determinations during 3 days without thyroid and during 3 corresponding days following prolonged feeding of glandular substance.

Three of the dogs showed no increase in acetone body production in the hyperthyroid periods, while the other, No. B-16, excreted 2 to 3 times the amount of its basal ketosis in both of 2 hyperthyroid series. The effects of the ingestion of meat were studied on 3 of the animals used, and it was found that this foodstuff produced a marked increase in ketone body elimination of dog No. B-16, but only very slight rises in the amounts excreted by the other 2. It should be noted that the differences in these changes were quite similar to those occurring after thyroid administration. However, in the entire set of experiments, the protein catabolism was heightened only once by the thyroid treatment—in 1 of the 2 series on No. B-16, which produced increased ketosis.

Summary. The resting metabolism of depancreatized dogs was raised by exercise, by dinitrophenol injection, and by thyroid administration, always, as far as could be learned, at the expense of increased oxidation of fat. Out of the total of 35 series of experi-

ments, none showed increased ketosis commensurate with the increased amounts of fat burned. The quantities of extra acetone to be expected were considerably lower when these were calculated from the basal heat and acetone values rather than from the increased fat oxidation. Even computed in this manner, however, there were only a few of the exercise and thyroid, and none of the D.N.P., results which were in agreement with the theoretical ketone excretion.