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Kidney hypertrophy produced by diets unusually rich in protein.

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In preliminary reports¹ Osborne and Mendel demonstrated that rats can grow to considerable size on diets consisting of nine-tenths or more of protein, provided that they receive a suitable supply of vitamins A and B as well as of inorganic salts. Both casein and washed meat were used as the sources of the protein. Similar tests have since been made with rations containing about 75 per cent. of protein in the diet. It seemed unlikely that rations on which young rats grew from 60 to 260 grams could be extremely harmful to the organism. However Squier and Newburgh² have concluded, in harmony with a widespread popular belief, that "a high protein diet in man is a renal irritant"; and Newburgh and Clarkson³ have described the production of arteriosclerosis in rabbits on "diets containing 27 and 36 per cent. of protein derived chiefly from beef." For this reason it seems worth while to give a preliminary account of our observations on some of the organs of rats growing on our diets very high in protein.

The only striking change was found in the kidneys, which in the animals on the high protein diets were greatly hypertrophied. The average weight of the kidneys was almost twice that of the kidneys of control animals and their size about one-third greater. Microscopic examination showed no changes of an inflammatory or degenerative nature. The exact histological condition of the kidneys and of the other organs will be reported in full in a

¹ Osborne, T. B., and Mendel, L. B., *Proc. Soc. Exp. Biol. and Med.*, 1921, xviii, 167; *Proc. Nat. Acad. Sc.*, 1921, vii, 157.

² Squier, T. L., and Newburgh, L. H., *Arch. Int. Med.*, 1921, xxviii, 1.

³ Newburgh, L. H., and Clarkson, S., *Jour. Am. Med. Assn.*, 1922, lxxix, 1106.

subsequent paper. Hypertrophy of the kidneys existed without hypertrophy of the heart. The ratio of the weight of the heart as well as of the liver to the body weight was about the same in the animals fed the high protein diets as in the control animals. The ratio of the weight of the kidneys to the body weight in the animals on the high protein diets was, on the average, almost double that of the control animals. The hypertrophy occurred whether the protein used was of animal or vegetable origin or was rich or poor in phosphorus.

The animals on such diets were poorly or, at best, only moderately well nourished. The subcutaneous fat was scant and the skin adherent. There was some fat in the abdominal cavity and in certain animals it was fairly plentiful, but in none was it so abundant as in the control animals. In a considerable proportion of the animals the lungs showed the infection so commonly seen in the domestic rat. The thymus was invariably atrophied. The heart was normal. The spleen varied greatly in size. In some rats it was large, in others normal, and in others atrophic. The liver presented no gross abnormalities. The testes in some of the animals were normal in size; in others they were exceedingly atrophic.

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A contribution to the bio-physics of intestinal absorption.

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The following experiments were suggested by purely bio-physical considerations concerning absorption from the intestines and it was deemed desirable to report the same in this preliminary communication.

On purely physical-chemical grounds it can be shown that the absorption of a chemical in solution which flows through a membranous tube will depend on the speed of flow of the solution through the lumen of the tube. The authors attempted to