lowers the lipolytic activity of most tissues in the body, with the probable exception of the spleen, in comparison with tissues from non-infected normal rats. Even in "early stage small lesion" leprosy there seems to be a tendency in some tissues of the infected rats, especially heart and abdominal muscle, to be significantly lower in lipolytic action than comparable tissues from healthy non-infected rats.

6401

Renal Pigmentation Following Ingestion of Psyllium Seed.

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Psyllium seed, often known as "flea seed", is the seed of a plant, *plantago psyllium*, which grows in southern European countries. This seed finds current vogue as a laxative. The seeds have the property of swelling and becoming gelatinous on contact with moisture. Their laxative action has generally been attributed to this physical change and explained on a purely physical basis.[1] During an experimental study of the effect of the roughage in the diet on the intestinal tract of the albino rat psyllium seed was used as one source of a residue substance. On sacrificing these animals after 125 days on the diet it was found that the kidneys were black in color.

Sagittal section of these organs showed most of the pigment material in the cortex with a still blacker area of demarkation toward the medulla (Figs. 1A and 1B). Microscopic examination revealed many coarse to moderately fine brown granules in the epithelial cells of the tubules (Fig. 2). These granules were most abundant in the proximal convoluted tubules and in the loops of Henle. They tended to accumulate in the basal portions of the cells and about the nuclei. Only an occasional granule was found in the lumen. The pigment was not uniformly spread through the cortex but tended to accumulate more abundantly in groups of 6-12 or more tubules. Considerable pigment was found in the outer portions of Henle's loop but none was seen in the deeper parts of the medulla. The pigment failed to give the reaction for iron when sections were treated

[1] Macht, D. I., and Black, J. A., *Proc. Am. Physiol. Soc., Am. J. Physiol., Soc., Am. J. Physiol.*, 1932, **101**, 71.

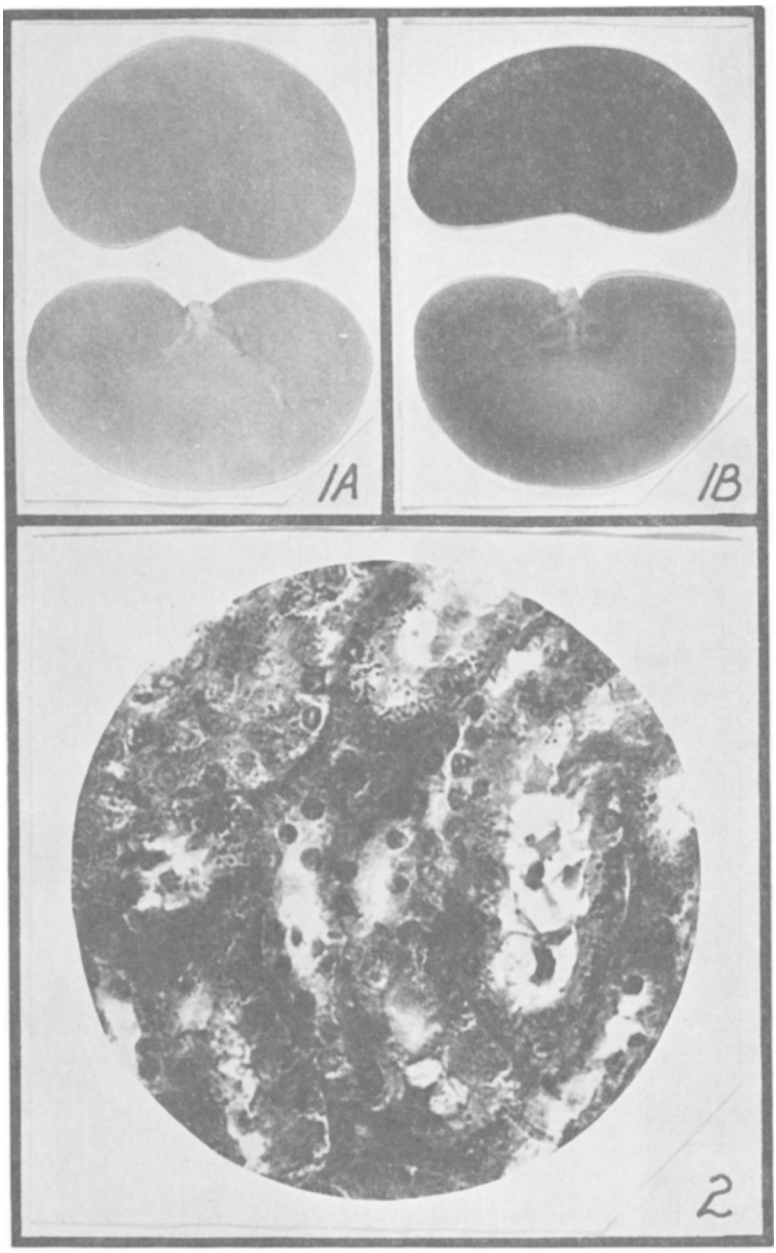

PLATE 1.

Fig. 1A—Kidneys of rat fed the control diet for 125 days.

Fig. 1B—Kidneys of rat fed a diet containing 25% ground psyllium seed for 125 days.

Fig. 2—Microphotograph (high power) showing pigment in the convoluted tubules of kidney pictured in figure 1B.

with potassium ferro-cyanide and hydrochloric acid, neither did it stain with basic fuchsin. The kidneys of the control rats to which no psyllium seed was given were entirely free of pigment.

The rats in which the black kidneys were first found received a mixture containing 75% of a control diet[2] and 25% of finely ground psyllium seed. It was impossible to feed whole seed to the rats for they simply ate the food around the seeds and discarded the seeds. Since we desired to know whether human kidneys might ever become pigmented as a result of the therapeutic use of the whole seed an experiment was carried out with a litter of 6 young dogs. Two received a diet of commercial canned dog food. Two more received the same food mixed with 25% of whole psyllium seed and the third pair the same except that the seed had been ground. After 30 days on these diets only the dogs which had been fed the ground seed had gray black kidneys when they were killed. The pigmentation was grossly not as marked as in the rats. No pigment granules were found on microscopic examination in the kidneys of these dogs or in any of the others. These animals had been fed psyllium seed for only 30 days in contrast with the rats which showed microscopic as well as gross pigmentation, which had been on the diet for 125 days. In 2 rats fed psyllium seed in the diet for 10 days, although the kidneys were grossly darker than the controls, no pigment was found on microscopic examination. The livers were also somewhat dark in appearance but failed to show pigment on microscopic examination. It might be noted that for their size the psyllium seed fed rats always had heavier kidneys than their controls. It is not certain, however, that they were swollen, for the rats were undernourished and the kidneys may simply have been of normal size.

It seemed probable that the renal pigmentation was due to the black pericarp of the seeds but when the bulk of the mucilaginous material was dissolved out of crushed seeds with hot water and the dried shells fed to rats in the usual diet at a concentration of 30% no pigmentation of the renal organs followed. Flaxseed, which has physical characteristics very similar to psyllium seed failed to produce any pigmentation of the kidneys when fed in the same concentration, either whole or ground.

We obtained no evidence as to the chemical nature of the coloring substance in the kidneys. Strong alkali extracted a dark brown substance from the seeds but not from pigmented kidneys. The color in the kidneys faded slowly when they were preserved in neu-

[2] Addis, T., MacKay, E. M., and MacKay, L. L., *J. Biol. Chem.*, 1926, **71**, 139.

tral or acid formalin or ethyl alcohol and more slowly in chromate fixing solutions.

Conclusions. The addition of a large quantity of ground psyllium seed to the diet of albino rats or dogs is followed by a darkening of the kidneys when examined grossly. If the feeding is continued for a longer period brown pigment granules become evident microscopically in the renal tubules. Whole psyllium seed produces no renal pigmentation.

6402

Method for Determining Shape of Colloidal Particles; Application in Study of Tobacco Mosaic Virus.

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(Introduced by T. D. Beckwith.)

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According to Freundlich,[1] when a sol containing rods, discs, or leaf-shaped colloidal particles is flowing through a tube the particles become oriented with the longest axis of the particles parallel to the direction of flow. Discs or leaf-shaped particles near the walls of the tubes also tend to be oriented with their faces parallel to the adjacent wall. Ambronn and Frey[2] reported that sols containing rod-shaped particles are doubly refractive when the particles are oriented by streaming and the direction of observation is perpendicular to the direction of flow. Sols containing discs or leaf-shaped particles show double refraction when the longest axis of the particles is parallel to the direction of flow and the faces of the particles are parallel to the direction of observation.

The above phenomena led us to assume that if a sol containing rod-shaped particles were forced from a small glass tube of circular cross section into the same sol contained in a beaker the orientation of the particles should be the same throughout the stream and all parts of the stream should, therefore, show double refraction. If the direction of flow were reversed and the sol were sucked from the beaker through the small glass tube the sol in the beaker should flow radially toward the mouth of the tube as a center and the long

[1] Freundlich, Colloid and Capillary Chemistry, 1922, E. P. Dutton & Co., N. Y.

[2] Ambronn and Frey, *Das Polarisationsmikroskop*, 1926, Akademische Verlags gesellschaft M. B. H. Leipzig.