we have made use of the method of passive immunization. The test rabbits were given intravenously an immune serum prepared against a Type I pneumococcus, and control rabbits were given the same amount of normal serum. Both test and control animals were then inoculated intracutaneously with various multiples of the lethal dose of a Type I pneumococcus of tested virulence for rabbits. The sites of inoculation were carefully studied at frequent intervals, and in no instance did an allergic reaction occur at the site in the immunized animals, whereas progressive, destructive lesions developed in the controls. The latter died, with septicemia, usually within 36 hours after the inoculation; exceptional animals, however, lived as long as 72 hours. On the contrary, all of the immunized animals survived without developing any appreciable lesion at the site of inoculation. Twenty-two passively immunized animals and the same number of controls have been used in these experiments.

It is clear, therefore, that there exists in the plasma of an animal immunized against the Type I pneumococcus, a means of protection against this organism which is effective in the absence of allergic inflammation. It is also clear that the widely postulated necessity of a local allergic sacrifice of tissue for the preservation of the body as a whole during the operation of acquired immunity finds no support in these experiments.

Conclusions. Following the intravenous injection of an immune serum prepared against the Type I pneumococcus, immunity to infection can be demonstrated in the absence of allergic inflammation. The inflammation of allergy, therefore, is not necessary for the operation of immunity in this infection.

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A Study of the Islands of Langerhans in vivo With Observations on the Circulation.

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Studies of the pancreas with an intact circulation were made in the living animal by Kuhne and Lea,[1] Mathews[2] and Covell.[3]

[1] Kuhne, W., and Lea, A., *Untersuch. a. d. Physiol. Instit. d. Univ. Heidelberg,* 1882, ii, 448.

[2] Mathews, A., *J. Morphol.*, Supplement, 1899, xv, 171.

[3] Covell, W. P., *Anat. Rec.*, 1928, xl, 213.

The following report deals with the physiology of the islands of Langerhans in the pancreas of a living mammal with observations on the circulation. The pancreas of the white mouse was the most satisfactory for this purpose. Male mice weighing from 10 to 20 gm. were used. Anesthesia was induced by the subcutaneous injection of 1 mgm. of sodium amytal (Eli Lilly & Co.) per 5 gm. of body weight. After 10 to 20 minutes narcosis was complete. The animal was placed upon its right side in a petri dish that rested upon a warm stage. An incision measuring 1 cm. was made in the left flank, and the anterior pole of the spleen was grasped and drawn through the opening in the abdominal wall. By gentle traction and rotation the tail of the pancreas was brought into view, attached to the hilum of the spleen. After teasing the lobules apart to expose the main central vessels, the pancreas was bathed with physiological saline at 37°C. and covered with a small cover slip. Observations extended one to 2 hours under a binocular microscope using direct illumination.

In suitable preparations the islands could be identified by the naked eye, as minute white dots on a yellow background. They were distributed usually along the course of the main central vessels or branches of the latter. Microscopically they appeared as brilliant yellowish white bodies on the surface of the less refractile yellow pancreas or on a vein. They were round, oval or kidney-shaped, had well defined margins and varied in size from 0.6 to 0.07 mm. No spontaneous changes in the number, size or shape of the islands were noted. Islands that were studied *in vivo* were identified by serial sections.

Accurate observations were possible only when the islands were situated at the surface of the pancreas, although when they were imbedded deeper in the gland, they could be distinguished by the fact that they reflected the light more brilliantly than did the surrounding tissue. Great anatomical variations existed in different animals with respect to the number of islands that were superficial. In the glands of some mice, many islands were found at the surface. In others only one or two were available for study. In some pancreas no islands were found at the surface.

The circulation in the islands was distinguished clearly. The capillaries appeared as thin, red, thread-like loops that had U. S. V. or spiral shapes and dipped into the substance of the islands. The capillaries were situated between double columns of highly refractile islet cells. The number of visible capillaries varied in different glands. Sometimes no vessels were seen. As a rule the main capil-

lary pattern remained unaltered although lightning-like changes were observed frequently, now one, now another capillary becoming visible and then disappearing from view. The circulation was extremely rapid and the red blood cells were not distinguished. The direction of the flow of blood was often noted in the efferent venules at the periphery of the islands. In this region changes in the course of the flow of blood through different capillaries occurred at irregular intervals. Anastomoses between the capillaries of the island and the interacinar capillaries were seen. In a few instances the afferent arterioles were distinguished, but as a rule they were not visible. Rhythmic spontaneous contractions were observed in the small arteries. In studying the circulation it was important to determine whether any pancreatic tissue was interposed between the island and the surface, because the interacinar capillaries were easily confused with those in the underlying islands. The anatomical arrangement of the circulatory system in the islands of Langerhans was investigated by Dr. Jas. P. Beck by means of the double injection dye method. It was found that one or more afferent arterioles and one or more efferent venules were connected with each island; in addition anastomoses existed between the capillaries in the islands and those in the adjacent acinar tissue. These findings corresponded with the observations which had been made *in vivo*.

Observations were also made concerning the action of epinephrin (Armour & Co.) and pituitrin (Armour & Co.) on the blood vessels of the pancreas, including the circulation in the islands of Langerhans. The drugs were injected intravenously into the left lateral tail vein in doses varying from 0.01 cc. to 0.05 cc. Vasoconstrictor effects on the arteries were noted with epinephrin in dilutions of 1:10,000, 1:20,000, 1:100,000, 1:500,000 and 1:1,000,000. Following the injection of epinephrin in the higher orders of concentrations, blanching and cessation of the circulation in the islands were observed. With the more dilute solutions the effects upon the circulation in the islands were irregular and difficult to follow. This was due to the fact that the vasoconstrictor influence of epinephrin in high dilutions was very transitory.

Vasoconstrictor effects upon the arteries similar to those following epinephrin were seen after the injection of pituitrin in dilutions of 1:400, 1:1000, 1:10,000, 1:100,000 and 1:200,000. These were associated with changes in the circulation in the islands. With doses in the order of 0.02 cc. of 1:10,000 and 0.03 cc. of 1:100,000 dilutions, irregular and segmental vasoconstrictor reactions of the small arteries were noted at the branching points of the vessels. Pituitrin

was tolerated by the mice in much higher concentrations than epinephrin.

During vasoconstrictor action the capillaries in the islands were distinguished as thin, grey channels lying between interlacing cords of cells; the islands became lusterless and their outlines grew indistinct.

The results of the studies with epinephrin and pituitrin indicate that the circulation in the islands of Langerhans is probably regulated by changes in the afferent arterioles or the small arteries in response to physiological stimuli. This may constitute the mechanism by which the supply of insulin to the circulation is controlled. In diabetes the amount of insulin available to the body may be curtailed by vasomotor disturbances in the arterioles and small arteries without demonstrable lesions in the islands.

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Cytological Changes in the Definitive Ova of the White Rat.

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It has been noted in atretic follicles of ovaries of a number of different mammals that the oocytes appear to be going through a process closely resembling normal development. It appears to be a matter of interpretation, after a review of the literature from 1884-1930, as to whether this process is the beginning of parthenogenetic cleavage or whether it is only degenerative fragmentation.

Segmented ovarian ova appeared in every stage of the oestrous cycle of the white rat. They were more numerous in pregnant rats which were at the fifth and eighteenth day of their gestation period. This observation agrees with that of Evans and Swezy.[1] The small size of the follicle and of the segmented egg within, in comparison with the normal follicle and egg is striking. The abnormal follicles were in every case below the surface of the ovary, and in nearly every case they were adjacent to larger normal follicles, or to ovarian corpora. Swezy[2] found very few follicles developing from the germinal epithelium bounding follicles or corpora, due she believed, to the

[1] Swezy, O., and Evans, H., *Science*, 1929, cxxi, 46.

[2] Swezy, O., *J. Morph.*, 1929, xlviii, 445.