

neither *P. rouxi* nor *P. vaughani* confers any protection against the other is rather difficult to demonstrate with certainty because of the very close morphological resemblance between these 2 species, but all the evidence seems to point that way. Birds having a chronic infection of *vaughani*, for example, usually show no parasites after a few weeks, whereas those infected with *rouxi* generally show parasites for months or years. Chronic cases of one of these 2 species, when infected with the other, behave as do pure chronic infections of *rouxi*. In view of the close resemblance of these 2 species, the absence of cross-immunity is surprising. It confirms the evidence offered by the differences in natural hosts, in geographical distribution, in morphology, and in type of infection, that these 2 very similar species are in reality distinct.

An incidental result of this study has been the finding of 2 cases of complete recovery from *vaughani* infection, as shown by failure to infect fresh birds with massive doses of the blood of these cases. This is a very rare occurrence in avian malaria of any kind. Superinfection was not tried in these cases for unavoidable reasons, but it is easily possible in birds cured by drugs, and is impossible in cases of chronic infection.

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Observations on a Dog Maintained for Five Weeks Without Adrenals or Pancreas.

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We have previously reported¹ some preliminary observations on totally adrenalectomized-depancreatized cats. Several workers in the past have attempted this double operation upon dogs and in no instance have the animals survived more than a few hours. Such results as have been obtained have led to the conclusion that total adrenalectomy had no influence upon the subsequent course of the diabetes. During the past year we have completed the double operation upon a dog which was observed over a period of 5 weeks.

The dog (a male weighing 11.2 kilos) was totally depancreatized on March 9th, 1934, the left adrenal removed on March 20th, 1934,

¹ Long, C. N. H., and Lukens, F. D. W., *Science*, 1934, **79**, 569.

and the right on May 4th, 1934. The animal lived until June 8th, 1934.

Following the pancreatectomy the animal was easily stabilized on a diet of 300 gm. liver, 50 gm. raw pancreas and 20 gm. sugar daily with 20 units of insulin administered in 2 doses. On this regime the urinary glucose averaged about 4 gm. per day. The fasting overnight blood sugar ranged from 191-254 mg. %. During this period of 10 days the weight decreased to 10.3 kilos.

After the unilateral adrenalectomy the daily glycosuria still averaged 4 gm. on the same diet and insulin, while the blood sugar ranged around 270 mg. %. Reduction of the insulin to 10 units daily keeping the diet the same resulted in an increase of the urinary glucose to 16 gm. daily. The animal was then restored to the previous regime and maintained on it in good health for a further 6 weeks. During this time no alterations occurred in the character of the diabetes while the weight at the end of the period was 9.1 kilos.

Following the second adrenalectomy the injection of a preparation of cortical extract, kindly supplied by Parke, Davis and Company, was commenced. Since this was not a very potent preparation 10 cc. daily were injected intraperitoneally, and in addition about 4 gm. of NaCl were included with the food. The animal was brought into balance again by diet and insulin, as we wished to determine the insulin requirement on diets similar to those used when some adrenal tissue was present. The duration of life after removal of the remaining adrenal was 35 days.

Four days after operation the animal was placed on a diet of 300 gm. of liver, 50 gm. of raw pancreas and 40 gm. of sucrose. Four units of insulin daily now kept the glycosuria at about 2 gm. per day. The fasting overnight blood sugars ranged from 44-160 mg. %.

After 5 days of this regime the diet was increased to 400 gm. of liver, 50 gm. of pancreas and 60 gm. of sucrose with the same insulin dosage (4 units). The glycosuria only increased to 6 gm. daily and the fasting blood sugars for a 3-day period were 68, 101 and 132 mg. %. For one day on this diet insulin was withdrawn and the urinary glucose promptly rose to 63 gm. The sucrose in the diet was then omitted and the animal kept on meat alone without insulin for a further 3 days. The glycosuria was 20 gm. daily and the fasting blood sugars were 143, 270 and 257 mg. %. The D/N ratio on the third and fourth days of insulin withdrawal were 1.6 and 1.7 respectively. The animal was then returned to the diet of

400 gm. of liver, 50 gm. of pancreas, 60 gm. of sucrose and 4 units of insulin daily for a further 17 days, after which time it collapsed and died 2 days later. At autopsy a subdiaphragmatic abscess was found, associated with a terminal peritonitis. Prior to this development the animal had been well and lively, and at the time of death it weighed 8.1 kilos. No adrenal or pancreatic tissue was found at autopsy.

In this animal the removal of one adrenal had apparently no effect on pancreatic diabetes. This conclusion is reached since after the unilateral adrenalectomy the same amount of insulin was required with the same diet to keep the glycosuria at the same level.

After removal of all adrenal tissue the most striking feature was the ability of small amounts of insulin, one-quarter to one-fifth the original amount, to keep the glycosuria at a very low level, in spite of feeding of as much as 60 gm. of sucrose daily in addition to 450 gm. of meat. The available carbohydrate of this diet was about 127 gm. yet only 4 units of insulin were required to keep the urine almost sugar free.

On the other hand it is quite apparent from a study of the periods when insulin is withheld that the animal did not possess a normal capacity to metabolize carbohydrate. How long such an animal would have survived if not treated with insulin remains to be determined.

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Indirect Method for Determining Blood Pressure in Small Animals.

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Experimental problems requiring the repeated taking of blood pressure have, in the past, required the use of fairly large animals. Various indirect methods suggested for small animals have, as a rule, proven unsatisfactory. Griffith and Collins¹ reported an indirect method for obtaining blood pressure in man by capillary observation with simultaneous arterial compression. This method has now been modified for use in small animals.

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¹ Griffith, J. Q., Jr., and Collins, L. H., Jr., *Am. Heart J.*, 1933, **8**, 671.