is not at all clear. It certainly is alien to present concepts to associate a beneficial action with bacteria in relationship to the host. Except for the elaboration of Vit. K in the intestine there is no other evidence that the host is in any way helped by presence of these organisms.

It has been shown in this experimental model that penicillin has a beneficial effect on survival of mice infected with a penicillin resistant organism. The mechanism of this is discussed in detail by McCune(3,4) *et al.* In brief, studies of the Giorgio strain on agar plates with varying amounts of penicillin have revealed that this strain is composed of cells 90% of which are susceptible to 0.1 unit of penicillin per milliliter. However, even when organisms from one of the most resistant colonies are subcultured on plain agar or on penicillin containing agar the pattern of mixed resistance and susceptibility seen with the original culture is seen again. This would explain why penicillin is at least partially ef- Biology—One hundred seventy-nine Marks fective in treatment of this infection in mice.

Summary. Survival and microbial population studies in mice with their intestinal flora reduced by neomycin indicate that these animals are much more susceptible to intravenous staphylococcal infections than their littermate controls.

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Evaluation of Renal Function with Radio-Renogram.* (25979)

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Evaluation of renal function with I^{131} diodrast renograms has been reported(1,2). The value of the test is limited because the renogram could appear normal in presense of considerable kidney damage. This report deals with a modification of the I^{131} diodrast renograms designed to improve its effectiveness in both diagnosing and localizing renal disease.

Methods. Control Group. Standard I^{131} diodrast renograms were performed in 7 normal female mongrel dogs weighing between 10 and 17 kg. The animals were placed in a prone position and a catheter was inserted in the bladder. Scintillation detectors were placed over each kidney and over the heart. Output of the scintillation detector was connected to a count rate meter and a rectilinear strip chart recorder. Fifteen μc of I^{131} labeled diodrast (less than 3 mg) was injected intravenously. Levels of activity observed over each kidney and the heart were recorded. After completing the control renogram, an intravenous priming dose of para-amino-hippurate (PAH) calculated transiently to saturate the renal tubular mechanism was injected. The I^{131} diodrast renograms were repeated at frequent intervals as plasma level of PAH fell. Plasma levels of PAH were determined at each of these intervals. *Operative Group.* Routine radio-renograms were recorded in 8 dogs following which partial resection of their left kidneys were performed. Five dogs had about one-third, 2 had one-half and one had two-thirds of the left kidney excised. A bladder extrophy was also performed to facilitate study of indirect renal function in each kidney. One month or more post-operatively the glomerular filtration rate (GFR) and effective renal plasma flow (ERPF) were determined simultaneously in both kidneys of each dog by measurement of creatinine and para-amino-hippurate (PAH)

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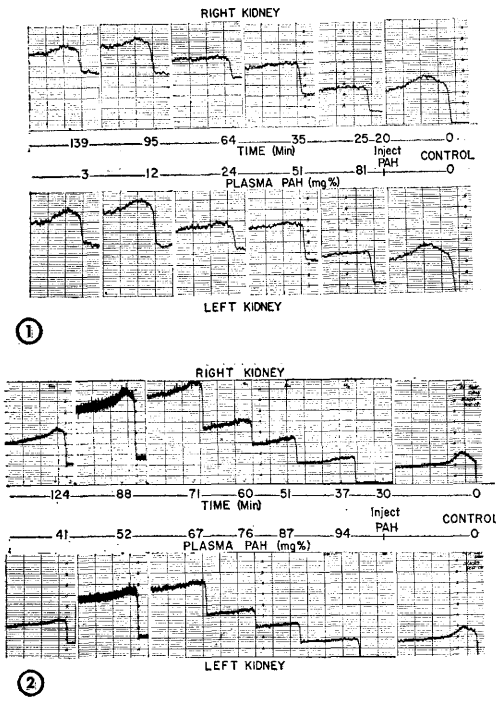

FIG. 1. Radio-renograms pre- and post-intrav. inj. of 15 cc 20% PAH in normal 10 kg female dog.

FIG. 2. Radio-renograms pre- and post-intrav. inj. of 32 cc 20% PAH in a 14 kg female dog with ⅓ of left kidney removed.

clearances respectively(3). Routine radio-renograms were again recorded in each animal and in addition the tubular saturation technic with PAH was performed as described above.

Results. Control Group. Fig. 1. is an experiment representative of this series. The pre-PAH injection I^{131} renogram revealed normal concentration and secretion curves usually obtained. Following injection of the tubular saturation PAH dose the radio-renogram revealed no apparent concentration above initial blood dilution of I^{131} diodrast. Not until 95 minutes after the PAH dose when plasma PAH level was 12 mg % did the repeat renogram show some concentration and secretion of I^{131} diodrast. By 119 minutes when PAH plasma level was 3 mg % the I^{131} diodrast renogram had returned to essentially the control pattern.

Operative Group. Simultaneous recording of GFR and ERPF in both kidneys was measured in 3 animals with approximately one-third of the left kidney excised. GFR and ERPF of the left kidney averaged 56% and 55% respectively of normal right kidney. In 2 animals with one-half of left kidney removed a GFR and ERPF of 44% and 40% respectively of the normal right kidney was noted. When one-half or less of the left kidney was removed the I^{131} diodrast renograms gave inconsistent results, either showing no difference between the 2 kidneys or minimal differences.

After the saturation dose of PAH was injected, the immediate I^{131} renogram revealed essentially no concentration above initial blood dilution of the I^{131} diodrast and therefore no significant excretion of the substance. Between 3 and 50 minutes the normal right kidney was noted to show some concentration and excretion. The left kidney, depending on how much functioning tissue remained, showed either a delay in concentration and excretion or so minimal a concentration and excretion at any given moment as to be easily differentiated from the normal kidney. A representative case is noted in Fig. 2. Although GFR and ERPF of the left kidney were 65% and 58%, respectively, of normal values for the right kidney, no significant difference was noted in the control I^{131} diodrast renogram. At 37 minutes (or 7 minutes after tubular saturation dose of PAH) with a plasma PAH level of 94 mg % neither kidney showed any concentration of I^{131} diodrast. At 71 minutes (or 41 minutes after injection) at a PAH plasma level of 67 mg % the normal right kidney was able to concentrate and excrete the I^{131} diodrast whereas no significant similar function was seen in the left kidney. This difference was also noted at the next I^{131} diodrast injection at 88 minutes when plasma PAH level was 52 mg %.

Discussion. At low blood levels (less than 2 mg %) about 80% diodrast or PAH is taken up and secreted by the tubular cells in one circulation through the kidney. As plasma concentration of either substance is increased, more of it is secreted until maximal rate of secretion, Tm (tubular maximum) is reached. Further increases in concentration augment the rate of excretion only by increasing the filtered load which is that small fraction of circulating diodrast or PAH which is not protein bound(4).

Since concentration and secretion of I^{131} diodrast dose used in the standard test requires little kidney function, it is understandable why the renogram appears normal even when significant renal dysfunction exists. If the renal mechanism responsible for secreting diodrast is functioning at its maximum (for example, with Tm doses of diodrast or PAH), the I^{131} diodrast renogram would be expected to show a flat curve or essentially no tubular cell concentration or secretion of the I^{131} diodrast. Plasma level of the competing substance falls as the kidneys secrete it and/or it is distributed in extracellular fluids. Repeat I^{131} diodrast injections should show a gradual return of concentration and secretion by both kidneys. This sequence of events was demonstrated in normal dogs. If the functional capacity of one kidney is decreased the normal control kidney should show an earlier appearance of and a greater concentration and secretion of I^{131} diodrast as compared with the defective kidney. This was also demonstrated in the operative animals in this report.

Studies have been performed on human cases of unilateral and bilateral renal diseases. Currently we are employing a combination of I^{131} hippurate and PAH to eliminate the liver background problem encumbent with I^{131} diodrast(5).

Conclusions. (1) Routine I^{131} diodrast renograms frequently fail to demonstrate significant renal lesions. (2) Initial loading of tubular mechanism responsible for secretion of diodrast by competitive substance (for example, para-amino-hippurate) blocks concentration and secretion of I^{131} diodrast. (3) As tubules secrete the competing substance and plasma level gradually returns toward normal, the control kidney in cases of unilateral disease demonstrates, on successive injections of I^{131} diodrast, earlier appearance of uptake and secretion as well as greater quantitative uptake and secretion of I^{131} diodrast.

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Effects of Intra-Adrenal Infusion of Potassium on Urinary Potassium Excretion in the Dog.* (25980)

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It is well-known that intravenous infusion of potassium salts induces a prompt increase in urinary excretion rate of potassium. The kaliuresis is effected by a change in renal tubular activity since both glomerular filtration rate and serum potassium remain relatively constant(1). It is not known exactly how infusion of potassium salts provokes this change in renal tubular activity but it seems reasonable to suppose the existence of a site or sites sensitive to alterations in potassium concentration. Several lines of evidence suggest that at least one such site may be the adrenal cortex. There is a positive correlation between potassium intake and aldosterone excretion(2), and aldosterone acts directly on the mammalian renal tubule to increase potassium excretion(3). Furthermore, when potassium concentration is increased in perfusates of isolated beef adrenals, greater amounts of aldosterone are secreted(4). Similar results are obtained by addition of potassium to isolated rat adrenals(5). These observations suggest that potassium acts di-

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