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Experimental Chronic Renal Failure in Rats

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Sir,

An experimental model of renal failure would be most valuable for studying metabolism, skeletal changes and intestinal disturbances in uremia. Several authors, i.e. [Plaitetal.](#) [6], Morrison[5], Chantler^{etal.} [2], and Ejerblad[3], have described the so-called 5/6 nephrectomy in rat. The uremia thus achieved has been unsatisfactorily defined. To judge from the increase in body weight, the rats have only been lightly to moderately uremic. [Mehls et al.](#) [4], by combining 7/8 nephrectomy with local irradiation to inhibit renal hypertrophy, could reduce the endogenous creatinine clearance to 20% of that of controls. [Boudet et al.](#) [1] describe an interesting method, using electrocoagulation, which results in progressive uremia over several months. One disadvantage is the difficulty in deciding at the time of operation how uremic the rats will be. I found that extended kidney resection produced a more profound uremia than is shown earlier with partial nephrectomy. 4 weeks after operation creatinine clearance was only 10% of that of normal rats. Below follows a description of the technique.

Wistar rats weighing 150–200 g were anesthetized with mebumal-sodium 60 mg/kg body weight intraperitoneally. The abdomen was opened with a midline incision, the left kidney was separated from the adrenal gland and from perirenal fat, and a clamp was placed on the kidney vessels to minimize bleeding – an earlier problem. After fastening the kidney on a plastic plate, both poles and part of the lateral, anterior, and posterior parenchyma were resected (fig. 1). Special attention was paid to the posterior resection, as the pelvis could easily be damaged. The arterial clamp was removed and hemostasis achieved with 5–10 min digital pressure. The remaining parenchyma was then irradiated with 290 rad on each side. The right kidney was removed 1 week later when the animals had recovered. Weights were taken every week (fig. 2). The uremic rats survived 5–6 weeks after the second operation. Table I lists the laboratory data of the uremic and sham-operated rats. This standardized technique produces an experimental model of severe chronic uremia. Several of the serum abnormalities seen in these rats compare well with those found in patients with chronic renal failure. The uremic model should therefore be useful in studying the effect of uremia on different organ systems.

Fig.1. Resection of left rat kidney, anterior and lateral view. Hatched areas represent resected parenchyma.

Table I. Some laboratory data in uremic and sham-operated rats (mean i SD)

Uremic rats
Sham-operated
300
200

100

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A weeks

Serum-creatinine, $\mu\text{mol/l}$ Creatinine clearance, $\mu\text{l/min/100 g b.w.}$ Serum urea, mmol/l Serum sodium, mmol/l Serum potassium, mmol/l Serum chloride, mmol/l Serum calcium, mmol/l Serum phosphate, mmol/l Serum magnesium, mmol/l Plasma bicarbonate, mmol/l Hematocrit, %
 368 ± 80.3 (19) 65.1 ± 25.9 (19)
 69.9 ± 13.4 (12) 148 ± 9.57 (12) 5.44 ± 0.79 (12) 106 ± 9.80 (12) 1.86 ± 0.37 (12) 3.98 ± 0.80 (12) 1.32 ± 0.27 (12) 19.0 ± 1.94 (9) 32 ± 1.69 (8)
 51.6 ± 8.76 (9)
 688 ± 165 (9)
 7.46 ± 1.79 (5)
 142 ± 3.42 (7)
 4.80 ± 0.31 (7)
 104 ± 4.63 (7)
 2.37 ± 0.15 (7)
 2.70 ± 0.23 (7)
 1.24 ± 0.18 (5)
 20.8 ± 0.45 (5)
 48.4 ± 1.52 (5)

Fig. 2. Weight gain for uremic (-rats ( )).

-) and sham-operated

Number of rats in parentheses.

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Letters to the Editor

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