To avoid the influence of other organs in the body, whole blood perfusion of a kidney in true isolation has been studied in a 'Heart-lung' developed at Hammersmith Hospital (Figures 1 - 3), incorporating the principles described by Nizet (1963). The system provides good control of the perfusion pressure, flow rate, acid-base balance and oxygenation at 38°C. Preparations studied were (a) 'live' canine kidneys (10 min ischaemia - Group I); (b) 'Cadaver' canine kidneys (hypotensive for 30 min and ischaemic for 30 min, Group II), and (c) human cadaver kidneys.

In all groups there was normal blood flow and pressure. The haeimolytic damage to red blood cells was minimal (average plasma haemoglobin at 270 min of perfusion was 130 mg/100 ml). In the first group of kidneys for successful perfusion it was necessary to use blood freshly shed (under 5 min). In the other two groups, blood older than 5 min or ACD preserved blood was satisfactory. There was no vasoconstriction even at 14 hours of perfusion. In fact the initially absent vasoconstrictor response in Groups II and III was found to have recovered within 90 min of perfusion. In all groups after an initial rise there was normal oxygen consumption (Kulatilake, 1967). The 'live' and 'cadaver' canine kidneys were shown to have normal glucose and lactate metabolism (Kulatilake & Fleming, 1968). In the continued perfusion there was a reduction of creatinine, inulin and PAH clearances. There was a simultaneous rise in the plasma ammonia level (Kulatilake & Clegg, 1969). This accumulation of ammonia could be reduced by incorporating a dialyzer in the circuit. Tubular transport and intrarenal haemodynamics have been investigated (Chisholm et al, 1967; Cosgrove et al, 1968). Enzyme studies in the first group of kidneys revealed a 12% reduction in the activities of acid phosphatase, alkaline phosphatase, N.A.D.H., succinate dehydrogenase, glucose-6-phosphate by the fifth hour of perfusion, while unperfused kidneys at 35°C (used as controls) showed an 18% reduction.
Tetrazolium bromide reduction time was persistently below 35 sec, while that of the controls varied between 30 and 60 sec at 5 hours.

After 6 hours of perfusion there was mild tubular necrosis in all kidneys but it was minimal in those from human cadavers. There was no vascular damage.

The apparatus can be easily disassembled, cleaned and reassembled. Sterilisation is easy.

**Figure 1. Diagram of perfusion apparatus**
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REFERENCES

Cosgrove, M. D., Evans, K. and Raphael, M. J. (1968) British Journal of Surgery, 55, 245