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STUDIES OF HEMODIALYSIS IN SMALL ANIMAL PRACTICE
INVESTIGATION OF ULTRAFILTRATION RATE AND INFUSION RATE

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The purpose of this study was to establish the effectiveness and safety of hemodiafiltration in small animal practice. Experimental studies to investigate the influence of ultrafiltration pressure, blood flow rate, permeability and area of the membrane, and dialysate flow rate, on the ultrafiltration rate were carried out using bovine blood. A single pass system with an accumulator was used. Hemodiafiltration was carried out in dogs and a cat with both experimentally induced acute renal failure and chronic renal failure to determine the ultrafiltration and infusion rates.

The ultrafiltration rate could be calculated by measuring the hematocrit difference across the dialyzer. The ultrafiltration rate calculated in this experiment was 50% less than that recommended by the manufacturer. When the blood flow was kept constant and a suitable dialyzer corresponding to this blood flow was used, it was observed that any increase in ultrafiltration pressure resulted in a corresponding increase in the ultrafiltration rate. However, when the ultrafiltration pressure was kept constant, increasing the blood flow rate had no effect on the ultrafiltration rate. A relationship between the ultrafiltration rate and the area of the membrane was also established. An increase in the area of the membrane resulted in a directly proportional increase in the ultrafiltration rate. This was more so with a permeable membrane than with a semipermeable one and resulted in a high extraction rate.

As a result of the relationships between the dialysate flow rate and ultrafiltration rate, 300 ml/min was recommended as an optimum dialysate flow rate.

Hemodiafiltration was performed in 2 dogs with acute renal failure experimentally induced by HgCl₂ injection and 2 healthy dogs to investigate the infusion rate.

When the infusion rate reported by the manufacturer was used during hemodiafiltration, it resulted in excessive infusion. However, the rate calculated in this study was found to be appropriate. Similar results for hemodiafiltration in experimental cases were obtained when clinical cases (1 dog and 1 cat) were used in the experiment. In addition, high extraction rates for blood urea nitrogen (BUN) and creatinine (CRE) were achieved in 150 minutes, a period shorter than that reported in previous studies. It was therefore concluded that, even for small animals, if a suitable dialyzer that directly corresponds to the blood flow rate is used, effective hemodiafiltration can be performed safely simply by controlling the ultrafiltration and infusion rates appropriately.