

Abstract Submission No.: A-1273

Suitable albumin concentration of perfusate in a rat kidney in situ perfusion model

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Objectives : An in situ perfusion model of an isolated kidney can be used to study drug metabolism and physiological function of the kidney under physiological conditions. It can also be used to develop the techniques for local organ therapy, such as selective perfusion of anticancer agents. The aim of the present study was to establish an in situ perfusion model of the rat kidney by determining the appropriate albumin concentration of the perfusate.

Methods : The experiments were conducted using male Sprague Dawley rats. Cannulations of the renal vein, renal artery, and ureter were performed in that order for the left kidney. The perfusion experiment was then conducted for 2 hours using erythrocyte-containing perfusate at varying albumin concentrations of 0%, 2%, and 4%. The flow resistance of the kidney and urine production during the circulation experiment were measured every 15 min. After perfusion was completed, the left kidney was harvested and the rate of glomerular congestion was evaluated using HE staining.

Results : During the 2-hour circulation experiment, urine production remained constant in all groups, while renal artery pressure was maintained within the target range of 100-120 mmHg. The urine production was significantly lower when the albumin concentration was at 4%, which was closer to the physiological urine production of rats, compared to the other groups. Glomerular congestion was observed in all groups, but the ratio of congested glomeruli to total glomeruli was lowest when the albumin concentration was at 4%. These results suggested that an albumin concentration of 4% in the perfusate is optimal.

Conclusions : In an in situ perfusion model of rat kidney, a perfusate with an albumin concentration of 4%, which maintained colloid osmotic pressure and physiological urine production, is considered suitable for a physiological isolated kidney model.