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The efficacy and biocompatibility of a novel polymer-based solution in a rat model of acute peritoneal dialysis

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Background: Peritoneal dialysis (PD) for treating renal end-stage disease is limited by the bioincompatibility of conventional glucose-based lactate-buffered solutions. The present study was to test the biocompatibility of a novel polymer molecule as a primary osmotic agent in acute PD.

Materials and Methods: Spragle-Dawley rats were used as a preclinical model of acute PD. Peritoneal injury and cellular infiltration were determined by both histology and flow cytometric analysis.

Results: Here we showed that intraperitoneal administration of polymer solutions significantly induced fluid removal in a concentration-dependent manner. As compared to conventional PD solution (Dianeal™ 2.5%), polymer solutions at the concentration of 15% removed more fluid, and at both 7.5% and 15% retained more urea, indicated by the higher amount of net urea in the effluents or higher urea clearance rates during 4 hrs of dialysis. Histological examination indicated that the peritoneal membrane injury along with polymorphonuclear infiltrates in rats with polymer solutions was milder than those with conventional PD solution. These observations were further confirmed by the presence of fewer neutrophils and peritoneal mesothelial cells in the recovered polmer solutions. In cultured human peritoneal mesothelial cells, more cells survived following exposure to polymer solutions than those to conventional PD solution that induced cytoplasmic vacuolation.

Conclusion: Our data indicated that polymer solution was superior to conventional glucose-based PD solution both in the removal of fluid and urea, and in peritoneum tolerance, suggesting the potential of this polymer as an osmotic agent for developing a new PD solution.

Biography

Dr. Caigan Du is a scientist at the Vancouver Coastal Health Research Institute and an Assistant Professor in the Department of Urologic Sciences at the University of British Columbia. He received a Ph.D. degree in Biochemistry and postdoctoral training in Immunology. He is interested in the pathogenesis of kidney ischemia-reperfusion injury and transplant rejection, and molecular control of urinary malignancies. He has been studying the impact of kidney donor-derived factors on renal allograft rejection, and the molecular pathways of kidney injury and regeneration in experimental models. He is also interested in developing medical solution including drugs made from natural compounds for all kinds of health problems, including kidney failure and urinary cancer. He is the PI of many grant supports from the Kidney Foundation of Canada and other funding agencies.

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