Experimental Approaches for Peritoneal Dialysis: In-vivo Experience

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In vivo animal studies are an intermediate step between in vitro study and clinical trials in humans. Several animals are used for the peritoneal dialysis models. The rat model is the most popular. Research into peritoneal fibrosis and angiogenesis has been enhanced by new animal models. For this research, 3 or more years of clinical studies are required, which are too long and very difficult to perform. However, in the rat model, 6 to 12 weeks are enough to induce significant peritoneal changes. In the chronic inflammatory infusion model, it requires just 4 weeks. In this model, LPS is instillated into the abdominal cavity for simulating peritonitis and accentuating peritoneal changes. The animal PD model is maintained for a maximum of up to 24 weeks. Intravital microscopy allows to show microvascular structure directly including rolling, adhesion and extravasation of leukocyte. The gene transfer study conducted by Margetts using adenovirus vector has elucidated the molecular mechanisms of peritoneal fibrosis. In the long-term animal PD model, investigation of mechanisms of peritoneal fibrosis and angiogenesis/vasculopathy are mostly based on interventional studies using pharmacologic agents, blocking antibodies, or various expression systems including gene therapy. These models are helpful to test the effects of long-term intraperitoneal application of different dialysis solutions. Recently the knockout or transgenic mice model has been used for investigating molecular mechanisms as a counterpart of gene transfer model. The knockout mouse model has both advantages and disadvantages. The advantages are that it is useful to characterize the specific molecular bases for the alteration of the peritoneal membrane and is economical and easy to breed & maintain. Disadvantages are related to size. The mouse is smaller than the rat. Smaller blood samples can be taken to study. In future researches with animal studies, role of various cytokines and growth factors, cellular processes, and matrix interactions in fibrosis and angiogenesis can be studied. Inhibition of epithelial-mesenchymal transition can be demonstrated in the animal model with new therapeutic interventions.