The first part of thesis is focused on the technical aspects of experimental model of liver transplantation on rats. The second part describes the research project that tested a novel immunosuppressive drug gemcitabine compared to low dose of cyclosporine A on the acute liver rejection model. To use a cytostatic drug in a low dose with a minimal toxicity as an immunosuppressant would be attractive for clinical use. Particularly because liver transplantation for hepatocellular carcinoma represent a frequent indication nowadays and also due to risk of development of a new post transplant malignancies as an side effect of standard immunosuppressant. Our results showed lower nephrotoxicity compared to cyclosporine, however, did not confirm the previous optimistic reports in terms of rejection treatment as it only mildly decreased the rejection severity. Our data suggests that gemcitabine cannot be used as a main immunosuppressant alone.